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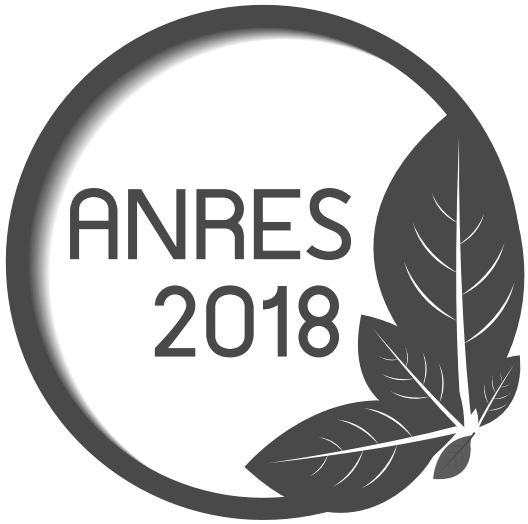
Proceedings
ANRES 2018

International Conference of Agriculture and Natural Resources

26 – 28 April 2018

HOTEL WINDSOR SUITES & CONVENTION
Bangkok, Thailand



http://anresconference.kasetsart.org/
Organized by Kasetsart University Research and Development Institute (KURDI)

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PREFACE

On behalf of the Organizing Committee, we are pleased to present the Book of Abstracts, of the International Conference on Agriculture and Natural Resources 2018 (ANRES 2018). It is scheduled to be held from 26th – 28th April 2018 in Bangkok, Thailand. It is organized by Kasetsart University Research and Development Institute (KURDI) together with editorial team of Agriculture and Natural Resources (ANRES journal). The conference's goal is to provide a frontier research forum on agriculture including agricultural science, animal science and aquaculture, biodiversity and evolution, environment and ecology, food science, forestry, genetics and breeding, microbiology and biotechnology, plant science, soil science, and agricultural applications in physical science, engineering and computational science. ANRES 2018 is an international gathering with an excellent opportunity to create knowledgeable network, build research collaboration, and meet scientific colleagues from many countries. ANRES 2018 takes the privilege to invite researchers, agricultural industry, and young scientists to gain international atmosphere and meet inspiring speakers and expert. The book of Abstracts is one of the main outcomes of the ANRES 2018 conference and serves as an input for the conference discussions. More than 300 authors and attendees will participate and share their theoretical and applied scientific knowledge as well as new findings through various forms of participation. To this end, the conference make valuable contribution and new scientific networks.

Thank you all for participating

Thongchai Suwonsichon
Chairman, ANRES 2018

Program of International Conference of Agriculture and Natural Resources 2018

Thursday 26 April 2018, Pailin-Petch room 11th floor		
8:00-9:00	**Register**	
9:00-9:30	**Opening ceremony**	
9:30-10:10	**Plenary lecture:** Intracellular communication of abiotic stress, memory and recovery: From model systems to crops *Barry Pogson, Australian National University, Australia*	
10:10-10:50	**Plenary lecture:** Gene evolution by design *Apichart Vanavichit, Kasetsart University, Thailand*	
10:50-11:05	**Coffee break**, 10th floor	
11:05-11:45	**Plenary lecture:** Sustainable urban pest management in Asia -- Challenges and feasibilities *Chow-Yang Lee, Universiti Sains Malaysia, Malaysia*	
11:45-12:00	**Special lecture:** Accelerating agrigenomics genomic breakthroughs. Driving innovation in agriculture *Evgeny Glazov, illumina*	
12:00-12.15	**Special lecture:** Beyond traditional SEM with *in-situ* dynamic evaluation using environmental SEM (ESEM) *Simon Fong Khin Mun, Crest Nanosolution (Thailand) Ltd.*	
12.15-13.30	**Lunch**	
	Session 1 Plant Science Pailin room 11th floor **Chairman:** Pongphan Jitareerat **Co-chair:** Wannarat Phonphoem	**Session 2 Microbiology and Biotechnology** Petch room 11th floor **Chairman:** Savitree Limtong **Co-chair:** Nichanun McMillan
13:30-14:00	**Invited lecture:** Biosynthesis of β-Citraurin in citrus fruit *Masaya Kato,* *Shizuoka University, Japan*	**Invited lecture:** Expanding primary metabolism in *Streptomyces* helps generate metabolic robustness to cope with life in the soil *Paul Hoskisson,* *University of Strathclyde, UK*
	Oral presentation	
14:00-14:15	**PS-O1:** Identification of interspecific hybrid between *J. curcas X J. integerrima* using morphological and molecular marker *Darmawan Saptadi,* *University of Brawijaya, Indonesia*	**MB-O1:** Bacteriocin activity of *Lactobacillus brevis* isolated from rumen liquid of thin tail sheep *Okti Widayati,* *Gadjah Mada University, Indonesia*
14:15-14:30	**PS-O2:** Detection and allele identification of rice blast resistance gene, *Pik*, in Thai rice germplasm *Kasirapat Ariya-anandech,* *Kasetsart University, Thailand*	**MB-O2:** Analysis of targeted metabolites in tricarboxylic acid cycle of cordycepin administration in streptozotocin-induced diabetic mice *Kongphop Parunyakul,* *Kasetsart University, Thailand*
14:30-14:45	**PS-O3:** MaxEnt modelling for predicting the potential distribution of *Vitex glabrata* R.Br. in Thailand *Kanokporn Promnikorn,* *Kasetsart University, Thailand*	**MB-O3:** Dual transcriptome analysis of *Penicillium chermesinum* and its co-cultivation for investigating polyketide biosynthetic genes *Suthasinee Rattanachan,* *King Mongkut's University of Technology Thonburi, Thailand*

14:45-15:00	**PS-O4:** Diversity of durian (*Durio zibethinus* L.) from Nonthaburi, Thailand based on morpho-palatability characteristics and SSR markers *Sasivimon Swangpol,* *Mahidol University, Thailand*	**MB-O4:** Preparation and characterization of bacterial nanocellulose incorporated with xanthone for cosmeceutical product *Boonyasit Porngarm,* *Kasetsart University, Thailand*
15:00-15:15	**Coffee break**, 10th floor	
	Session 3 Genetics, Diversity and Ecology Pailin room 11th floor **Chairman:** Kornsorn Srikulnath **Co-chair:** Narongrit Muangmai	**Session 4 Microbiology and Biotechnology** Petch room 11th floor **Chairman:** Arinthip Thamchaipenet **Co-chair:** Ekaphan Kraichak
15:15-15:45	**Invited lecture:** The Thai long-tailed macaques (*Macaca fascicularis*): Pest or precious? *Suchinda Malaivijitnond,* *Chulalongkorn University, Thailand*	**Invited lecture:** Microbial lipid production from crude glycerol by an oleaginous yeast, *Rhodosporidiobolus fluvialis* DMKU-RK253 *Savitree Limtong,* *Kasetsart University, Thailand*
	Oral presentation	
15:45-16:00	**GDE-O1:** Activity pattern of leopard (*Panthera pardus*) in Huai Kha Khaeng Wildlife Sanctuary, Thailand: A confirmation from multiple year data *Apinya Saisamorn,* *Kasetsart University, Thailand*	**MB-O5:** Biochemical mechanism of anti-inflammation explained from two marine-derived bioactive compounds *Jidapa Sornsiri,* *Burapha University, Thailand*
16:00-16:15	**GDE-O2:** Multiple nesting of hawksbill turtle *Eretmochelys imbricata* at Talu Island, the Gulf of Thailand as revealed by mitochondrial DNA analysis *Mukrekha Chiewchanchai,* *Chulalongkorn University, Thailand*	**MB-O6:** Antiplatelet and fibrinogenolytic activities of a purified mucus protein from *Eudrilus euginiae* (African night crawler) *Kittidet Prem-U-domkit,* *Kasetsart University, Thailand*
16:15-16:30	**GDE-O3:** Genetic diversity and history of Japanese indigenous chickens inferred from mitochondrial D-loop region *Mitsuo Nunome,* *Nagoya University, Japan*	**MB-O7:** Transient recombinant human Osteopontin expression in non-transgenic plants *Wanuttha Boonyayothin,* *Kasetsart University, Thailand*
16:30-16:45	**GDE-O4:** Telomere dynamics of age-related sex differences in Siamese Cobra (*Naja kaouthia*) reflects lifespan estimation *Kornsorn Srikulnath,* *Kasetsart University, Thailand*	**MB-O8:** Development of an electrochemical sensor for Fumonisin B1 based on molecularly imprinted polymer nanoparticles *Hasim Munawar,* *University of Leicester, UK*
16:45-18:00	**Poster presentation**, Ampava room 10th floor	
18:00-20:00	**Banquet**	
	Friday 27April 2018	
	Session 5 Animal Sci. and Aquaculture Pailin room 11th floor **Chairman:** Kornsorn Srikulnath **Co-chair:** Narongrit Muangmai	**Session 6 Genetics, Diversity and Ecology** Petch room 11th floor **Chairman:** Prateep Duengkae **Co-chair:** Pramote Chumnanpuen

09:00-9:30	**Invited lecture:** National BioResource Project (NBRP) "Chicken and Quail" in Japan *Yoichi Matsuda,* *Nagoya University, Japan*	**Invited lecture:** Smart man, smart ranger, and smart patrol: The essential elements in protection and recovery of threatened wildlife species in Thailand *Anak Pattanavibool,* *Wildlife Conservation Society Thailand Program, Thailand*
	Oral presentation	
09:30-9:45	**AA-O1:** The relationship between expression of *LPL, FATP4, FAT/CD36* gene and effects of dietary curcuminoids and tuna oil in Korat chicken *Siraprapa Homkhajohn,* *Suranaree University of Technology, Thailand*	**GDE-O5:** Sapling dynamics along altitudinal gradients at Doi Suthep-Pui National Park, Northern Thailand *Sutheera Hermhuk,* *Kasetsart University, Thailand*
09:45-10:00	**AA-O2:** The expression of antioxidant enzyme genes and the effects of dietary curcuminoids combined with tuna oil in Korat chicken meat *Witchapat Nambundit,* *Suranaree University of Technology, Thailand*	**GDE-O6:** Predicting risk zones of Nipah virus from foraging utilization of Lyle's flying fox (*Pteropus lylei*) in Eastern Thailand *Aingorn Chaiyes,* *Kasetsart University, Thailand*
10:00-10:15	**AA-O3:** The relationship of hematological values with Newcastle disease antibody in Thai indigenous chicken: Strain Leung Hang Khow *Keyapat Kongroi,* *Suranaree University of Technology, Thailand*	**GDE-O7:** Development of web portal application as an innovative learning media about Timber license for forest farmers and local industry in Indonesia *Mahtuf Ikhsan,* *Bogor Agricultural University, Indonesia*
10:15-10:30	**Coffee break** 10th floor	
	Oral presentation	
	Session 7 Animal Sci. and Aquaculture Pailin room 11th floor **Chairman:** Skorn Koonawootrittriron **Co-chair:** Nichanun McMillan	**Session 8 Insect and Pest Control** Petch room 11th floor **Chairman:** Chow-Yang Lee **Co-chair:** Minta Chaiprasongsuk
10:30-10:45	**AA-O4:** Effects of bedding type and stocking density on growth performance, carcass characteristics and foot-pad of broiler rearing *Kang Ly,* *Prince of Songkla University, Thailand*	**IP-O1:** Population dynamic and insecticide response of stable fly in Southwestern France *Krajana Tainchum,* *Prince of Songkla University, Thailand*
10:45-11:00	**AA-O5:** Evaluation Cashew Nut Shell Liquid (CNSL) as phenol source on *in vitro* methane production with rumen fluid from Bligon Goat *Rahma Fitriastuti,* *Gadjah Mada University, Indonesia*	**IP-O2:** Field evaluation of transfluthrin-treated plastic sheet against outdoor biting mosquito in Thailand *Chutipong Sukkanon,* *Kasetsart University, Thailand*

11:00-11:15	**AA-O6:** Potential preventive effects of *Cordyceps militaris* aqueous extract against cyclophosphamind-induced mutagenicity and sperm abnormality in rats *Thanawit Thongmai,* *Kasetsart University, Thailand*	**IP-O3:** Laboratory evaluation of novel LLINs on vector control *Kritsawan Phonjatturas,* *Kasetsart University, Thailand*
11:15-11:30	**AA-O7:** Effect of growth on mucous cell distribution and mucus production in foot tissues of the giant African snail (*Achatina fulica*) *Wipawadee Suwannapan,* *Kasetsart University, Thailand*	**IP-O4:** Species composition and population dynamics of blow flies (Diptera: Calliphoridae) in longan orchard as revealed by semi-automatic trap collections *Tunwadee Klongklaew,* *Chiang Mai University, Thailand*
11:30-11:45	**AA-O8:** The effect of Microsporidia Enterocytozoon hepatopenaei (EHP) on growth, survival and production of Rearing Pacific White Shrimp (*Litopenaeus vannamei*) in Thailand *Ganokphorn Vannapanich,* *Kasetsart University, Thailand*	**IP-O5:** The growth response on population densities in larval stage of darkling beetles (Coleoptera: Tenebrionidae) *Tenebrio molitor* and *Zophobas atratus* *Jingyoh Zaelor,* *Mahidol University, Thailand*
11:45-12:00	**AA-O9:** Cloning and characterization of a fibrinogen-related protein from Banana Shrimp *Fenneropenaeus merguiensis* (FmFREP1) *Benjawan Thongkhluean,* *Prince of Songkla University, Thailand*	**IP-O6:** Differences in climbing ability of *Cimex lectularius* and *Cimex hemipterus* (Hemiptera: Cimicidae) *Chris Daeyun Kim,* *University of Science Malaysia, Malaysia*
12:00-13:00	**Lunch**	
13:00-14:30	**Poster presentation** Ampava room 10th floor	
	Oral presentation	
	Session 9 Animal Sci. and Aquaculture Pailin room 11th floor **Chairman:** Uthairat Na-Nakorn **Co-chair:** Pramote Chumnanpuen	**Session 10 Plant Science** Petch room 11th floor **Chairman:** Prakit Somta **Co-chair:** Sompid Samipak
14:30-14:45	**AA-10:** *Acinetobacter clariasiae* sp. nov., a probiotic candidate associated with broad-range inhibition against fish pathogens *Anurak Bunnoy* *Kasetsart University, Thailand*	**PS-O5:** The effect of some bacterial isolates on growth, yield, proline content and capsaicin of red pepper under salinity conditions *Nurul Aini* *University of Brawijaya, Indonesia*
14:45-15:00	**AA-11:** Molecular characterization and diversity analysis of immunoglobulin M heavy chain genes in Günther's walking catfish (*Clarias macrocephalus* Günther, 1864) *Prapansak Srisapoome* *Kasetsart University, Thailand*	**PS-O6:** Effect of medium components and light on growth and development of in vitro *Vandopsis lissochiloides* (Gaudich.) Pfitz. Seedlings *Julaluk Linjikao* *Naresuan University, Thailand*
15:00-15:15	**Coffee break**, 10th floor	

15:15-15:30	**AA-12:** Identification of three variants of the sex-determiner sex-lethal gene in giant river prawn (*Macrobrachium rosenbergii*) *Nichanun McMillan* *Kasetsart University, Thailand*	**PS-O7:** LED light quality affects shoot regeneration and flowering in *Drosera spatulata* Labill *Teerawech Promchaingsa* *Naresuan University, Thailand*
15:30-15:45	**AA-13:** The development of Entamoeba species-specific primers for the molecular identification using 18S rRNA gene *Vilawan Luankongsomchit* *Kasetsart University, Thailand*	**PS-O8:** Sunflower genotypes grouping based on specific morphologu character *Noer Rahmi Ardiarini* *University of Brawijaya, Indonesia*
	Saturday 28 April 2018	
	Session 11 Agricultural Science Pailin room 11th floor **Chairman:** Prakit Somta **Co-chair:** Chatchawan Jantasuriyarat	**Session 12 Food Science** Petch room 11th floor **Chairman:** Rungnaphar Pongsawatmanit **Co-chair:** Ekaphan Kraichak
09:00-9:30	**Invited lecture:** Construction and application of a high-density mutant library in soybean *Akito Kaga,* *National Agriculture and Food Research Organization (NARO), Japan*	**Invited lecture:** Hydrocolloids approach to health and nutrition science *Katsuyoshi Nishinari,* *Hubei University of Technology, China*
	Oral presentation	
09:30-9:45	**AS-O1:** Ripening retardation of "Namwa" banana during long-distance transport process using low-cost ethylene scavenger, vacuum packaging, cold storage, and their effects on fruit quality *Nisanart Naksin,* *National Science and Technology Development Agency, Thailand*	**Invited lecture:** Metabolic innovations to advance food diversity and fermented foods to advance climate resilient food systems *Kalidas Shetty,* *North Dakota State University, USA*
09:45-10:00	**AS-O2:** Differential expression of Xoo-induced kinase 1 (XIK1), a *Xanthomonas oryzae* pv. oryzae responsive gene, in bacterial blight-susceptible and Xa21-mediated resistant indica rice cultivars *Carlo Magno Sagun,* *Naresuan University, Thailand*	
	Oral presentation	
10:00-10:15	**AS-O3:** Efficacy of sericin on reducing browning of fresh-cut mango cv. Nam Dok Mai *Chalida Chimvaree,* *King Mongkut's University of Technology Thonburi, Thailand*	**FS-O1:** The effects of salt extraction and heating condition on protein characteristics and its antioxidant activity of salmon (*Salmo salar*) bone extract *Ahsanatun Syahidawati,* *Kasetsart University, Thailand*
10:15-10:30	**Coffee break** 10th floor	

10:30-10:45	**AS-O4:** The genetic variability of winged bean (*Psophocarpus tetragonolobus* L.) collection and their implication to selection *Kuswanto Kuswanto,* *University of Brawijaya, Indonesia*	**FS-O2:** Determination of water activity, moisture content, total soluble solid, sucrose, glucose and fructose in osmotically dehydrated papaya using near-infrared spectroscopy, *Bumrungrat Rongtong* *Kasetsart University, Thailand*
10:45-11:00	**AS-O5:** Transcriptomic profiling of genes involved in salt stress of salt-susceptible indica rice cultivar IR29 associated with 1-aminocyclopropane-1-carboxylate deaminase (ACCD)-producing *Streptomyces* sp. GKU 895 *Worarat Kruasuwan,* *Kasetsart University, Thailand*	**FS-O3:** Ohmic-assisted mechanical extraction of rice bran oil *Jirapinya Sangpradab,* *Kasetsart University, Thailand*
11:00-11:15	**AS-O6:** Genetic diversity and pungency association of Thai chili landraces by SNP genome wide association analyses *Wassana Kethom,* *Kasetsart University, Thailand*	**FS-O4:** Effect of humectants and packaging film with oxygen absorber on shelf life of Chinese pastry (Kha-Nom Pia) *Chanthicha Chauthong,* *Kasetsart University, Thailand*
11:15-12:00	**Close and Poster Award**, Petch-Pailin room 11th floor	
12:00-13:00	**Lunch**	

TABLE OF CONTENTS

Oral presentation

Plant Science

PS-O6 Effect of medium components and light on growth and development of *in vitro* *Vandopsis lissochiloides* (Gaudich.) Pfitz. Seedlings
Julaluk Linjikao 3

PS-O7 Light emitting diode light quality affects shoot regeneration and flowering in *Drosera spatulata* Labill.
Teerawech Promchaingsa 7

Microbiology and Biotechnology

MB-O2 Analysis of targeted metabolites in tricarboxylic acid cycle of cordycepin administration in streptozotocin-induced diabetic mice
Kongphop Parunyakul 11

MB-O3 Dual transcriptome analysis of *Penicillium* sp. and its co-cultivation for investigation of polyketide, phenicin, biosynthesis potential
Suthasinee Rattanachan 16

MB-O7 Transient recombinant Human Osteopontin expression in non-transgenic *Nicotiana benthamiana* plants
Wanuttha Boonyayothin 20

Genetics, Diversity and Ecology

GDE-O2 Multiple nesting of hawksbill turtle *Eretmochelys imbricata* on Talu Island, Gulf of Thailand as revealed by mitochondrial DNA analysis
Mukrekha Chiewchanchai 24

GDE-O5 Sapling dynamics along an altitudinal gradients in Doi Suthep-Pui National Park, Northern Thailand
Sutheera Hermhuk 28

GDE-O6 Predicting risk zones of Nipah virus from foraging utilization of Lyle's flying fox (*Pteropus lylei*) in eastern Thailand
Aingorn Chaiyes 31

Animal Science and Aquaculture

AA-O1 Effect of dietary curcuminoids and tuna oil on the expression of LPL, FATP4, FAT/CD36 genes in Korat chicken
Siraprapa Homkhajohn 36

AA-O2 Effect of dietary curcuminoids combined with tuna oil on the expression of genes encoding antioxidant enzymes in Korat chicken
Nambundit Witchapat 40

AA-O5 Effect of supplementation with cashew nut shell liquid (CNSL) as phenol source on *in vitro* methane production and rumen parameters with rumen fluid from Bligon goat
Rahma Fitriastuti 43

AA-O8 Effect of microsporidian *Enterocytozoon hepatopenaei* (EHP) on growth of Pacific white shrimp (*Litopenaeus vannamei*) in Thailand
Ganokphorn Vannapanich 47
AA-O9 Cloning and characterization of a fibrinogen-related protein gene from banana shrimp *Fenneropenaeus merguiensis* (FmFREP1)
Benjawan Thongkhluean 51
AA-O13 Development of entamoeba-specific primers for molecular identification using 18s rRNA gene
Vilawan Luankongsomchit 55

Food Science

FS-O3 Ohmic-assisted mechanical extraction of rice bran oil
Jirapinya Sangpradab 59
FS-O4 Effect of humectants and packaging film with oxygen absorber on shelf life of Chinese pastry (Kha-Nom Pia)
Chanthicha Chuaythong 62

Poster presentation

Plant Science

PS-P1 Discrimination of stable isotopes in Thai jasmine rice and Sungyod rice
Chunyapuk Kukusamude 69
PS-P5 Effect of boric acid on postharvest quality of jasmine flowers
Mayuree Krajayklang 73
PS-P12 Variation in elemental compositions of Thai jasmine rice cultivated from different origins
Supalak Kongsri 78
PS-P15 Effect of light quality on *in vitro* growth and development of *Haworthia cooperi* var. *truncata*
Wasin Thongpisitsombut 82

Microbiology and Biotechnology

MB-P1 Exploration of the proteolytic activity of non-human transthyretins on amyloid beta
Adesola Julius Tola 86
MB-P2 Acid-treated activated carbon for improvement of calcium adsorption capacity
Apichaya Wongteapwanit 90
MB-P3 Purification and immobilization of carboxylesterase from *Thermobifida alba* AHK119
Apipat Saleepot 94
MB-P5 Efficacy of peroxyacetic acid against common pathogenic bacteria contamination in shrimps
Artchara Shongpra 98
MB-P6 Sludge utilization as raw material in preparation of magnetic modified sludge absorbent for the removal of Cr(VI) in aqueous solution
Attajaree Smata 101
MB-P7 Effect of cheap nitrogen sources and fermentation mode on lactic acid production from food waste using thermotolerant *Bacillus* sp. NF11
Ayyapruk Moungprayoon 105

MB-P8 Effect of chemical agents in compounded latex on properties of foam natural rubber
Cataleeya Imkaew 109
MB-P9 Development of extraction and purification processes for poly (3-hydroxybutyrate) from *Cupriavidus necator* strain A-04 using an environmentally friendly solvent
Chanakarn Wongmoon 112
MB-P10 Ethanol production from Sweet Sorghum Bagasse using separation hydrolysis and fermentation by *Saccharomyces cerevisiae* TISTR 5606
Chanin Khomlaem 115
MB-P11 Antioxidant activity of slime extract from giant African snail (*Lissachatina fulica*)
Chattida Wiya 118
MB-P12 Selection of an aptamerspecific of diethyl thiophosphate by colorimetric sensor
Chonnikarn Saikaew 122
MB-P13 Cloning and overexpression of hypervariable prophage genes with intragenic tandem repeats from '*Candidatus* Liberibacter asiaticus'
Duangtip Sudhan 126
MB-P14 Cloning and preliminary expression of flagellin-like protein from *Bacillus subtilis* N3 in *Escherichia coli*
Juthakarn Namsanga 129
MB-P15 Evaluation of the ability of endophytic fungi isolated from *Mangifera indica* L. on ammonia production and solubilization of some insoluble plant nutrients
Kanyapat Sonsiam 133
MB-P16 Actimicrobial activities of actinomycetes isolated from solar saltern soil, Thailand
Khanungkan Klanbut 138
MB-P17 Effect of cordycepin on cognitive deficit in streptozotocin-induced diabetic mice
Krittika Srisuksai 142
MB-P19 Optimazation of transformation of *kan*MX cassette using lithium acetate method in *Spathaspora passalidarum* CMUWF1-2
Lalitphan kulcharoen 146
MB-P21 Extraction and determination of phenolic and antioxidant in spent green tea leaves
Monsichar Yannarat 150
MB-P22 Application of coupled Mike SHE/MIKE 11 Modelling to estimate water balance components in Huay Luang River Basin, Thailand
Muhammad Faisi Ikhwali 154
MB-P24 Herbal kefir beverages with anti-oxidation and anti-bacterial activities against enteric pathogens
Natsinee U-on 159
MB-P26 Transcriptional expression of ammonium transporter gene in *Arthrospira* (*Spirulina*) *platensis* strain BP
Nopchanok Phadunglaksamee 163
MB-P28 Bacterial disinfection in hospital cooling water
Pakatip Buntongkaw 168
MB-P30 Production and characterization of monoclonal antibody against Chlortetracycline
Panicha Poungmalai 172

MB-P31 Characterization of probiotic lactic acid bacteria isolated from fermented foods
Panitnart Auputinan 176
MB-P32 Effect of modified cellulose on physical properties and biodegradability of biocomposite films prepared from polyhydroxybutyrate produced by *Cupriavidus necator* strain A-04 and cassava bagasse microcrystalline cellulose
Passaraporn Theeraseematham 179
MB-P33 Antimicrobial susceptibility and pathogen inhibition of the probiotic *Bifidobacterium animalis* strains of human and animal origins
Patcharanan Amornrattanapan 183
MB-P34 Design, Expression of a recombinant multiepitopes of CadF from *Campylobacter jejuni* in *E. coli*
Pattarapong Wenbap 188
MB-P36 Antioxidant activity of bee pollen from tea flower (*Camellia sinensis* (L.) Kuntze), mimosa flower (*Mimosa pigra* L.) and sunflower (*Helianthus annuus* L.)
Phanthiwa Khongkarat 192
MB-P37 Isolation and characterization of cellulolytic bacteria from cassava soil in Rayong province, Thailand
Pichwasu Aiemyungyuen 196
MB-P39 Isolation and screening of phosphate-solubilizing actinobacteria from rice rhizosphere soil of
Pisut Saruchikamchonwattana 201
MB-P40 Preparation of biocomposite films using polyhydroxybutyrate from *Cupriavidus necator* strain A-04 and pineapple leaf microcrystalline cellulose
Pitchanun Sinsukudomchai 205
MB-P41 Self-Assembly of DNA/chitosan supramolecular biomaterial
Pitchaya Pakornpadungsit 209
MB-P46 Evaluation of 4-aryl-N-phenylpyrimidin-2-amines as promising epidermal receptor growth factor tyrosine kinase inhibitors on the non-small cell lung carcinoma cell line
Praphasri Suphakun 212
MB-P50 Thiostrepton treatment inhibits breast cancer cell growth via cellular senescence
Sudtirak Wongkhieo 216
MB-P53 Cloning and expression of a hybrid polyketide synthase-nonribosomal peptide synthetase (PKS-NRPS) from *Menisporopsis theobromae* BCC 4162 involved in the 2-pyridone biosynthesis
Thanyaporn Tengsuttiwat 220
MB-P54 Effect of acid-pretreatment of agricultural wastes on polyhydroxybutyrates production by *Ensifer* sp. HD34
Thitichaya Khamkong 224
MB-P56 Fabrication and characterization of albumin/starch scaffold
Thridsawan Prasopdee 228

Genetics, Diversity and Ecology

GDE-P1 Late Holocene mangrove dynamics in an oxbow lake of the Bangpakong River, Chachoengsao, Thailand
Abdoulbastoi Houda 232
GDE-P2 Forest dynamics during successional stages in a tropical coastal sand dune
Jakkaphong Thongsawi 235

GDE-P5 Long-term seedling dynamics along an altitudinal gradients in Doi Suthep-Pui National Park, Chiang Mai Province, Thailand
Prapawadee Nutiprapun 238
GDE-P6 Genetic diversity assessment of captive eastern sarus crane in Thailand using microsatellite DNA markers
Rangsinee Sankhom 21
GDE-P9 Diversity of ectomycorrhizal mushrooms in Doi Suthep-Pui National Park, Chiang Mai province
Suwimon Wanwaen 244
GDE-P10 Investigation of Production of Trihalomethane precursors from algal reduction using prechlorination
Thae Su lwin 248

Animal Science and Aquaculture

AA-P1 Relationship of *MC4R*, *CAPN1* and *ADSL* genes on growth and purine content in Korat chicken
Achiraya Vandee 253
AA-P2 Molecular cloning and expression of four regions of vp1 protein from chicken anemia virus
Akekarach Sittidech 257
AA-P3 Influence of ozonated water on microbial and physiochemical quality of Nile tilapia (*Oreochromis niloticus*) fillets
Atitaya Tipmanee 261
AA-P4 Effect of traditional Thai plants on growth, survival and resistance to *Vibrio parahaemolyticus* in rearing of Pacific white shrimp (*Litopenaeus vannamei*)
Benjamas Kunna 265
AA-P5 Seasonal variations in seawater quality and its correlation with blood cockle at Klong Khone, Thailand
Chayarat Srisunont 268
AA-P7 Effect of electrolyzed water combined with lactic acid pretreatment on the reduction of foodborne pathogens in oyster
Kanchana Kaephen 272
AA-P8 Pre-analytical errors in veterinary laboratory
Oumaporn Rungsuriyawiboon 276
AA-P9 Effect of Silo health104L on growth and disease resistance of Pacific white shrimp (*Litopenaeus vannamei*) to *Vibrio parahaemolyticus*$_{AHPND}$
Putsucha Phansawat 281
AA-P13 Prevalence of gastro-intestinal parasites in Hog Deer (*Axis porcinus*), Phu Khieo Wildlife Sanctuary, Thailand
Sinsamut Sae Ngow 285
AA-P16 Influences of dissolved oxygen and chlorophyll-a concentration on condition index of oyster *Saccostrea cucullata* (Born, 1778) in Chonburi province
Thiyada Piyawongnarat 288
AA-P17 Examination of chilled boar semen quality supplemented with plant extracts
Thunchanok Wilasri 292

Insect and Pest Control

IP-P7 Diversity and composition of riparian spiders in Rayong Botanical Garden, Rayong province, Thailand
Suphapipatana Yothee 295

Agricultural Science

AS-P4 Genetic diversity of *Vigna umbellata* (wild) in western and lower northern Thailand based on Inter-simple sequence repeats markers
Chontira Sangsiri 299
AS-P5 Application of image analysis for chilling injury of 'Phulae' pineapple
Habib Ullah 304
AS-P10 Effect of bunch covers on reduing thrips damage and fruit quality enhancement of Cavendish banana during rainy season in Thailand
Johnson Makinwa Ogunsua 308
AS-P11 Geochemical controls on phosphorus availability in highly weathered Thai soils
Jureewan Boonplong 313
AS-P16 Evaluation of layer-by-layer coating between different sizes and concentration of chitosan and polystyrene sulfonate on "Nam Dok Mai No.4" Mango
Nanthawan Hadthamard 316
AS-P27 Studies on heterosis and correlation analysis in F_1 hybrids of mulberry (*Morus* spp.)
Sujaree Nonthakod 320

Food Science

FS-P4 Effects Chemical and physical properties of steamed banana in retort pouch for elderly
Chutharat Chanphet 323
FS-P6 Effects of different cooking methods on the bioaccessibility of polyphenols and antioxidant activities of sweet leaf (*Sauropus androgynus*)
Imas Arumsari 327
FS-P7 Extraction of oligosaccharide from copra meal using alkali treatment
Iththichai Chimpanao 331
FS-P8 Microencapsulation of ma-kwaen (*Zanthoxylum limonella* Alston.) essential oil by complex coacervation with gelatin-alginate
Jirapat Boonying 334
FS-P9 Effect of ethylene exposure on the quality of broccoli during cold storage at retail
Mary Joy Paico 337
FS-P12 Effect of cocoa bean (*Theobroma cacao* L.) fermentation as a chocolate coating of banana
Nova Solina Purba 341
FS-P13 Whey protein hydrolysate increases insulin association efficiency in chitosan/alginate nanoparticles
Panurat Pongpattananugul 345
FS-P22 Effect of washing agents on physico-chemical properties of sardine surimi
Rachata Tengchaiyaphum 349

FS-P23 Sugar consumption behavior of Thai people: A case study of students and workers in Kasetsart University, Bangkok
Rosalin Herman 353
FS-P27 Effect of ethyl laurate concentration on viscoelastic properties of virgin coconut oil
Tasida Tasawang 357
FS-P28 Investigating the chemical composition of non-wood plants and their potential use as packaging materials
Thananon Inprasit 360
FS-P29 Stability of starch-hydrocolloid blend films during chilled storage
Thitarat Phinainitisatra 364
FS-P30 Production of carnosine-rich chicken breast extract using enzymatic hydrolysis
Thunyachanok Gatngern 368
FS-P31 Production of malto-oligosaccharide using cyclodextrin glycosyltransferase (CGTase)
Wanwipa Wansanit 371
FS-P32 Ohmic pasteurization of orange juice containing alginate-particles packed in a conductive package
Wassamon Wattanayon 374
FS-P33 Effect of lemongrass and pandan leaf ratios on production of mixed juice with lycopene supplementation
Wattana Wirivutthikorn 378

Scientific Committee 383

International Conference of Agriculture and Natural Resources 2018
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Effects of different cooking methods on the bioaccessibility of polyphenols and antioxidant activity of sweet leaf (*Sauropus androgynus*)

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Abstract

The effects of different cooking methods (boiling, microwaves and raw) on the bioaccessibility of polyphenols and the antioxidant activity of sweet leaf (*Sauropus androgynous*) were investigated during *in vitro* simulated gastrointestinal digestion. Microwave cooking of sweet leaf can significantly retain more polyphenols and antioxidant capacity (ferric reducing antioxidant power and 2,2-diphenyl-2-picrylhydrazyl radical scavenging activity) after gastrointestinal digestion compared to raw leaves. The findings suggested that cooking sweet leaf with thermal processing such as microwaves or boiling could enhance the bioaccessibility of polyphenols during digestion which may provide better health benefits compared to raw leaves. This information may be useful to optimize culinary aspects of sweet leaf for disease prevention.

Introduction

Phenolic compounds have shown many desirable health benefits and play important roles in the prevention of chronic diseases (Liu, 2003). Nevertheless, dietary factors such as the interaction with the food matrix and differences in cooking methods may affect polyphenol bioavailability during digestion (D'Archivio et al., 2010; Bohn, 2014)

Sauropus androgynus (known as katuk/pakwan ban/cekur manis/sweet leaf) is a nutritious and palatable green leafy vegetable that is grown widely in Southeast Asia. It is rich in polyphenols and has demonstrated high antioxidant capacity (Andarwulan et al., 2012). Sweet leaf is edible as raw fresh leaves in salad or as cooked leaves using heat. However, no studies have been reported on how the different cooking methods affect the amounts of polyphenols and antioxidant activity of sweet leaf. Therefore, the aim of this study was to investigate the effects of different cooking methods (boiling and microwaves, compared to raw leaves) on the bioaccessibility of polyphenols and the antioxidant capacity of sweet leaf during *in vitro* simulated gastrointestinal digestion.

Materials and Methods

Sample preparation and cooking processes

Fresh sweet leaf (*Sauropus androgynus*) was purchased from a farmer in Nakhon Pathom, Thailand and the plant was identified by a botanist from the Department of Botany, Faculty of Science, Chulalongkorn University, Bangkok, Thailand. The leaves were cleaned and homogenized using a kitchen blender before cooking. Raw(control) leaves of homogenized fresh sweet leaf were blanketed under nitrogen and kept as the raw sample. The boiled sample involved cooking the homogenized sweet leaf in boiling distilled water (1:1, weight per volume, w/v) for 5 mins. The microwaved sample was prepared by mixing homogenized sweet leaf with distilled water (1:1, w/v) and cooking in a microwave oven at 800 W for 90 s. All samples were blanketed with nitrogen and stored at -20°C until analyses.

In vitro simulated gastrointestinal digestion

The homogenized sweet leaf samples were digested according to the *in vitro* simulated gastrointestinal digestion procedure adapted from Pasukamonset et al. (2016). Briefly, 1 g of homogenized sweet leaf sample was incubated at 37°C in a shaking water bath for 1 hr with 3 mL porcine pepsin solution (40 mg/mL in 0.1 N HCl), at pH 2.0±0.1 to initiate the gastric phase. Then, the small intestinal phase was started by increasing the pH to 4.5 before the addition of amyloglucosidase solution (120 mg/mL). After 30 min at 37°C with shaking, the pH was increased to 5.3 before the addition of 9 mL of small intestinal enzyme solution containing pancreatin (3 mg/mL) and bile acid (12 mg/mL) in 100 mM $NaHCO_3$. The final volume was increased to 20 mL with bile salts solution and the pH was adjusted to 7.2±0.1, and then incubated with shaking at 37°C for 2 hr. The supernatant (aqueous fraction) was collected after centrifugation of digesta (12,000 rpm, 5°C for 1 hr), filtered through a 0.22 μm nylon filter and stored at -20°C for further analyses.

Determination of total phenolic content

The total phenolic content was determined using the Folin-Ciocalteu assay as described by Chusak et al. (2014). The results were expressed as milligrams of gallic acid equivalent per gram of sample.

Determination of DPPH radical scavenging activity

2,2-diphenyl-2-picrylhydrazyl (DPPH) radical scavenging activity was determined as described by Chusak et al. (2014). The results were expressed as mg ascorbic acid/g sample.

Determination of Ferric Reducing Antioxidant Power

The ferric reducing antioxidant power (FRAP) was determined as described by Chusak et al. (2014). Results were expressed as micromoles of $FeSO_4$ equivalent per gram of sample.

Statistical analysis

Each experiment provided three independent replicates. All data were presented as mean ± SE. Statistical analysis was performed using the SPSS 16.0 software (SPSS Inc. Chicago, IL, USA). Differences among groups were determined using one-way analysis of variance followed by multiple comparisons. Differences between before and after digestion within the same cooking method were determined using Student's t-test. Statistically significant differences were considered at $p < 0.05$.

Results and Discussion

As shown in Table 1, with all cooking methods, the total phenolic compounds of sweet leaf after gastrointestinal digestion released more than that before digestion. This finding was similar to the study of Tagliazucchi et al. (2010) which demonstrated that incubation with pancreatic solution increased the release of flavonoids.

Table 1 Effect of different cooking methods on total polyphenols and antioxidant activity before and after *in vitro* simulated gastrointestinal digestion*

Cooking method	Total phenolic content (mg GAE/g)		FRAP (mmol Fe(II)/g)		DPPH (mg ascorbic acid/g)	
	Before	After	Before	After	Before	After
Raw (control)	23.73 ± 0.79^{a}	$34.38 \pm 0.90^{a,\dagger}$	1.61 ± 0.07^{a}	$0.78 \pm 0.02^{a,\dagger}$	16.96 ± 0.55^{a}	$13.65 \pm 0.25^{a,\dagger}$
Boiling	16.54 ± 0.45^{b}	$37.82 \pm 2.39^{b,\dagger}$	1.48 ± 0.12^{a}	$1.24 \pm 0.02^{b,\dagger}$	19.54 ± 1.11^{a}	$13.22 \pm 0.89^{a,\dagger}$
Microwaves	26.48 ± 0.80^{c}	$37.27 \pm 2.47^{b,\dagger}$	2.32 ± 0.13^{b}	$1.60 \pm 0.04^{c,\dagger}$	27.83 ± 0.57^{b}	$21.67 \pm 2.47^{b,\dagger}$

DPPH = 2,2-diphenyl-2-picrylhydrazyl; FRAP = ferric reducing antioxidant power. GAE = gallic acid equivalent
* Homogenized sweet leaf samples were analyzed before digestion and after gastric phase for 1 hr and small intestinal phase for 2.5 hr at 37°C.
Data are presented as mean ± SE (n= 3)
[a,b] Different letters indicate significant differences ($p < 0.05$) among different cooking methods
[†] Significant differences ($p < 0.05$) compared with before digestion in the same cooking method

Interestingly, after 1 hr incubation in gastric enzymes (pH 2.0±0.1) and 2 hr incubation in intestinal enzyme (pH 7.2±0.1), cooking sweet leaf using a microwave oven or boiling retained more polyphenols and antioxidant activity after gastrointestinal digestion. This result was in line with Kaulmann et al. (2016) who explained that thermal processing has a positive effect on the bioaccessibility of polyphenols. Heat treatment increases the risk of polyphenol degradation during food preparation, but on the other hand, it disrupts cell walls and facilitates polyphenol release during digestion via modification of the bioactive compound from glycoside to aglycone which is more biologically active (Bohn, 2014; Kaulmann et al., 2016).

The findings in this study suggested that cooking sweet leaf using microwaves or boiling could enhance the bioaccessibility of phytochemical compounds during digestion which may provide better health benefits compared to raw leaves.

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References

Andarwulan, N., Kurniasih, D., Apriady, R.A., Rahmat, H., Roto, A.V., Bolling, B.W. 2012. Polyphenols, carotenoids, and ascorbic acid in underutilized medicinal vegetables. J. Funct. Foods. 4: 339−347.

Bohn, T. 2014. Dietary factors affecting polyphenol bioavailability. Nutr. Rev. 72: 429−452.

Chusak, C., Thilavech, T., Adisakwattana, S. 2014. Consumption of *Mesona chinensis* attenuates postprandial glucose and improves antioxidant status induced by a high carbohydrate meal in overweight subjects. Am. J. Chin. Med. 42: 315−336.

D'archivio, M., Filesi, C., Varì, R., Scazzocchio, B., Masella, R. 2010. Bioavailability of the polyphenols: status and controversies. Int. J. Mol. Sci. 11: 1321−1342.

Kaulmann, A., André, C.M., Schneider, Y.J., Hoffmann, L., Bohn, T. 2016. Carotenoid and polyphenol bioaccessibility and cellular uptake from plum and cabbage varieties. Food Chem. 197: 325−332.

Liu, R.H. 2003. Health benefits of fruit and vegetables are from additive and synergistic combinations of phytochemicals. Am. J. Clin. Nutr. 78: 517S−520S.

Pasukamonset, P., Kwon, O., Adisakwattana, S. 2016. Alginate-based encapsulation of polyphenols from Clitoria ternatea petal flower extract enhances stability and biological activity under simulated gastrointestinal conditions. Food Hydrocoll. 61: 772−779.

Tagliazucchi, D., Verzelloni, E., Bertolini, D., Conte, A. 2010. In vitro bio-accessibility and antioxidant activity of grape polyphenols. Food Chem. 120: 599−606.

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