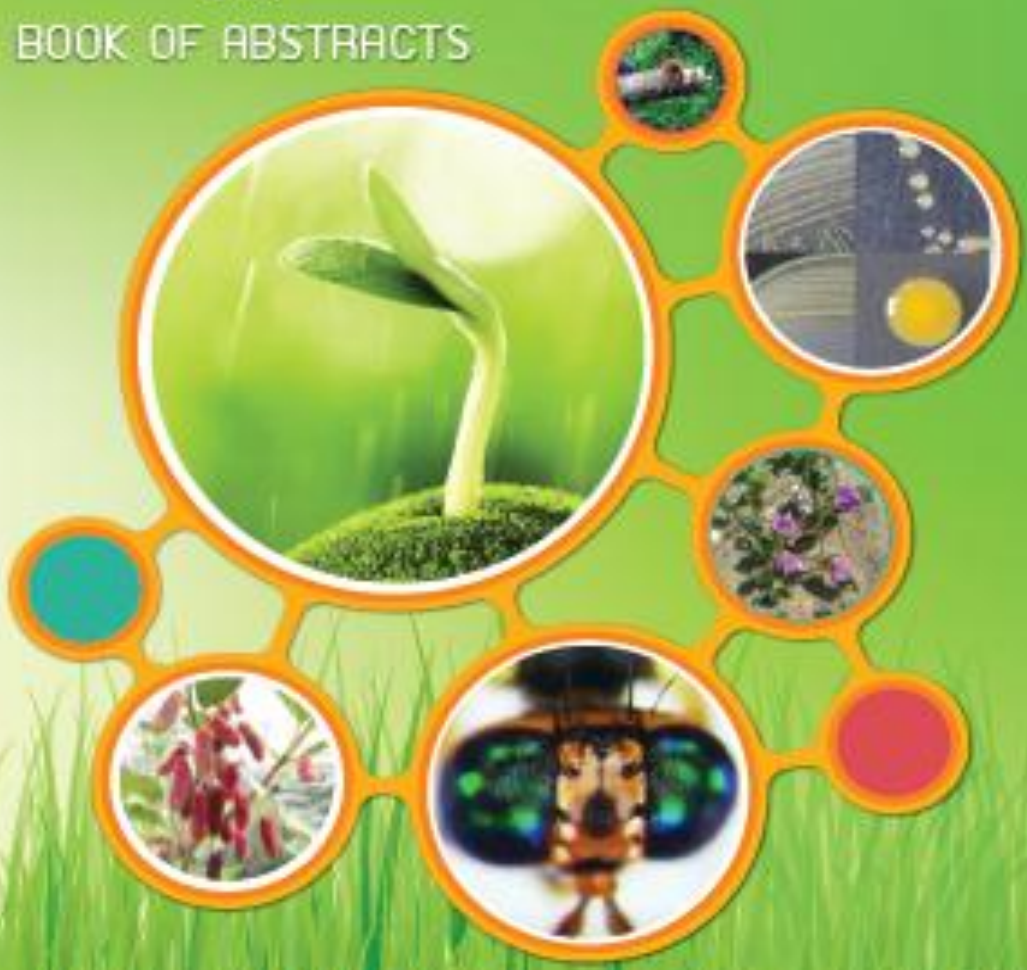
the Sixth International Conference

on Integration of Science and Technology for Sustainable Development 2017

(6th ICIST 2017)

AARTSEA Annual Meeting

SCIENTIFIC PROGRAM
and
BOOK OF ABSTRACTS



Hotel Supreme and Convention Plaza, Baguio City, Philippines
November 24-26, 2017

FOREWORD

The ICIST 2017 Organizing Committee invites you to participate in the sixth International Conference on Integration of Science and Technology for Sustainable Development 2017 (6th ICIST 2017) in November, 25, 2017 at Hotel Supreme and Convention Plaza, Baguio, Philippines and for providing the opportunity to discuss the recent advances and developments in science and technology with the theme "Agricultural Innovations and Entrepreneurship, Environment Stewardship and Food Security for Socially Engaged Communities.**"** The theme of the conference is aptly chosen to address the current needs for academic, research and farm demands for further development and improvisation.

The integration of various topics in biological and social sciences and technology in agriculture is needed to build up the sustainable development of human being. As being a resource of knowledge, AATSEA realizes that it is responsibility to serve the community by providing education, research and development in science and technology, particularly in the multi-disciplinary aspects. Accordingly, this conference is targeted to initiate an international network among academic members, researchers, scientists and interesting peoples in science and technology. It is aimed to a venue for knowledge exchange and discussion among those seeking for new vision and insight in all topics related. For the technical point of view, the conference will explore various topics as following oral sessions: Organic Agriculture, Plant and Food Technology, Microbial Biotechnology, Biodiversity, Taxonomy, Biological Activity, Animal and Fishery Sciences, Environmental Science, Soil and Water Conservation, Agricultural Biotechnology, and Socio Economic, Community Development and Agricultural Development. Poster Sessions will be demonstrated as follows:- Plant Sciences, Biological Sciences, Microbial Biotechnology and Plant Protection, Animal and Fishery Sciences, and Entomology, Environment, Toxicology and Agricultural Development.

This year, there will be eight plenary speakers, 196 oral and 111 poster presentations and attendants all together is 368 participants from delegates coming from 19 different countries. ICIST 2017 are organized Association of Agricultural Technology in Southeast Asia(AATSEA), Central Luzon State University (Philippines), University of the Philippine Los Banos (Philippines), King Mongkut's Institute of Technology Ladkrabang (Thailand), Rajamangala University of Technology Tawan-ok, Chantaburi Campus, (Thailand), Rambhai Barni Rajabhat University (Thailand), ATQ, Tuem, Hanoi (Vietnam), CGC organic coffee, Pakse, Champasack (Laos), South Asia Friendship Association, SAFA, (Japan), NOMAFSI, Phutho (Vietnam), Society of Applied Biotechnology (India), Foundation of Environmental Education (Thailand), CAS Asian Agricultural Bio Engineering Co. Ltd (China) and Bengkulu University (Indonesia)

Academicians, researchers, policy makers as well as extension experts contributed their expertise, experiences and research results to this conference. May the book of abstracts of this conference provide useful information and serve as references for those who are interested in the specific discipline. All full texts will be peer reviewed by Editorial board of International Journal of Agricultural Technology (IJAT) and will be online published in website: www.ijat-aatsea.com

Editors

The 6th ICIST 2017

Organized by

Association of Agricultural Technology in Southeast Asia (AATSEA); Central Luzon State University, Philippines; King Mongkut's Institute of Technology Ladkrabang, Thailand; Rajamangala University of Technology Tawan-ok, Chantaburi Campus, Thailand; Rambhai Barni Rajabhat University, Thailand; ATQ, Tuem, Hanoi, Vietnam; CGC Organic Coffee, Pakse, Champasack, Laos; South Asia Friendship Association, Japan; NOMAFSI, Phutho, Vietnam; Society of Applied Biotechnology, India; Faculty of Agriculture, University of Bengkulu, Indonesia; Mahasarakham University, Thailand; Foundation of Environmental Education, Thailand, University of the Philippine at Los Banos, Philippines; CAS Asian Agriculture Bio Engineering, China.

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The sixth International Conference on
Integration of Science and Technology for Sustainable Development
(6th ICIST 2017)

"Agricultural Innovations and Entrepreneurship, Environment Stewardship and Food Security for Socially Engaged Communities**"**

Hotel Supreme and Convention Plaza, Baguio, Philippines
November 24-26, 2017

PROGRAM

November 24, 2017 **16:00 Registration and poster display**
19:00 Welcome dinner

DAY 1: **November 25, 2017**: **Room 1 Diamond Ball Room**

Time
7:00-8:00

Registration : Secretariat and Staff

Master of Ceremony (MC): James Kennrad Jacob, Hezekiah Mirielle Aguinaldo, Jakrapan Wongpa**,** Kannika Janchidfa

8:00

Philippine National Anthem

Parade of National Flags and Representatives on stage
Country Representatives: Cambodia (Mr. SEM Savuth),China (Dr.Hongkai Wang), Egypt (Prof. Dr. Riad Sedki Riad El-Mohamedy), Finland (Prof. Dr. Timo K. Korpela), India (Dr. Lalitha Ravikumar), Indonesia (Dr. Nanik Setyowati), Iran (Dr. Yurnes Danesh), Japan (Prof Dr. Hiroyuki Konuma), Laos (Dr. Somlit Vilavong), Myanmar (Ms. May Soe Oo), Nigeria (Prof. Dr. Raphael Okigbo), Pakistan (Ms,Saher Islam), Philippines (Prof. Dr. Fe Porciuncula), Russia (Dr. Elvira Khalikova), South Korea (Prof. Dr. Jin-Cheol Kim), Sri Lanka (Dr. Samantha C. Karunarathna), Thailand (Dr. Wattanachai Pongnak), Vietnam (Mr. Nguyen The Quyet), USA (Prof. Robert Mc Govern)

Special guests
AATSEA Committee: Dr. Kasem Soytong; Prof. Cynthia, Divina; Dr. Devarajan Thangaduri; Asst. Prof. Waigoon Tongaram; Prof. Dr. Tereso A. Abella; Prof. Dr. Teodoro C. Mendoza

Welcome Addresses
Prof. Dr. Timo Korpela (Finland), Chairman of International Advisory Committee
Prof. Dr. Cynthia C. Divina, Chairman of local organizing committee
Assoc. Prof. Dr. Kasem Soytong, President of AATSEA

	Theme song: IMAGINE
8:15 – 8:20	**Opening and welcome remarks: Dr. Tereso A. Abella**
8:20 – 9:00	**AATSEA Awarding Ceremony**:
	AATSEA Outstanding Leadership Awards **Mr. Pablito Malabanan Villegas**, Policy Making and Governance (Philippines) **Prof. Dr. Zainal Muktamar**, Education and Research (Indonesia) **Dr. Jin –Cheol Kim,** Education and Research (Republic of Korea) **Prof. Dr. Kampon Sriwatanakul**, Community Development (Thailand) **Mr. Dennis Bialen**, Community Service (Philippines)
	AATSEA Recognition Awards **Dr. Hoang N.D. Pham** (Vietnam) **Dr. Samantha C. Karunarathna** (Sri Lanka) **Prof. Dr. Somdej Kanokmedhakul** (Thailand) **Assoc. Prof. Dr. Yournes Danesh** (Iran) **Mr. Yun Young Ken** (Republic of Korea) **Ms. Wanna Satiraphun** (Thailand) **Ms. Payong Saenkamol** (Thailand)
	Special Recoganition to Co-organizers
	AATSEA awardees will be given Award Plaques and Souvenirs by Dr. Kasem Soytong, President of AATSEA
9:00-9:10	**GROUP PHOTO and COFFEE BREAK**
Plenary Session	**Chairs: Prof. Dr. Cynthia C. Divina (Philippines), Dr. Fe Porciuncula (Philippines)**
9:10-9:30	**Prof. Dr. Kampon Sriwatanakul (Thailand):** The Therapeutic Effects and Uses of Curcumin in Health and Diseases
9.30-9:50	**Dr. Tereso A. Abella (Philippines):** Recent Trends on Fisheries Technology for Sustainable Development
9:50 - 10:10	**Asst. Prof. Waigoon Tongaram (Thailand):** ASEAN Food Security
10:10-10:30	**Prof. Dr. Teodoro C. Mendoza (Philippines):** Reducing the Energy Bill of Producing Food Crops: Will it Reduce the Carbon Footprint
10:30-10:50	**Dr. Jin –Cheol Kim (Republic of Korea) :** Development of A New Fungal Bionematicide for the Control Root Knot Nematodes Using *Aspergillus niger* F22
10:50-11:10	**Atty. Antonio H. Cerilles (Philippines):** The Role of Local Government in Upscaling the Adoption of Organic Agriculture: The Zamboanga del Sur Experience
11:10-11:30	**Mr. Pablito Malabanan Villegas (Philippines):** Experiential Learning in Climate Change Mitigation and Adaptation Through Organic and Ecological Farming in The Philippines
11:30:11:50	**Mr. Dmitry Rubin (Russia):** Use of Ultra-Light UAV Drones in Agriculture: Analys, Monitoring and Control.
11:50-13:00	**LUNCH BREAK**
12:30- 13:00	**Poster Presentation and Judging**
12:30-13:00	**AATSEA committee meeting at Diamond Ball Room**: Assoc. Prof. Dr. Kasem Soytong (Thailand), Prof. Dr. Cynthia C. Divina (Philippines), Prof. Dr. Timo Korpela (Finland), Dr. Nanik Setyowati (Indonesia), Rujira Tongon (Thailand), Jiaojiao Song (China), Dr. Riad Sedki Riad El-Mohamedy (Egypt), Dr. Younes Danesh (Iran), Dr. Jin –Cheol Kim (Republic of Korea), Dr. Devarajan Thangaduri (India), Dr. Samantha C. Karunarathna (Sri Lanka), Somlit Vilavong (Laos), Nguyen The Quyet (Vietnam), Dr. Fe Porciuncula (Philippnes), Dr. Somdej Kanokmedhakul (Thailand), Prof. Dr. Waigoon Tongaram (Thailand), Dr. Preeyanan Sittijinda (Thailand), Mr. Jun Zhao (China) , Dr. Raphael Okigbo (Nigeria), Dr. Hoang N.D. Pham (Vietnam)

RESEARCH FORUM

13:00 -19:30 ORAL PRESENTATIONS - Parallel Sessions

Session 1 (Room 1)	**ORGANIC AGRICULTURE AND RELATED FIELDS** **Chairs: Prof. Dr. Teodoro C. Mendoza (Philippines), Prof. Dr. Somdej Kanokmedhakul (Thailand), Carmelita Cervantes (Philippines)**
13:00 – 13:15	**Invited Speaker: Prof. Dr. Somdej Kanokmedhakul (Thailand):** Secondary Metabolites and their Biological Activities from Soil-derived Fungi
13:15 – 13:30	**Wikanya Prathumyot (Thailand):** Biogas Production from Peels and Seeds of Longan (*Dimocarpus longan* Lour.) in Anaerobic Ferment System
13:30 – 13:45	**Wipawee Meepoomru (Thailand):** Fumigation Test of Water Based Essential Oils against House Dust Mite [*Dermatophagoides pteronyssinus* (Trouessart)]
13:45 – 14:00	**Sigit Sudjatmiko (Indonesia):** Biomass Accumulation of Sweet Corn Inbred Lines under Organic Systems
14:00 – 14:15	**Ammorn Insung (Thailand):** Application of Plant Essential Oil Formulas to Control Rice Insect Pests in Field Condition
14:15 – 14:30	**Nguyen The Quyet (Vietnam):** Biological Products for Agriculture in Vietnam
14:30 – 14:45	**Dollawan Pechhong (Thailand):** Effect of Preharvest Calcium Sprayed on Growth and Fruit Quality of Cherry Tomato cv. Red Lady
14:45 – 15:00	**Kankulranach Sukmuang (Thailand):** Insecticidal Properties of Plant Essential Oils against Common Blossom Thrips (*Frankliniella schultzei* (Trybom))
15:00 – 15:15	**Somlit Vilavong (Laos):** Application of Bio-products for Organic Coffee Production in Lao PDR
15:15 – 15:30	**Danupat Thongkham (Thailand):** Efficacy of Nano Elicitor from *Chaetomium cupreum* to Control *Phytophthora* spp. Causing Root Rot of Durian
~~15:30 – 15:45~~	~~**Phan Chí Nghĩa (Vietnam):** Replacing a Part of NPK Compound Fertilizer with Micro Organic Fertilizer which Produced Winter-Spring Tea in Northern Vietnam~~
15:45– 16:00	**Sunantra Banjobpudsa (Thailand):** The Effect of Pre-sowing Treatments on Germination and Vigor of Upland Rice (*Oryza sativa* L.)
16:00 – 16:15	**COFFEE BREAK**
16:15 – 16:30	**Invited Speaker: Kasem Soytong (Thailand):** Organic Farm's Model
16:30 – 16:45	**Phikul Intaparn (Thailand):** Controlling *Phytophthora* Causing Root and Stem Rot of Durian by Using Crude Extracts of *Chaetomium brasiliense*
16:45–17:00	**Carmelita Cervantes (Philippines):** Validation and Documentation of Organic Production Systems for Lettuce *(Lactuca sativa*) Camarines Sur, Philippines
17:00 – 17:15	**Sommart Yoosukyingsataporn (Thailand):** Effects of Sulfometuron-methyl as the Ripener on Growth and Yield of Sweet Sorghum
17:15 – 17:30	**Dante Lao-ay (Philippines):** (DRT) Double Row Transplanting: An Innovation in Organic Rice Production
17:30 – 17:45	**Nattakarn Pisutpiboonwong (Thailand):** Effect of Preharvest Calcium Chloride Sprayed on Growth and Development and Quality of Mulberry Fruit
17:45 – 18:00	**Nguyen Huy Thinh (Vietnam):** Total Polyphenol Content and Antioxidant Activity of the Extracts from *Thunbergia laurifolia* Lindl. Leaves
18:00 – 18:15	**Sunisa Chomchid (Thailand):** Isolation and Selection of *Chaetomium* spp. for Controlling Citrus Root-Rot Disease
18::15 – 18:30	**May Soe Oo (Mynmar):** The Energy Bill of Inbred and Hybrid Genotypes Grown under Organic Rice Production System in Three Different Planting Patterns
18:30 – 18:45	**Yardrung Suwannarat (Thailand):** Production of Bacterial Cellulose from *Acetobacter xylinum* by using Rambutan Juice as a Carbon Source
18:45 –19:00	**Nguyen The Quyet (Vietnam):** Molecular Identification of *Chaetomium* spp From Soil in Vietnam
19:00–19:15	**Parinn Noireung (Thailand):** Controlling *Phytophthora* Causing Root Rot of Citrus by Using Crude Extracts of *Chaetomium cupreum*
19:00– 19:30	**Loetchai Chitaree (Thailand):** Effect of Biogas Effluent from Pig Manure and Durian Residues on Soil Chemical Property and Growth of Marigold
19:30	**Closing Ceremony and Dinner: Diamond Ball Room**

Session 2 (Room 2)	**PLANT AND FOOD TECHNOLOGY** **Chairs: Dr. Devarajan Thangaduri (India), Dr. Bancha Wiangsamut (Thailand), Dr. Thanuku Samuel Sampath Kumar Patro (India)**
13:00 – 13:15	**Invited speaker: Dr. Devarajan Thangaduri (India):** Wine from Wild: Production, Characterization and Utilization of Wine from Wild Edible Fruits
13:15 – 13:30	**Invited Speaker**: **Dr. Thanuku Samuel Sampath Kumar Patro (India)**: Millets – The Miracle Grains the Future Food Crops
13:30 – 13:45	**Invited Speaker**: **Dr. Bancha Wiangsamut (Thailand)**: Yield, Fruit Quality, and Growth of 4 Cantaloupe Varieties Grown in Hydroponic System and Drip Irrigation Systems of Substrate and Soil Culture
13:45 – 14:00	**Mohammad Chozin (Indonesia):** Hybrid Performance and Heterosis in Sweet Corn as Grown Under Organic Cropping System at Tropical Highland Climate
14:00 – 14:15	**Kannikar Charoensuk (Thailand):** Formulation, Sensory and Pulp Stability of Durian (*Durio zibethinus* Murr) Juice
14:15 – 14:30	**Duanrung Benjamas (Thailand):** Effect of Process Conditions and Shelf life on ORAC (Oxygen Radical Absorbance Capacity) Value of Supplement Mangosteen Juice
14:30– 14:45	**Naruemon Mongkontanawat (Thailand):** Yoghurt Production from Germinated Native Black Rice (Khaohawmmaepayatong dum)
~~14:45 – 15:00~~	~~**Fredisminda Dolojan (Philippines):** Banana Tissue Culture Derived Plants as Hedgerows in Sustainable Corn Production in Sloping Area~~
15:00 – 15:15	**Nakorn Boonnoi (Thailand):** Growth and Yield of Chinese Kale Grown in DRFT with Re-used Nutrient Solution
15:15 – 15:30	**Widodo Widodo (Indonesia):** Growth and Yield Responses of Peanuts on Dolomite and Cow Manure Doses
15:30 – 15:45	**Boondarika Sumana(Thailand):** Development of High-Fiber Crispy Rice Products from Jasmine Rice Mixed with *Gracilaria* spp.
15:45– 16:00	**Diana Mae A. Bayani (Philippines):** Survivability and 1st Meiotic Completion *In Vitro* of Immature Bovine Oocytes after Vitrification
16:00 – 16:15	**COFFEE BREAK**
16:15 – 16:30	**Amornrat Suwanposri (Thailand):** Production and Quality Improvement of the Tropical Fruit Tamarind (*Tamarindus indica* Linn.) Wine
16:30 – 16:45	**Daisy Capon (Philippines):** Nutrient Use Efficiency, Yield and Fruit Quality of Sweet Corn (*zea mays saccharata* sturt.) Grown under Different Fertilizer Management Schemes
16:45–17:00	**Kasinee Saowakon (Thailand):** Effect of Carboxymethyl Cellulose as Edible Coating on Postharvest Quality of Rambutan Fruit under Ambient Temperature
17:00 – 17:15	**Leah S. Guzman (Philippines):** Erythema Inhibiting Potential of Banana (*Musa paradisciaca* Linn.), Guava (*Psidium guajava* Linn.) and Lima Bean (*Phaseolus lunatus*) Leaf Extracts on Acute Models of Inflammation
17:15 – 17:30	**Sakulrat Sanputawong (Thailand):** Study on Type and Concentration of Plant Growth Regulator on Shoot Development of Pummelo [*Citrus maxima* (Burm.) Merr.] cv. Taptimsiam
17:30 – 17:45	**Rachelle P. Mallari (Philippines):** Genetic Diversity Analysis of Selected Philippine Traditional Rice (*Oryza sativa* L.) Varieties Using Simple Sequence Repeat (ssr)
17:45 – 18:00	**Thitima Wongwan (Thailand):** Precision and Sustainable Management of *Phytopthora* Disease of Durian
18:00 – 18:15	**May Basco Divina (Philippines):** Phytohormone and Phytochemical Analysis of *Gracilaria* sp. Extract and Its Effect on Callus Induction and Rice Seed Germination
~~18::15- 18:30~~	~~**Ratchadawan Cheewangkoon (Thailand):** Biotechnique in Controlling Durian *Phytophthora* Disease~~
18:30–18:45	**Clarissa Yvonne J. Domingo (Philippines):** Detection of Salmonella in Raw Pork Meat and Eggs Sold in the Wet Markets in Nueva Ecija, Philippines
18:45-19:00	**Suwaphit Wongsrisiri (Thailand):** Effect of Setting Agent on Quality of Tubed-Package Sesame Tofu
19:00-19:15	**Aueangporn Somsri (Thailand):** Detection and Identification of Bacterial Contamination in Meat by MALDI-TOF Mass Spectrometry
19:30	**Closing Ceremony and Dinner: Diamond Ball Room**

Session 3 (Room 3)	**MICROBIAL BIOTECHNOLOGY, BIODIVERSITY,TAXONOMY, BIOLOGICAL ACTIVITY** **Chairs: Prof. Dr. Riad Sedki Riad El-Mohamedy (Egypt), Asst. Prof. Dr. Itsanun Wiwatanaratanabutr (KMITL, Thailand), Dr. Samantha C. Karunarathna (Sri Lanka), Dr. Hoang N.D. Pham (Vietnam)**
13:00 – 13:15	**Invited Speaker**: **Prof. Dr. Riad Sedki Riad El-Mohamedy (Egypt):** *Moringa oleifera* Extracts as Natural Fungicide against Some Plant Pathogenic Fungi Incited Tomato, Potato and Green Bean Crops in Egypt
13:15 – 13:30	**Invited Speaker: Dr. Samantha C. Karunarathna (Sri Lanka):** New Edible Fungi from Southeast Asia: Discovery To Production
13:30 – 13:45	**Supattra Poeaim (Thailand):** Molecular Marker SRAP and Bioactivity of Methanolic Seed Extract of Indian Gooseberry
13:45 – 14:00	**Fahrurrozi Fahrurrozi (Indonesia):** Determination of Potential Bacteria from Six Different Types of Green Biomass Enriched Liquid Organic Fertilizer for Developing Bio-decomposer
14:00 – 14:15	**Taksaporn Changmuang (Thailand):** Isolation and Screening of endophytic bacteria against Rice Blast Pathogen
14:15 – 14:30	**James Kennard Jacob (Philippines):** Macroscopic Fungi in Isabela State University, Isabela as Baseline Information
14:30 – 14:45	**Mongkutkarn Udompongsuk (Thailand):** Efficacy of Nano Elicitor from *Chaetomium cochliodes* to control *Pythium* spp Causing Root Rot of Tangerine (*Citrus reticulate*)
~~14:45 – 15:00~~	~~**Quyen Nguyen (Vietnam):** Research on the Ratio and Some Risk Factors for The Larval Ascarid Infection from Dog to Human in Phu Tho Province, Viet Nam~~
15:00 – 15:15	**Pennapar Tansian (Thailand):** Study of Optimum Mobile Phase for Determination of Phytoalexin in Rice by Thin Layer Chromatography
15:15 – 15:30	**Constancia C. Dacumos (Philippines):** Effects of Microbial Biocontrol Agents and Botanical Extracts for the Management of Bulb Rot and Twister Diseases of Onion
15:30 – 15:45	**Supanan Suksiri (Thailand):** Isolation and Identification of *Pythium* sp. and *Phytophthora* sp. from Durian Orchard in Chumphon Province, Thailand
15:45– 16:00	**Hezekiah Mirielle Aguinaldo (Philippines):** In Vitro Testing of Nanoparticles from *Chaetomium globosum* against *Sclerotium rolfsii*
16:00 – 16:15	**COFFEE BREAK**
16:15 – 16:30	**Invited Speaker: Dr. Hong-Kai Wang (China):** Researches on Enhancement of Control Effect of Tobacco Bacterial Wilt by *Piriformospora indica*
16:30 – 16:45	**Invited Speaker: Dr. Hoang Pham (Vietnam):** Utilizing Microorganisms for Sustainable Land Productivity in Coffee and Pepper Crops
16:45–17:00	**Sucheera Danarun (Thailand):** Growth and Development of *Ooencyrtus* sp.
17:00 – 17:15	**Krissada Natungnuy (Thailand):** Antioxidant and Cytotoxic Activities of Methanolic Extract from *Mimusops elengi* Flowers
17:15 – 17:30	**Josephine Joy Tolentino (Philippines):** Proximate Nutrient Composition of *Pleurotus florida* on Corn-based Substrate
17:30 – 17:45	**Watcharawit Rassami (Thailand):** Species Diversity of Insect Pollinators in the Area of Plant Genetics Conservation Project under the Royal Initiation of Her Royal Highness Princess Maha Chakri Sirindhorn (RSPG) at the Rambhai Barni Rajabhat University, Chanthaburi Province, Thailand
17:45 – 18:00	**Edlyn E. Pooten (Philippines):** Anti-proliferative and Cytotoxic Activities of Ethnobotanicals from Imugan, Nueva Vizcaya, Philippines against Human Cancer Cell Lines
18:00 – 18:15	**Panisa Prasom (Thailand):** In vitro Study of Endophytic Bacteria Isolated from Tomato Plant against *Fusarium oxysporum*
18::15- 18:30	**Gina D. Balleras (Philippines):** Endophytic Colonization of Rice by *Beauveria bassiana* and *Metarhizium anisoplae* and its Effects on Brown Planthopper (*Nilaparvata lugens* Stal.) Longevity under Controlled Condition
18:30–18:45	**Maneerat Bangpai (Thailand):** *Acherontia styx styx*: The Lesser Death's Head Hawkmoth
18:45-19:00	**Jiaojiao Song (China):** Antifungal Activity *of Emericella* sp. against *Pyricularia oryzae*
19:00-19:15	**Nuntharat Numo (Thailand):** Efficacy of Predatory Spiders (*Agelenopsis* sp.) on Asiatic Pennywort Cutworms
19:15-19:30	**Nina Mae L. Dela Cruz (Philippines):** Detection of Potentially Toxigenic Filamentous Fungi and Economically–Important Mycotoxins in Samples of Soybean Curd Produced in The Philippines
19:30	**Closing Ceremony and Dinner: Diamond Ball Room**

Session 4	**ANIMAL AND FISHERY SCIENCES**
(Room 4)	**Chairs: Prof. Dr. Raphael Okigbo (Nigeria) , Asst. Dr. Virapol Jamswat (Thailand) Dr. Dwatmadji (Indonesia), Dr. Chongko Saetung (Thailand)**
13:00 – 13:15	**Invited Speaker: Prof. Dr. Raphael Okigbo (Nigeria)**: Ethnostudy of mushrooms and nutritional composition of *Cantharellus* sp newly discovered in Ukwa-East, Abia State Nigeria.
13:15 – 13:30	**Renz Carlo Cajucom (Philippines**): Meiotic Resumption and Completion *In Vitro* of Immature Buffalo Oocytes after Vitrification
13:30 – 13:45	**Auaree Suksomnit (Thailand):** Cultures of Siamese Fighting Fish (Halfmoon variety) Fed with Commercial Feed Mixed EM (Effective Microorganisms)
13:45 – 14:00	**Sontaya Koolkalya (Thailand):** Growth, Population Dynamic and Optimum Yield of Indian Mackerel, *Rastrelliger Kanagurta* (Cuvier, 1816), in the Eastern Gulf of Thailand
14:00 – 14:15	**Araya Daengroj (Thailand):** Used Mangosteen (*Garcinia mangostana*) Pericarp Extract to against *Zoothamnium* sp. in White Leg Shrimp (*Litopenaeus vannamei*) in Chanthaburi Province
14:15 – 14:30	**Umarin Matchakuea (Thailand):** Utilization of Shrimp Shell Substitute Soybean for Hybrid Catfish (*Clarias macrocephalus* × *Clarias gariepinus*)
14:30 – 14:45	**Nissara Kitcharoen (Thailand):** Preliminary Guideline for Replacement of Fish Meal for Good Aquaculture Moving towards Organic of Maejo Buk-Siam Hybrid Catfish
14:45 – 15:00	**Perla DC. Florendo (Philippines):** Cryopreservation of *Bubalus bubalis* L Rumen Bacteria: Effect on Viability and Conversion of Crop Residues into Soluble Sugars for Bioethanol Production
15:00 – 15:15	**Chongko Saetung (Thailand):** Commercial Feed and Algae for Feeding *Pinna Bicolor* in Indoor Tanks
15:15 – 15:30	**Chatpong Sookkua (Thailand):** Growth Performance of Tilapia (*Oreochromis niloticus* Linnaeus) Fingerlings Fed Diets Containing Different Levels of Spirulina (*Spirulina platensis* Geitler)
~~15:30 – 15:45~~	~~**Saher Islam (Pakistan)**: Identification of Superior Buffalo Bulls of Nili Ravi Breed for Increasing Milk Production through Selection by Estimation of Breeding Values and Genome Analyses~~
15:45– 16:00	**Wandee Tartrakoon (Thailand):** Insoluble Fiber Prepared From Rice Hulls for the Dietary Supplementation of Growing-Finishing Pigs
16:00 – 16:15	**COFFEE BREAK**
16:15 – 16:30	**Thanyaporn Madee (Thailand):** Life History of Jumping Spiders (*Plexippus paykulli*)
16:30 – 16:45	**Dwatmadji (Indonesia):** Effect of Feeding Wheat Pollard as Feed Supplementation on Dry and Organic Matter Digestibility in Indonesian PE Goats Fed Native Grasses
16:45–17:00	**Jay Merculio (Philippines):** Bioaccumulation Study of Cadmium in Selected Tissues of *Hoplobatrachus rugulosus* Wiegmann
17:00 – 17:15	**Kunya Tuntivisoottikul (Thailand):** Association of Dik2670 Microsatellite Marker with Carcass Trait in Crossbred Beef Cattle
17:15 – 17:30	**Joel B. Ellamar (Philippines):** A Novel Furan Fatty Acid, 7,10-Epoxyoctadeca- 7,9-Dienoic Acid as Potential Livestock Antimicrobial
17:30 – 17:45	**Arnuparp Wankanapol (Thailand):** Evaluation of Different Carbon Sources for Polyculture of Hybrid Catfish (*Clarias gariepinus* x *Clarias macrocephalus*) and Nile Tilapia (*Oreochromis niloticus*) under Biofloc Technology
17:45 – 18:00	**Eugene Yolanda F. Irang-Maxion (Philippines):** Sex Ratio of Genomar Supreme Tilapia Strain Exposed to Elevated Temperature
18:00 – 18:15	**Manee Srichanun (Thailand):** Effects of Different Mushroom by Product Types and Levels on Growth Performance and Survival Rate in Dietary of Nile Tilapia (*Oreochromis niloticus*)
18::15- 18:30	**Maria Teresa SJ. Valdez (Philippines):** Production and Evaluation of High-Protein Biomass from Sweet Potato for Broilers and Aquatic Species
18:30–18:45	**Isagani P. Angeles, Jr (Philippines):** Performance of Red Tilapia (*Oreochromis* sp.) Fed Diet with Fermented Banana (*Musa acuminata* ×*balbisian*a) Peel at Different Stages of Ripeness Following *Aeromonas hydrophila* infection
18:45-19:00	**Wuttikorn Buajoom (Thailand):** The Differences and Relationship in the Gene Expression of Calpain System and Pork Tenderness Between Duroc Purebred and Crossbred Pigs
19:00-19:15	**Adrian Deil C. Manliclic (Philippines):** Seed Production of Nile Tilapia (*Oreochromis niloticus* L.) as Affected by The Breeders' Stress-Coping Style
~~19:00- 19:30~~	~~**Phan Thi Yen (Vietnam)**: Evaluate the Effect of Different Feed on Survival Rate, Growth, and FCR of Weather Loach Fish (*Misgurnus Anguillicaudatus*) in Rice-Fish Coculture System~~
19:30	**Closing Ceremony and Dinner: Diamond Ball Room**

Session 5 (Room 5)	**ENVIRONMENTAL SCIENCE, SOIL AND WATER CONSERVATION** **Chairs: Prof. Dr. Timo K. Korpela (Finland), Assist. Prof. Dr. Wattanachai Pongnak (Thailand), Dr. Phattraporn Soytong (Thailand), Dr. Nanik Setyowati (Indonesia)**
13:00 – 13:15	**Invited speaker: Prof. Dr. Timo K. Korpela (Finland):** Clean Water Resources are of Crucial Importance for a Society
13:15 – 13:30	**Phattraporn Soytong (Thailand):** Monitoring Urban Heat Island in the Eastern Region of Thailand and its Mitigating through Cities Greening and Urban Agriculture
13:30 – 13:45	**Zainal Muktamar (Indonesia):** Soil Chemical Improvement Under Application of Liquid Organic Fertilizer in Closed Agriculture System
13:45 – 14:00	**Jeerasak Treedat (Thailand):** Assessment Monitoring of Watershed Management to Reduce Risk Disaster and Community Adaptation to Climate Change in Pasak River Basin Area, Thailand
14:00 – 14:15	**Nanik Setyowati (Indonesia):** Colored Plastic Mulches Influence Weed Growth and Soil Temperature in Tropical Highland
14:15 – 14:30	**Lalitha Ravikumar (India):** Impact of Microbial Inoculation on Herbicide Affected Soil
14:30 – 14:45	**Somchivang Dethoudom (Laos):** Assessment of Sustainability of Urban Water and Water Demand Management by Using Geo-information Technology for Vientiane Municipality, Vientiane Capital, Lao PDR
14:45 – 15:00	**Surasak Kaeongam (Thailand):** The Project Feasibility Study and Analysis of a Waste-Electric Power Plant of Kamalasai Sub-district Municipality, Kamalasai district, Kalasin province
15:00 – 15:15	**Juvy Monserate (Philippines):** Synthesis and Characterization of Zinc Oxide Nanoparticles as a Source of Zinc Micronutrient in Biofertilizer
15:15 – 15:30	**SEM Savuth (Cambodia):** The Energy Costs of Producing Lowland Rice Established in Different Practices in Cambodia
15:30 – 15:45	**Sasima Fakkhong (Thailand):** Development Indicators of City Resilience for Water Resources Management in Chiang Rai Province, Thailand
15:45– 16:00	**Ofelia Campano Malonzo (Philippines):** Agricultural Innovation System in Selected Non-Irrigated Rice Municipalities in Nueva Ecija, Philippines
16:00 – 16:15	**COFFEE BREAK**
16:15 – 16:30	**Kritsada Phongkaranyaphat (Thailand):** Factors Influencing People Participation in Community Forest Management in Phrae Province, North Thailand
16:30 – 16:45	**Suchart Chayhard (Thailand):** Multi-temporal Mapping of Seagrass Distribution by using Integrated Remote Sensing Data in Kung Kraben Bay (KKB), Chanthaburi Province, Thailand
16:45–17:00	**Panupong Junkeaw (Thailand):** Impact of Temperature on Distribution of Diamondback Moth (Lepidoptera: Plutellidae) on Cabbage Leaves
17:00 – 17:15	**Federico Pineda (Philippines):** Safe and Potable Water for the Community- Science City of Munoz T.U.B.I.G. Project in Focus and the Central Luzon State University Water Potability Testing Activity
17:15 – 17:30	**Maribelle P. Astejada (Philippines):** Bulbsets as Planting Materials for Off-Season Onion Production under Rainy Simulated Condition
17:30 – 17:45	**Phattraporn Soytong (Thailand):** Analyzing Meteorological Factors which affected the Cultivation and Growth of Rice, Sugarcane and Cassava in Thailand Using Geoinformatics Technology
17:45 – 18:00	**Suparat Ongon (Thailand):** Initial Environmental Examination Report : Project of Effective Waste Management with Production as a Renewable Energy of the Mahasarakham Provincial Administrative Organization
18:00 – 18:15	**Rico Tabal (Philippines):** Energy Accounting : A Quantitative tool for Determining the Sustainability of Corn Production in Barangay Vitali, Zamboanga City, Philippines
18::15- 18:30	**Kannika Sookngam (Thailand):** The Project Feasibility study of Solid waste Management in Kalasin Local Governance Organization to Produce Refuse Derived Fuel (RDF)
18:30–18:45	**Suneeporn Suwanmaneepong (Thailand):** Evaluating the Irrigation Efficiency using Rapid Appraisal Process Technique (RAP) in a Large Scale Irrigation, Case Study: Mae Lao Operation and Maintenance Project and Chiang Rai Irrigation Project, Thailand
18:45–19:00	**Sonthaya Numthuam (Thailand):** Method Development for Pesticide Determination in Paddy Rice Using Near Infrared Spectroscopy
19:30	**Closing Ceremony and Dinner: Diamond Ball Room**

Session 6	**AGRICULTURAL BIOTECHNOLOGY**
(Room 6)	**Chairs: Dr. Younes Danesh (Iran), Dr. Lalitha Ravikumar (India), Dr. Saithong Kaewchai (Thailand), Dr. Sutisa Chaikul (Thailand), Dr. Nagia Farag Ali Mohamed (Egypt)**
13:00 – 13:15	**Invited speaker : Dr. Younes Danesh (Iran):** In Vitro Culturing of Mycorrhiza and Mycorrhiza Like Fungi
13:15 – 13:30	**Invited Speaker: Dr. Lalitha Ravikumar (India)**: Plant Growth Promoting Rhizobacteria (PGPR) against Plant Disease in *Cicer arieti*
13:30 – 13:45	**Invited Speaker: Dr. Nagia Farag Ali Mohamed (Egypt):** Antimicrobial Activity of Some Natural Dyes Extract from Different Plants against Human Pathogens
13:45 – 14:00	**Mark Nell C. Corpuz (Philippines):** Spatial and Sexual Variation on Morphometrics, Length and Weight, and Condition Factor Dynamics of Endemic Silver Therapon (*Leiopotherapon plumbeus*, Kner**)**
14:00 – 14:15	**Atchara Jaiboonma (Thailand):** The Bioactivities of Seed Coat and Embryo Extracts from Indian Gooseberry (*Phyllanthus emblica*)
14:15 – 14:30	**Neil Vicencio (Philippines):** Gross Anatomy of the Female Reproductive Organs of Philippine Native Pig (*Sus scrofa* L.)
14:30 – 14:45	**Saithong Kaewchai (Thailand):** The Effect of Betel (*Piper betle* L.) Crude Extract on the Growth of *Colletotrichum* sp. and *Fusarium* sp. Causing Agent of Chili Diseases
14:45 – 15:00	**Chaisit Preecha (Thailand):** The Canker Damage on Yield of Pummelo (*Citrus maxima* (Burm.) Merr.) var. Tabtimsiam in Nakhorn Si Thammarat Province, Thailand
15:00 – 15:15	**Ms. Fatima Grace P. Bernardino (Philippines):** Isolation and Characterization of Gonadal Primordial Germ Cells (gPGCs) of Turkey (*Meleggris gallopavo*) from 11-14 Days Old Embryo
15:15 – 15:30	**Ajchara Bunroj (Thailand):** Research and Development Project of Monkey's Head Mushroom (*Hericium erinaceus*) Cultivation in East of Thailand
~~15:30 – 15:45~~	~~**Divine Grace S. Batenga (Philippines):** Calcium Uptake of *Pleurotus djamor* on Calcium Enriched Rice Straw Based Formulation~~
15:45– 16:00	**Sawitri Chuenban (Thailand):** Morphological Aspects of *Trilocha varians* Walker (Lepidoptera:Bombycidae)
16:00 – 16:15	**COFFEE BREAK**
16:15 – 16:30	**Roselyn F. Paelmo (Philippines):** Analysis of Energy Inputs in Rice Production at Varying Yield Levels among Selected Towns of Laguna, Philippines
16:30 – 16:45	**Chalermchon Changthom (Thailand):** Effect of Pole Types and NPK Fertilizer Rates on the Early Growth of Black Pepper (*Piper nigrum* Linn.)
16:45–17:00	**Jaypee A. Abenoja (Philippines):** Prevalence of Subclinical Mastitis in Goats from Commercial Farms in The Philippines
17:00 – 17:15	**Tipawan Thongjua(Thailand):** Effect of Plant Extracts, Bio-insecticides , Petroleum Oil and Insecticides for Controlling Rose beetle (*Adoretus compressus*, Rutelidae : Coleoptera) in Immature Oil Palm
17:15 – 17:30	**Virginia M. Venturina (Philippines):** Antibiotic Sensitivity of Bacteria Isolated in Clinically Mastitic Goats
17:30 – 17:45	**Shesea Mae A. Marata (Philippines):** Evaluation of Epididymal Sperm from Post-Mortem Derived Cauda Epididymides of Ram (*Ovies aries*)
17:45 – 18:00	**Thanaporn Doungnapa (Thailand):** Effectiveness of Nano Turmeric Essential Oil against the African Red Mite (*Eutetranychus africanus* (Tucker))
18:00 – 18:15	**Bea Emma Bachinela (Philippines):** All Natural Alternative AntiExternal Parasite Treatment to Farm Animals at USLS Granada Farm, Brgy. Granada, Bacolod City
18:15 – 18:30	**Laorngtip Jaisuk (Thailand):** Microbial Control on Common Cutworms (Lepidopetera: Noctuidae)
18:30 –18:45	**Jerome Galapon (Philippines):** Utilizing Beneficial Microorganisms in Suppressing Bacterial Leaf Blight (BLB) Disease in Rice
18:45 –19:00	**Anuwat Lakyat (Thailand):** Effectiveness of Nano Plant Essential Oils against Brown Planthopper, *Nilaparvata lugens* (Stål)
19:00 –19:15	**Rujira Tongon (Thailand):** Bioactivity test of *Chaetomium cochliodes* against *Phytophthora* sp causing Durian Rot
19:15 –19:30	**Jiaojiao Song (China):** Fungal Metabolites of *Chaetomium lucknowense* for Inhibition of a Rice Blast Pathogen, *Pyricularia oryzae*
19:30	**Closing Ceremony and Dinner: Diamond Ball Room**

Session 7 (Room 7)	**SOCIO ECONOMIC, COMMUNITY DEVELOPMENT AND AGRICULTURAL DEVELOPMENT I** **Chairs: Prof. Dr. Fe Porciuncula (Philippines), Dr. Preeyanan Sittijinda (Thailand), Dr. Wutthisak Bunnaen (Thailand), Patricia M. Barcelo (Philippines)**
13:00 – 13:15	**Invited Speaker: Prof. Dr. Fe Porciuncula (Philippines)**: Local Government Engagement in Solid Waste Management Cum Organic Fertilizer Production in Support to HighValue Vegetable Production
13:15 – 13:30	**Songsak Wangkhahat (Thailand):** Problems and Encountered in Sufficiency Economy Philosophy (SEP) Application of People in Thonnalab Community, Thonnalab Sub-district, Bandung District, Udon Thani Province, Thailand
13:30 – 13:45	**Prawach Chourwong (Thailand):** Mango Production Cost Under Tailor-Made Fertilizer Technology in Bangkha District, Chachoengsao Province, Thailand
13:45 – 14:00	**Sumonwan Jirarud (Thailand):** Profitability of Rice Production under Large Agricultural Plot Scheme inKhlong Khuean District, Chachoengsao Province Thailand
~~14:00 – 14:15~~	~~**John Carlo S. Gabato (Philippines):** Assessment of Mechanization Level of Rice (*Oryza sativa* L.) Production in Santo Domingo, Nueva Ecija, Philippines~~
14:15 – 14:30	**Cha-on Juyjaeng (Thailand):** Comparative of Costs and Returns on Oil Palm Production of Member and Non-member Farmers Under Large Agricultural Plot Scheme in Bang Saphan Noi District, Prachuap Khiri Khan Province
14:30 – 14:45	**Harry Jay M. Cavite (Philippines):** Profitability Analysis of Banana (*Musa balbisiana*) Industry in Bato, Leyte, Philippines: A Value Chain Approach
14:45 – 15:00	**Suneeporn Suwanmaneepong (Thailand):** Economic Aspects of Urban Vegetable Gardening in Bangkok Metropolitan, Thailand
15:00 – 15:15	**Prawach Chourwong (Thailand):** A Quality Improvement of Manufacturing Process for Jasmine Rice 105 by Applying the Design of Experiment
15:15 – 15:30	**Helen Pasicolan (Philippines):** Enhancing Profitability and Productivity of Upland Rice Areas through Crop Diversification
15:30 – 15:45	**Raweewan Sakullax (Thailand):** A Feasibility Study for Investment in Para Rubber Latex Foam Production for Combat Sport Mats in Thailand
15:45–16:00	**Sergey Sayfudinov (Russia):** Concentrated Plant Growth Stimulator, Immunomodulator, Fungicide
16:00 – 16:15	**COFFEE BREAK**
16:15 – 16:30	**Paiboon Limmanee (Thailand):** The Campaign for Effective Reduction of Sugarcane Burning before Transporting Them to the Factory Aimed Specifically at Khok Klang Community, Nong No Sub-District, Kranuan District, Khon Kean Province
16:30 – 16:45	**Pimolwan Katepan (Thailand):** Strengths, Weaknesses, Opportunities, and Threats (SWOT) Analysis for Okra Production: Case of Okra Growers for Export in Nakhon Pathom Province, Thailand
16:45 –17:00	**Sutee Khunchaikarn (Thailand):** Factors Affecting the Decision to Raise Beef Cattle of Farmers in Thailand
17:00 – 17:15	**Dhanita Doungwilai (Thailand):** Developing Reading and Writing Abilities of Prathomsuksa2 Students at Schools in MuangMahasarakham Municipality Through Brain-based Learning
17:15 – 17:30	**Wutthisak Bunnaen (Thailand):** The Biological Literacy, Environmental Awareness and Integrated Science Process Skills in the SCiUS Students of Mahasarakham University Demonstration School (Secondary)
17:30 – 17:45	**Likhit Junkaew (Thailand):** The Project Feasibility Study of Solid Waste Transfer Station Pluakdaeng Subdistrict Administration Organization; Pluakdaeng District, Rayong
17:45 – 18:00	**Ma. Cecilia Antolin (Philippines):** Value Chain Analyis of Tomato in Bukidnon, Philippines
18:00 – 18:15	**Wannasakpijitr Boonserm (Thailand):** The Promotion of Traditions of Chong Ku Khu Mahathat of Community on Eco-Culture Concept
18::15 – 18:30	**Pimolwan Katepan (Thailand):** Factors Affecting Okra Farm Income in Nakhon Pathom Province, Thailand
18:30 –18:45	**Patricia M. Barcelo (Philippines):** Multi-Strata Production of Leguminous Forages for Livestock Production in Northern Philippines
18:45 –19:00	**Jeeranun Khermkhan (Thailand):** Ability to Increase Values on Agricultural Sector: Mittraphap Road in Northeastern Region of Thailand
19:00 – 19: 15	**Joel Juvinal (Philippines):** Sensory Analysis of Single Origin Cocoa Liquor and Chocolates: A Systematic Review
19:30	**Closing Ceremony and Dinner: Diamond Ball Room**

Session 8 (Room 8)	**SOCIO ECONOMIC, COMMUNITY DEVELOPMENT AND AGRICULTURAL DEVELOPMENT II** **Chairs: Dr. Pakkapong Poungsuk (Thailand), Dr. Adisak Singseewo (Thailand), Dr. Tatik Suteky (Indonesia)**
13:00 – 13:15	**Invited speaker: Dr. Pakkapong Poungsuk (Thailand):** Development of Basic Skills in Agriculture of Students Program in Agricultural Education, Department of Agricultural Education, King Mongkut's Institute of Technology Ladkrabang, Thailand
13:15 – 13:30	**Adisak Singseewo (Thailand):** Promoting the Use of Environmentally Friendly Packaging Materials for Municipality School Students
13:30 – 13:45	**Ma. Cecilia Antolin (Philippines):** Understanding Household Food Security Status of A Rural Community in Nueva Ecija, Philippines
13:45 – 14:00	**Amporn Saduak (Thailand):** Model for Development of Agricultural Skills under Occupation and Technology Subject (Agriculture) of Grade 3 Students using School Agricultural Learning Center, Praibuengwittayakom School, Srisaket Province
14:00 – 14:15	**Maria Excelsis Orden (Philippines):** Consumers' Preferenc and Willingness to Pay for Aromatic Rice in Selected Markets in Nueva Ecija, Philipines
14:15 – 14:30	**Khanungchai Viriyasoonthorn (Thailand):** Learning Achievement of Thai Language on Poetry Writing by Using Learning Together (LT) Collaborative Group
14:30 – 14:45	**Winyoo Kromkratoke (Thailand):** Socio-economic of Rubber Farmer in Drought area, in Sakwae Province Thailand
14:45 – 15:00	**Rangsan Panyakom (Thailand):** Needs for Animal Farm Work Development of Northeastern Vocational Institute of Agriculture, Ministry of Education, Thailand
15:00 – 15:15	**Owat Yinglap (Thailand):** Monitoring and Evaluation to Develop Preliminary Rice Cultivation Curriculum of School of Rice and Famers, Department of Rice, Ministry of Agriculture and Cooperative
15:15 – 15:30	**Kanokwan Tammaroopa (Thailand):** Assessing Knowledge Attitude and Experience of White Shrimp Farmer in Chachoengsao Province , Thailand
15:30 – 15:45	**Anders L. Dela Cruz Jr (Philippines):** Enabling Communities Through Increased Farm Productivity and Agroenterprise Development: The San Juan, Quirino, Isabela, Philippines Experience
15:45– 16:00	**Teeka Yotapakdee (Thailand):** Transformation of Agroforestry from Invasive Forest to Encourage Food Security to Smallholder Farmers at Maekammee Watershed in Northern Thailand
16:00 – 16:15	**COFFEE BREAK**
16:15 – 16:30	**Tatik Suteky (Indonesia):** The Farmers Characteristics on the Adoption of Artificial Insemination Technology in Bengkulu, Indonesia
16:30 – 16:45	**Araya Musika (Thailand):** A Study and Development of Local Materials to Improve Quality of Oyster Mushroom Culture Materials, Panom Samran Sub-district, Khu Mueang District, Buriram Province
16:45–17:00	**Tawid Rasi (Thailand):** Factors Affecting of Basic School Administration by Using Schools Based Management in Nam Nao Districts, Phetchabun Province, Thailand
17:00 – 17:15	**Phaitoon Thongsuk (Thailand):** A Needs Assessment to Develop Teachers' Professional Competency of Agricultural Training Teacher Students in Surin Rajabhat University, Thailand)
17:15 – 17:30	**Suthep Munfkhun (Thailand):** Utilization and Preservation of Agricultural Areas Ban Bang Rong Phuket Province
17:30 – 17:45	**Wattana Saduak (Thailand):** State Problems on Using School Agricultural Learning Center at Praibuengwittayakom School, Srisaket Province, Thailand
~~17:45 – 18:00~~	~~**Gamon Savatsomboon (Thailand):** Decision to Rent Space at Agricultural Shopping Center using Factor and SEM Analyses in Mahasarakham, Roi-Et, Kalasin and Khonkaen, Thailand~~
18:00 – 18:15	**Tossapone Ruamchimplee (Thailand):** The Competency of Agricultural Teachers in Secondary Schools, Nakhon Ratchasima Province, Thailand
18::15- 18:30	**Thatree Rodchamnan (Thailand):** Stress in Learning English for Agriculture of Agriculture Student at Maejo University
18:30–18:45	**Pavida Charoenjindarat (Thailand):** Process of Driving the Sufficiency Economy Philosophy of Debsirinromklao School, Bangkok, Thailand
18:45-19:00	**Anedem Ebillo (Philippines)** Providing College Education Opportunity for All: A Life Changer for Rural People of Zamboanga del Sur, Philippines
19:00-19:15	**Prayoon Wongchantra (Thailand):** The Project Feasibility Study of Solid Waste Transfer Station of Mahasarakham
19:30	**Closing Ceremony and Dinner: Diamond Ball Room**

19:30	**CLOSING CEREMONY** **Diamond Ball Room** Presentation of BEST PAPER AWARDS for Oral and Posters Conclusion Remarks: Prof. Dr. Timo Korpera (Finland), Chairman of International Advisory Committee Future Remarks by Prof. Dr. Cynthia C. Divina, Chair, International Organizing Committee Welcome to Indonesia for ICIST 2018 Closing Address and Future Remark: Assoc. Prof. Dr. Kasem Soytong, President of AATSEA Singing of the ICIST Theme Song **"IMAGINE"** **DINNER**
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Chairs: Dr. Bancha Wiangsamut (Thailand), Dr. Phan Chí Nghĩa (Vietnam) , Dr. Sutisa Chaikul (Thailand), Dr. Mohammad Chozin (Indonesia), Dr. Widodo Widodo (Indonesia)

1 **Agatha Nina Balberona (Philippines):** Ethnomedicinal Plants Utilized by the Ilongot-Egongot Community of Bayanihan, Maria Aurora, Aurora, Philippines

2 **Anurug Poeaim (Thailand):** Effects of Gamma Radiation for Callus Induction of *Stylosanthes hamata* cv. Verano

3 **Jennifer Manangkil (Philippines):** Root Response of PSB Rc68 Under Abiotic Stresses

4 **Jiraporn Sawasdikarn (Thailand):** Characterization of Gum from Durian Seed and Application in Ice Cream

5 **Lani Lou Mar A. Lopez (Philippines):** *Moringa* Extract in Combination with Organic Fertilizer for Organic Vegetables Production

6 **Leelawadee Ngoenngam (Thailand):** In vitro Effect of Gamma Irradiation and Plant Growth Regulators (PGRs) for Induction and Developing of *Stylosanthes hamata* cv. *Verano*

~~7~~ ~~**Mietch G. Dela Cruz (Philippines):** Productivity and Grain Quality of Aromatic Rice Lines under Organic Cultivation~~

8 **Natnicha Jedoroh (Thailand):** Callus Induction and Cell Suspension Culture from Leaves of *Kadsura coccinea* (Lem.) A.C.Sm

9 **Paulina J. Alvaran (Philippines):** Characterization of F2-Derived Lines of White Aromatic Rice

10 **Paulina J. Alvaran (Philippines):** Evaluation of Breeding Lines of Sticky Rice Under Irrigated Lowland Condition

11 **Rachelle P. Mallari (Philippines):** Evaluation of Anaerobic Germination and Seedling Vigor of Selected Philippine Traditional Rice Varieties

12 **Sakulrat Sanputawong (Thailand):** Study of Proper Fertilizer Management on Growth and Yield of Oil Palm (*Eleais guineensis* Jacq.)

13 **Sathit Chaikachang (Thailand):** Efficiency of Biogas Effluent from Durian Shells and Seeds Combined with Chicken Manure on Soil Chemical Properties, Growth and Nutrient Concentrations of Chinese Kale (*Brassica oleracea*)

~~14~~ ~~**Soledad P. Galang (Philippines):** Processing Haggis (*Syzygiumtripinnatum*) Leaves into Aromatic Seasoning~~

15 **Teodora Mananghaya (Philippines):** Physiological Response of PSB Rc68 under Progressive Drought Stress

16 **Varee Yoosumran (Thailand):** Induced Mutation of *Dendranthemum Grandifflora* through Tissue Culture by Ethyl Methanesulphonate (EMS)

17 **Venus Quines (Philippines):** Simultaneous Saccharification and Fermentation of Eastern Prickly Pear Cactus (*Opuntia humifusa*) using Pectolytic Enzyme and Lactic Acid Bacteria

18 **Via Ann C. Marcelo (Philippines):** Selection in Recombinant Inbred Lines of Rice (*Oryza sativa* L.) by Drought Tolerant Indices

19 **Worachet Bunkoed (Thailand):** Allelopathic Potential of Essential Oil from Bottle Brush (*Callistemon lanceolatus* DC.) on The Germination and Growth of *Echinochloa crus-gall* L.

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Chairs: Dr. Constancia C. Dacumos (Philippines), Dr. Anurug Poeaim (Thailand), Dr. Sigit Sudjatmiko (Indonesia), Dr. Fredisminda Dolojan (Philippines), Dr. Virginia M. Venturina (Philippines)

1 **Aldrin Corpuz (Philippines):** DNA Barcoding Pteridophytes Collection from Minalungao National Park, General Tinio, Nueva Ecija

~~2~~ ~~**Alessandra Cumbe (Philippines):** Molecular Identification of Chiroptera at Minalungao National Park Using *Mitochondrial Cytochrome Oxidase I* Gene~~

3 **Anan Lertsutthichawan (Thailand):** Induced Mutation of Chrysanthemum by Colchicine

4 **Crista Joyce GC. Banson (Philippines):** DNA Barcoding of Chiropterans at Minalungao National Park, Nueva Ecija, Philippines

5 **Geraldine R. Gamoso (Philippines):** Detection and Quantification of Auxin and Gibberellic Acid in *Caulerpa racemosa*

6 **Jessica Rustia (Philippines):** Influence of Different Brining Concentration as Pre-Treatment in Drying Sea Cucumber (*Holothuria Scabra*) using Cabinet Drier

~~7~~ ~~**Jim Andreus V. Mangahas (Philippines):** Ultrastructural Biology and Pathogenesis of Twig Blight Disease of Citrus in The Philippines~~

8 **Kraingsak Sangwiroonthon (Thailand):** Effects of NAA and GA3 at Different Concentrations on Growth and Quality of Oil Palm Bunch and Fruit (*Elaeis guineensis* Jacq.)

9 **Marcial Gonzales (Philippines):** Performance of Pigmented Rice Lines for Quantitative Traits

10 **Maureen Gajeton (Philippines):** Fertilization and Subsequent Development of Bovine Embryos Following In-Vitro Fertilization in Commercially-Prepared Medium

11 **Nidchaporn Nabhadalung (Thailand):** Using of Chemical Fertilizer and Arbuscular Mycorrhizal Fungi to Promote Growth and Yield of Sweet Corn INSEE 2 Variety

12 **Nidchaporn Nabhadalung (Thailand):** Utilization of Bioextract to Accelerate Growth of Cassava Cuttings

13 **Paul Nathaniel M. Marcelo (Philippines):** Relationship of Culm Anatomy and Lodging Resistance in Rice (*Oryza Sativa* L.) Genotypes under Direct-Seeded System

14 **Pimpan Pimonrat (Thailand):** Effect of Gamma Irradiation and Salt Stress on Survival Rate and Growth of Hom Thong Banana

15 **Pornchai Luangvaree (Thailand):** Use of Pork Belly and Broiler Chicken Meat Parts in Herbs Sai Oua (Spicy Thai Herb Sausage)

16 **Rujira Rakrawee (Thailand):** Efficiency of Antioxidant and Absorbent on Browning and The Optimal Factors of Plant Regeneration from Young Seed of *Gluta usitata* (217 Mae Ka) by Tissue Culture

17 **Somyot Detpiratmongkol (Thailand):** Effects of Different Planting Dates on Growth and Yield of Kalmegh

18 **Theeranai Thippawan (Thailand):** Optimum Concentration Sample of Herbal Fresh Sausage for Antioxidant Analysis

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1 **Ann Jhudeil C. Santos (Philippines):** *In vitro* Evaluation of the Antagonistic Activity of *Trichoderma* sp. against *Fusarium verticillioides*

2 **Bo Ra Kim (Republic of Korea):** Identification and Antifungal Activity of Oleanane Saponns Isolated from Trevesia Palmata against Phytopathogenic Fungi

3 **Excelsis S. Romorosa (Philippines):** Preliminary Investigation on the Pharmacological Properties of Wood Rotting Mushroom Collected from Isabela State University , Echague, Isabela Philippines

4 **Fusheng Zhang (China):** Biological Control of Chili Antracnose by Using *Trichoderma* spp. in *vivo*

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6 **Janejira Namee (Thailand):** Attraction of Fruit Fly Males to Flowering Plants

7 **Ronel C. Sogelio Jr. (Philippines):** Morphological Characterization and Bacteriostatic Activity of Entomopathogenic Fungi Isolated from Short-horned Grasshopper (*Oxya hyla intrica*)

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12 **Phikul Intaparn (Thailand):** Efficacy Test of Antagonistic Bacteria against Root-Rot Disease of Vinca, Citrus and Durian Caused by *Phytophthora* spp**.**

13 **Rainhart C. Inovejas (Philippines):** Methanol Extract and Nanocomposite of *Trichoderma* sp. as a Potential Bio-Control against *Fusarium moniliforme* in Tomato (*Lycopersicon esculentum*)

14 **Rey Mark Tecson (Philippines):** Antimicrobial Screening of *Ganoderma lucidum* (Isabela strain) as Affected by Different Liquid Substrates

15 **Ron Partrick Campos (Philippines):** Morphological Characterization and Antimicrobial Potential of Endophytic Fungi Isolated from Oregano (*Oreganum vulgare* L.) Leaves

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17 **Rungrat Vareeket (Thailand):** Screening of Antagonistic Bacteria for Biological Control of Rice Diseases

18 **Saowapar Khianngam (Thailand):** Isolation of Cellulase Producing Microbes and Nitrogen Fixing Bacteria from Bamboo Soils

19 **Sararat Monkhung (Thailand):** Bioefficacy of Mangosteen Peel Extracts in Controlling Seed-Borne Pathogenic Fungi of Maize Seeds and Seed Germination

20 **Seong-mi Im (Republic of Korea):** Isolation and Characterization of Antibacterial Metabolites from *Bacillus methylotrophicus* DR-08 Showing Strong Antibacterial Activities against Various Phytopathogenic Bacteria

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22 **Angeles De Leon (Philippines):** Optimization of Mycelial Growth and Mycochemical Screening of *Lentinus sajor-caju* (fr.) from Banaue, Ifugao Province, Philippines

23 **Jun Zhao (China):** Research and Development of Bioproducts for Agriculture in China

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1 **Bancherd Sornsupharp (Thailand):** Effect of Dry Giant Mimosa Leaves Pellet on Digestibility Efficiency and Skin Colour in Ornamental Fish

2 **Eugene Yolanda F. Irang-Maxion (Philippines):** Assessment of the Inhibitory Effect of Selected Medicinal Plants against *Aeromonas sobria* in Nile Tilapia (*Oreochromis niloticus* L.)

3 **Goldyn Anne G. Aquino (Philippines):** Evaluation of Wood Charcoal Supplementation in The Diet of Nile Tilapia (*Oreochromis niloticus* L.) and Ammonia Levels in Concrete Tanks

4 **Isagani P. Angeles, Jr (Philippines):** Dietary Effects of *Quillaja saponaria* and *Yucca schidigera* Extract on Rearing Performance of *Nile tilapia Oreochromis niloticus* L. and its Antioxidant Capacity and metabolic Response Following Hypoxic Stress

5 **Jaec C. Santiago (Philippines):** Taxonomic Classification and Identification of Class Actinopterygii found in Baler River, Baler, Aurora, Philippines

6 **Janejira Namee (Thailand):** Bactrocera (*Bactrocer*a) tuberculata (Bezzi) Reported as a Pest Attacking Fruit of Tummy-wood, (*Careya sphaerica*) in Thailand

7 **Jayvee A. Cruz (Philippines):** Effectiveness of Plant Growth-Promoting *Streptomyces* sp. on Seedling Growth and Development of Rice (*Oryza sativa* L.)

8 **Jennifer C. Paltiyan (Philippines):** Influence of *Theobroma cacao* on the Sexual Aggression of Fighting Fish (*Betta splendens*)

9 **Justin V. Dumale (Philippines):** Phytochemical Analysis, Larvicidal Activity and Cytotoxic Properties of Malvarosa (*Pelargonium Graveolens*) Leaf Extract

10 **Kathlene Claire (Philippines):** Development of Intermediate Moisture Goat Skin Salad (Chevon Ceviche)

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25 **Arlen A. Dela Cruz (Philippines):** *Glh14* and *tsv1* in Rice Boost Resilience to Tungro

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3 **Eleonor Alfonso (Philippines):** Qualitative Antibacterial Activity and Genotoxicity of Lanzones (*Lansium domesticum)* Seeds Extract Through *Allium cepa* Assay

4 **Ellen Romero (Philippines):** Modified Organic Dapog Method Using Different Organic Inputs for Organic Rice Seedling Production

5 **Geraldine G. Gantioque (Philippines):** Optimization of Coconut Residue as Flour by D-Optimal Mixture Design

6 **Joan Marie Castillo (Philippines):** Development of Mangifera Liqueur towards Commercialization

~~7~~ ~~**Jonalyn Noveno (Philippines):** DNA Barcoding of Pteridophytes of Minalungao National Park, Nueva Ecija, Philippines~~

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10 **Marijane A. Iglesia (Philippines):** Hydrologic Input-Output Model of Mt. Isarog Watershed

~~11~~ ~~**Mark Kevin Lopez (Philippines):** Genotoxic Properties of Water and Sediment from The Aringay and Bued Rivers Using Allium Test~~

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21 **Wanninee Chankaew (Thailand):** Diversity and Evenness of Mangrove trees in Thasala, Sichon and Pakpaneang District, Nakhon Si Thammarat Province, Thailand

22 **Wanninee Chankaew (Thailand):** Toxicological, Phytochemical and Antioxidant Activity Evaluation of *Nemalionopsis shawii* Skuja from Thailand

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ABSTRACT

Plenary Session

The Therapeutic Effects and Uses of Curcumin in Health and Diseases

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Recent Trends on Fisheries Technology for Sustainable Development

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ASEAN Food Security

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Reducing the Energy Bill of Producing Food Crops: Will it Reduce the Carbon Foodprint

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Energy is required to produce, process, distribute, prepare and cook food. About 12-13 cal is spent to produce 1 cal of food. Add logistics and the energy for preparing and cooking , the energy spent more than doubles. This paper explains why we need to reduce and how to reduce the energy bill of our food, hence reduce the carbon food print .

Why do we need to reduce the energy bill? Fossil fuel energy is used in growing ,harvesting , processing, distributing and preparing/cooking our food. Burning fossil fuel liberates carbon at 3.96 kgCO_2eq./li of oil. Due to this, majority (56%) of carbon emission comes from our food called *carbon foodprint*.

The increase in food output was not the result of increased photosynthetic efficiency. The 250% increase in food supply led to a 400% increase in energy use worldwide. Increasing rice yield from 4 t ha^{-1} to 6 tha^{-1} led to a 50% increase in energy. Peak oil (when 50% supply had been reached) had occurred. Supply is declining along with the difficulties (deep sea drilling, fracking technology) in extraction and costs of processing. Energy balance was about 100 before; now, it is only 3-4. As prices of oil increase, prices of food incease. Food becomes unaffordable to many while food supply is abundant.

How to reduce the energy bill of food? Examining the food value chain showed the following:

- ➔ *On Production.* Mechanized land preparation, fertilizers& pesticides and mechanized harvesting are the *energy hotspots*. Fertilizer, particularly Haber-Bosch nitrogen fertilizer, accounts for 30-40% of the production energy bill; tillage and mechanical harvesting, 10-15%. Reducing N-fertilizers, exploiting crop perenniality (practice ratooning rice, corn,sorghum can be ratooned; sugarcane can be ratooned up to 10 times).

- ➔ *On Post-Production.* This includes processing/packaging/storage (warehousing, cold storage), transport(food logistics) and preparing/cooking food. The energy bill of post-production can triple or quadruple the energy bill. The logical options are : minimize food processing (processed food needs packaging, transient cold storage), minimize food long distance transport/imports. Road transport increases the energy bill 2-3 times if transported more than 200 km away (food miles effect); more if airplanes are used . Rail system is 3-4 times more energy-efficient than roads. Shift to rail transport could significantly reduce the fossil fuel energy bill of food.

Technologies are in place using renewable energy (electricity – solar, hydro, wind, geothermal) for the rail transport system.

But the most energy-intensive of the 3 human food groups is the protein which is meat (not only in terms of energy but also land, water and all other resources and production inputs).

7 kg of plant protein is needed to produce 1 kg animal protein. This ramifies into excessive water use.
1 kg of beef consumes 15,000 to 19,000 li of water; 1 kg pork at 8,000 to 12,000 li of water and 1 kg broiler at 6,000 to 8,000 li of water.

Animals utilize 70% of all agricultural lands for grazing, growing forage and feeds; 56% of all grains are fed to livestock. Even cattle (beef and dairy) are grain-fed. Food energy bill and carbon footprint reduction mean reducing the consumption of animal protein-derived food (fish are quite efficient than animals).Meat-based diet requires 1.25 ha while vegetarians (vegan diet) requires only 0.07 ha or 1800% reduction. Reducing meat consumption by 50% and allowing lands to be reverted back to forest at 50%, translates to about 525 Mha additional forests. At 10 t CO_2eq ha^{-1}carbon fixation, the new forest can sequester back 5.25 Gt CO_2eq. (16%) of our yearly global carbon emission of 31 Gt CO_2eq. (or about 32% if we all stopped eating meat. Add the foregone emission of not raising animals, processing, distributing meat products, the emission reduction is enormous (4.65Gt CO_2eq).

Eating less and less meat means a great reduction in the fossil energy bill of our food which is centered on grains. Grain production is fertilized heavily of Haber-Bosch nitrogen fertilizer (that emits 12.18 kg CO_2eq per Kg N) that uses 30-40% of the total energy bill to produce grain. Reducing meat consumption relaxes the pressure to produce feed grains providing ample time to convert farms into organic (no chemical N-fertilizer and pesticides).Organic farming decreases tillage , and increases soil water retention making our crops more drought-tolerant. Organic agriculture requires 40-50% less energy giving us ample time to shift to renewable energy. Organic agriculture and less meat diet is energy efficient, greenhouse gas-sequestering ,hence, climate change-adaptive and mitigating.

Keywords: carbon foodprint, food energy bill, organic agriculture, meat less diet, nitrogen fertilizer, food, logistics, climate change adaptive and mitigating

Development of A New Fungal Bionematicide for the Control Root Knot Nematodes Using *Aspergillus niger* F22

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In order to develop new microbial bionematicides using antagonistic fungi, we examined nematicidal activities more than 1500 fungal culture filtrates against juveniles of *Meloidogyne incognita*, which is a causal agent of root knot disease on various crops. Through the screening, we found that the culture filtrates of two fungal strains such as *Aspergillus niger* F22 and *Xylaria grammica* KCTC 13121BP were active *M. incongnita* with marked mortality of second-stage juveniles and inhibition of egg hatching. The nematicidal component was identified as oxalic acid by organic acid analysis and gas chromatography-mass spectroscopy (GC-MS). Exposure to 2 mmol/L oxalic acid resulted in 100% juvenile mortality at 1 day after treatment and suppressed egg hatching by 95.6% at 7 days after treatment. Oxalic acid showed similar nematicidal activity against *M. hapla*, but was not highly toxic to *Bursaphelenchus xylophilus*. The fungus was incubated on solid medium and dried culture was used for preparation of a wettable powder-type (WP) formulation as an active ingredient. Two WP formulations, F22-WP10 (ai 10%) and oxalic acid-WP8 (ai 8%), were prepared using F22 solid culture and oxalic acid. In a field naturally infested with *M. incognita*, application of a mixture of F22-WP10 + oxalic acid-WP8 at 1,000- and 500-fold dilutions significantly reduced gall formation on the roots of watermelon plants by 58.8 and 70.7%, respectively, compared to the non-treated control. The disease control efficacy of the mixture of F22-WP10 + oxalic acid-WP8 was significantly higher than that of a chemical nematicide, Sunchungtan (ai 30% fosthiazate). Its pilot product could also suppress highly the development of root knot disease on melon and watermelon plants in fields. A new microbial nematicide named "Nemafree" using *A. niger* F22 was commercialized from March 2017.

The Role of Local Government in Upscaling the Adoption of Organic Agriculture: The Zamboanga del Sur Experience

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Created in September 17, 1952 through R.A. No. 711 with a land area of 473, 491 hectares, the province of Zamboanga del Sur is in Region IX. It has 26 municipalities, 1 City, and 681 Barangays. The capital city is Pagadian City, the total population of the province as of 2015 Census was 1,010,674.

The enactment of a Law on Organic Agriculture (RA 10068) provides the legal basis of promoting the adoption of organic farming in the Philippines. But conversion from chemical to organic farming is process – oriented as it requires diagnosing, identifying and providing the needs and support services of farmers across value chain or from production – to-post production. In production, organic production techniques, systems and procedures are not well-established unlike the package of technologies (POT) of chemical/green revolution agriculture. Much remains to be studied, innovated, and demonstrated on-farm to convince the farmers addicted to chemicals. However, the "*To see is to believe"* mentality of farmers is not an in-surmountable bottleneck. Much constraints are due to location, agro-environment and culture. Addressing them are in the purview of the local government units (LGUs) in the Philippine context. Local governance is mandated through the Local Government Code (RA No. 7160 of 1991) but even without this code, the local government should address the needs and provide support services to the farmers as farming is the main livelihood and employment in the rural areas. In turn, addressing them is solving poverty, malnutrition, unemployment, and improving the health and wellness of the people of Zamboanga del Sur province, in particular, and the whole country, in general.

The Zamboanga del Sur provincial government has been into organic agriculture decades ago or even before the passage of organic agriculture act. It is promoting the adoption of organic agriculture across agroecosystems – from upland to lowland agroecosystems. In the uplands, organic crop production technology like the Gahung-gahung organic cassava production had been promoted starting from few farmers and now increasing to more than a thousand farmers as they witness the benefits of increased yields and income. Increasing cassava root yields requires value adding processing technology to address cassava root perishability, increasing the income from fresh cassava, generate additional work, replace up to 40% of high-priced imported wheat flour for bread and other food preparations. Planting other crops like fruit trees, and vegetables is included in the farm plans and designs being relayed to the farmers during farmers' training and farm visit/monitoring.

In lowland rice agroecosystems, on-farm trials on organic rice to increase yields comparable or even higher to chemically grown rice had been done. It increase the farmers income 1.8 to 2.4 times when rice is marketed as organic. The net income increase further if marketed as organic brown rice. A rice-duck integrated farming systems is also being promoted to control golden snails-one of the major pest of lowland rice in the Philippines, raise farmers income, and to generate manure for making bokashi compost fertilizer (BCF) as basal fertilizer for organic rice production.

These are all works-in-progress that require lots of trials and optimization steps to finally establish the protocols for each crops grown the organic way. We are motivated to upscale what we are currently doing (ie. *DRT organic rice and rice-duck integrated farming systems, agroforestry (coconut+cacao multistorey cropping*) to all the 27 towns and 681 villages of Zamboanga del Sur in view of the encouraging positive results: examples- farm household incomes are increasing, nutrition and health improving. Farmers are now sending their children to school not only because tertiary education is now free but because school expenses can already be provided regularly by their parents. Thus, the existence of Zamboanga del Sur Provincial Government College, the first and only provincial local government unit (LGU) run college in the Philippines and will soon be declared as the 1st *Organic Agriculture College* in Mindanao caters the need for tertiary education of these students. At the provincial level, we have witnessed increased tax revenues, improve peace and order, among others. *Out-patient and in-patient in the* Zamboanga del Sur tertiary hospital had also increased which means the people put premium to health care besides they have some money to spare(SDG13) . Over all, Zamboanga del Sur had liberated itself from the 20 poorest provinces of the country. We will strive achieve zero hunger (SDG2) and no poverty (SDG1) BY YEAR 2030. We are about to launch the province as *agrotourist* destination and our organic products shall be one of our come-on for the tourists both local and international. Through organic agriculture as our flatform, our goal is for the province to become the nation's leader in achieving carbon neutral by year 2030 (SDG13) as our commitment for better future to our country's future generation.

Experiential Learning in Climate Change Mitigation and Adaptation Through Organic and Ecological Farming in The Philippines

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In the VOHO Farms, water from the former fish pond, when it becomes murky, was pumped out and used to fertigate the crops and other trees. The recycled water is rich in bio-nutrients for enriching the already fertile volcanic soils. The farm also maintains plant biodiversity. More than 80 species of plants and weeds are found in the farm. The farm boundaries are planted to medicinal and culinary herbal plants. Those with known pesticidal properties: neem tree, jatropha, *makabuhay*, lemon grass, citronella, marigold, *kakawate*, spring onions, lagundi, banaba and oregano as well as hot chillies, garlic and onions – are made into bio-pesticides and used as deterrent or repellents (bio-crop protection) for the control of insect pests and plant diseases. When fermented with molasses or brown sugar, it is also used as bio-fertilizers since the whole concoction is rich in macro and micro nutrients that serve as food for beneficial microbes to fix nitrogen from the air, synthesize and mobilize fixed macro and micro nutrients from the soils and make it available for plant nutrition and growth. In return, the host plant provides glucose or sugar food to the microbes through symbiosis relationship. The use of *rhizobia, azospirillum, mycorrhiza* and *trichoderma* as well as effective and indigenous micro-organisms (E/IMOs) technologies from the University of the Philippines at Los Banos and elsewhere are also being commercially adopted in the nucleus and satellite farm clusters. The benefits of organic farming and its contributions to climate resiliency are undeniable. That is why many people, not only farmers, are getting interested and motivated to support or go into organic food production. Its expected benefits transcend human health and wellness considerations with greater impact on climate resiliency and environmental security (soil, water, air, animals, plants or fauna and flora protection and conservation) as well as in economically assuring food security. The detail information will be discussed.

Keywords: Organic and Ecological Agriculture, Organic Farm Clusters

Use of Ultra-Light UAV Drones in Agriculture: Analys, Monitoring and Control

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Practical use of agro drones and known issues are presented. NDVI method allows to evaluate plant health level. The method is based on study of light absorption and reflection in red and UV specters. The main drawback in using NDVI method is caused by the lack of proper data collection and analysis methods. NDVI is heavily influenced by outside factors, such as humidity, lighting, etc. Ways to resolve the abovementioned issue are currently developed by our company jointly with Russia's leading agrochemical and chemical research institutes. Agricultural drones allow to solve two groups of tasks. The first group of tasks is connected to the methods of control and diagnostics for prompt detection of disease contamination centers and damage from insects on the early stages. Innovative methods allow to identify and facilitate specialized approaches to selecting decryption keys for remote images of fields. This allows to speed up the process of contamination centers detection. The second group of tasks is connected to the emerging possibilities in the field of analytics. First, that is the perennial mapping on the basis of visual and echolocational methods which present the data on the volume and quality of the fertile soil level for the purposes of the differentiated and precise cadastral valuation of agricultural land. Second, that is creating maps of the availability of nitrogen nutrition for plants, creating 3D topographic maps for predicting locations of moisture accumulation. Dosages of mineral fertilizers for the planned crop yields are to be estimated based on these indicators. These developments will be aimed at achieving the planned levels of crop yields and at the decrease in ecological risks associated with intensive agriculture activities, including the precise ones. The UAV complexes help to solve the following problems:- Detection of foci infection, Identification of plant death, Assessment of lesion size and damage assessment, Assessment of the effectiveness of any means of plant protection, Identifying the most effective means of plants protection, Detection of the accumulation of moisture, Increase the usable area by analyzing the 3D elevation model, Verification of the declared area in documents with the actual, Determine the area of land Bank for various purposes, Identification of the land, illegal structures, water reservoirs, landfills, Identification of unused farmlands, Equitable spreading of plant protection products, Detection of violations in the operation of equipment, Identify gaps in the sowing of crops, and Identification of facts of illegal grazing. It is concluded that the systems with UAVs can be very useful in agriculture industry. Although today this

technology has some issues. AgroDroneGroup technology is aimed to reduce the issues and make UAVs more useful for agriculture.

Keywords: AgroDrone, NDVI method

Session 1: ORGANIC AGRICULTURE AND RELATED FIELDS

Secondary Metabolites and their Biological Activities from Soil-derived Fungi

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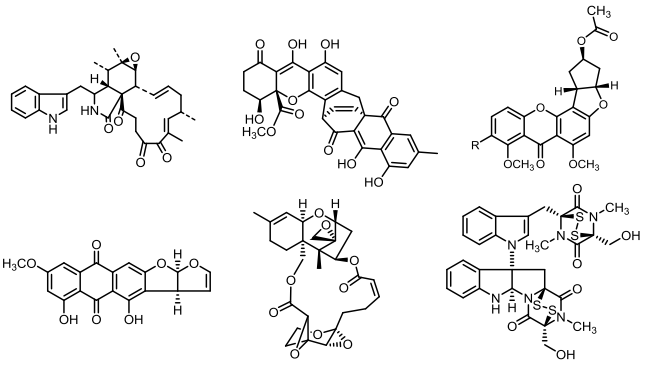
Our recent investigation on secondary metabolites from soil-derived fungi resulted in the isolation of numerous types of compounds for example cytochalasan, sterigmatocystin, polythiodioxopiperazine, xanthoquinodin and depsidone. Their bioactivities such as antimalarial activity against *Plasmodium falciparum*, antimycobacterial activity against *Mycobacterium tuberculosis*, antibacterial activity against Gram positive bacteria and cytotoxicity toward cancer cells (KB, MCF-7, NCI-H187) were evaluated. Some of secondary metabolites from those fungi have been reported as a carcinogenic effects in animals and humans. Contamination of those fungi in food and agricultural product should be aware. In addition, chaetoglobosin C from *Chaetomium globosum* showed a good potential as antibiotic, elicitor and plant growth regulator in tomato and chili. This presentation will highlight our work on chemical and biological aspects of these isolated compounds



Biogas Production from Peels and Seeds of Longan (*Dimocarpus longan* Lour.) in Anaerobic Ferment System

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Large amount of peels and seeds after longan processing are a serious waste problem at Chanthaburi Province in east Thailand. Therefore, the objective of this study was to investigate the potential of longan peels and seeds as resources for biogas production in an anaerobic system. Pig manure was used as the microorganism releaser and longan peels and seeds were provided as digestion substrates. Four treatments were applied; pig manure (T1), longan seeds fermented with pig manure (T2), longan peels fermented with pig manure (T3), peels and seeds fermented with pig manure (T4). The experiment was conducted from April 2016 to August 2016, for a total of 5 months at the Faculty of Agricultural Technology, Rambhai Barni Rajabhat University. The height of the biogas collecting tank, volume of the biogas collecting tank and inflammable time was recorded daily. The pH and temperature of the fermented solution were recorded monthly. At the end of experiment, nitrogen, phosphorus, and potassium concentrations in the fermented solution were analyzed.

Results showed that pH and temperature of the digested solution were not significantly different among treatments. The high amount of biogas production and inflammable time by all treatments was the 1st and 2nd month after starting the experiment and there were no significant difference between treatments. There was significant difference in the results

of biogas production and inflammable time the 3rd, 4th and 5th months after starting the experiment. The biogas production and inflammable time of pig manure treatment (T1) and longan seeds fermented with pig manure treatment (T2) were very low the 3rd, 4th and 5th months after starting the experiment. While, the highest biogas production and inflammable time was produced by longan peels fermented with pig manure treatment (T3) the 3rdand 4th months and peels and seeds fermented with pig manure treatment (T4) showed the highest biogas production and inflammable time the 5th month after starting the experiment. Nitrogen, phosphorus and potassium concentrations of digested solution were not significantly different among treatments. However, the treatments containing longan seeds trended to result in higher concentrations of nitrogen and phosphorus than the remaining treatments. It can be suggested that longan peels and seeds could be a potential resource for producing biogas in an anaerobic fermenting system.

Keywords: Longan, Biogas, Peel, Seed

Fumigation Test of Water Based Essential Oils against House Dust Mite [*Dermatophagoides pteronyssinus* (Trouessart)]

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Acaricidal property of essential oils from clove (*Syzygium aromaticum*), Cinnamon (*Cinnamon bejolghota* Sweet and standard eugenol against the house dust mite, (*Dermatophagoides pteronyssinus* (Trouessart)) was performed by using fumigation method. The essential oils were applied within 25 L knockdown chamber. The essential oils of clove, cinnamon and standard eugenol ditutted in ethanol and water with different ratios as 95:5, 80:20, 70:30, 60:40, 50:50, and 40:60 at various concentrations of 0, (95% ethanol), 0.3, 0.6, 0.9, 1.2 and 1.5 µl/L air against the mite were evaluated within the fumigation period of 1 hr, then the mortality of mite was observed at 24 hr after fumigation. The result showed that clove essential oil with ethanol and water ratio of 95:5 had a high fumigation effect when 100% mortality of mite at 0.6 µl/L air was obtained with the LC_{50} value at 0.36 µl/L air. It showed no significant difference when compared to standard eugenol at 0.6 µl./L air which gave the LC_{50} values at 0.59. Followed by cinnamon essential oil, at 1.2 µl/L air, it showed the LC_{50} value at 0.45 µl/L air. Remarkably result was obtained when clove essential oil with ethanol and water at the ratio 40:60 gave only 17.4% mortality at 0.6 µl/L air. The much more water contained the lower acaricidal activity was appeared.

Keywords: fumigation, houst dust mite, ethanol, water, essential oil

Biomass Accumulation of Sweet Corn Inbred Lines under Organic Systems

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Poor growth and low product quality of vegetable crops grown in organic environment, closely related to the lack of rapid nutrients availability in the root soil system. Beside methods must be continuously developed to improve soil nutrient availability under organic culture, the development of vegetables hybrids that adapted to such organic environment is becoming inevitable. Our research objective was to evaluate the biomass accumulation of sweet corn inbred lines developed under organic environment. The test was conducted on eight (8) potential organically developed inbred lines of sweet corn, namely CAPS2, CAPS3, CAPS5, CAPS15, CAPS17A, CAPS17B, CAPS22, and CAPS23. The inbred lines were grown in the organic environment at medium altitude area (600 m) of Bengkulu province of Indonesia. The type of soil was Inceptisol and has been intensively used for vegetables production under organic system for the last 4 years. The tested inbred lines were arranged in a Completely Randomized Block Design with three replications. The biomass accumulations of each inbred line were measured continuously for the whole sweet corn life cycle using destructive harvest method in 10 days interval. The plant growth analysis was conducted by calculating Specific Leaf Weight (SLW), Net Assimilation Rate (NAR), Plant Relative Growth Rate (RGR), and Crop Growth Rate (CGR) based on leaf area and dry matter accumulation measurements. The results show that the CAPS17A and CAPS17B have higher Specific Leaf Weight, Net Assimilation Rate, Plant Relative Growth Rate, and Crop Growth Rate compared to other inbred lines. The lowest in biomass accumulation was found in CAPS2 and CAPS5. The consequences of these differences between inbred lines for hybrids development program were thoroughly discussed.

Keywords: organic, sweet corn, inbred lines, biomass accumulation

Application of Plant Essential Oil Formulas to Control Rice Insect Pests in Field Condition

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Brown plant hopper (BPH), *Nilaparvata lugens* (Stål) is an economically important insect pest of rice in Thailand and other Asian countries. Definitely, chemical insecticides are mostly applied by farmers and bring to induce insect resistance, harmful to human and environment particularly to the natural enemy insects. The objectives of this study were to evaluate the use of plant essential oil formulas incorporated with petroieum oil to control BPH and other insect pests as well as the effect to natural enemies in field condition. The I2C2 (I, C refered to star anise and lemon grass, respectively) and I1C3 EO formulas at 1.0% were applied in the field experiments. The numbers of BPH, other rice insect pests and natural enemy numbers were observed before and after treatments, then, compared with insecticide and control. The result found that in general, I2C2 and I1C3 EO formulas and insecticide showed high effectiveness against BPH with no significant difference. Numbers of other insect pests as *Nephotettix virescens* and *Recilia dorsalis* also greatly reduced. The natural enemies such as *Micraspis discolor*, *Argyrophylax nigrotibialis*, *Tytthus chinensis*, *Cyrtorhinus lividipennis*, *Paederus fuscipes*, *Ophionea ishii* and spiders (*Lycosa pseudoannulata*, *Oxyopes linestipes* and *Argiope* sp.) were found. The *P. fuscipes*, *O. ishii* and spiders tended to increase after treatment in all experiments with no significant difference when compared to the control. Besides, *A. nigrotibialis*, *T. chinensis* and *C. lividipennis* tended to reduce after treatment in all experiments with no significant difference when compared to the control.

Keywords: insect pests, natural enemies, insecticidal, petroleum oil

Biological Products for Agriculture in Vietnam

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Research on development of bioproducts used for agricultural development in Vietnam has been investigated. It was to reduce the toxic chemicals and help to maintain surrounding environment. There are many bioproducts have released for grower application eg. Chaetomium globosum, Chaetomium cupreum, Trichoderma harzianum as biological fungicides, Metarhizium sp. And Beauviria nsp as the biological insecticide, Verticillium sp, Arthrobotrys sp, Dactyrella sp. As biological nematicide. The other bioproducts have been released as microbial elicitor for plant immunity, microbial for increasing plant growth as well as biodecoposer to promote organic compost production. Moreover, there are some microbial products have also been develop for animal production and for environmental protection as well. The detail iformation will be presented.

Effect of Preharvest Calcium Sprayed on Growth and Fruit Quality of Cherry Tomato cv. Red Lady

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Cherry tomato (*Lycopersicon esculentum* Mill.) are often planted in winter because of their high yield, less susceptible to diseases and insect infestation than summer and rainy seasons. Effect of preharvest calcium solution application on growth and fruit quality of cherry tomato cv. Red Lady were study. Tomato were seeded into the plastic tray then transplant into plastic bag (14″×22″) when the plantlet had 3-4 leaves and irrigated by drip method for 30 minutes twice per day. The experiment were separated for 2 treatment; sprayed with water (control) or sprayed with Magic® calcium-boron solution at the rate of 0.5% every weeks started at 21 days after transplant or when it was showed the second set of flowering for 6 times before harvest. The results showed that plant application with the calcium-boron had the percentage of fruit set, number of fruit per inflorescence, number of fruit per plant and fruit size higher than the control (non-sprayed) by about 12%, 4 and 30 fruits and 3.084 mm, respectively. Non significantly different between sprayed and non-sprayed with calcium-boron solution in number of flower per inflorescence and number of flower per plant. The results for fruit quality after harvest showed that plant sprayed with calcium-boron solution had higher in fruit firmness (10.90 N), vitamin c content (2.763 mg/100g) and titratable acidity (TA) content (1.04%) than the control

treatment by about 2.22 N, 0.131 mg/100g FW and 0.033%, respectively. However, no statistically difference in total soluble solids (TSS) content and lycopene content between sprayed and non-sprayed with calcium-boron solution.

Keywords: lycopene, quality, firmness, inflorescence, vitamin C

Insecticidal Properties of Plant Essential Oils against Common Blossom Thrips [*Frankliniella schultzei* (Trybom)]

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The study aimed to evaluate the efficiency in terms of insecticidal and repellency properties of plant essential oils from clove (*Syzygium aromaticum* (L.) (Merr. & Perry)), lemon grass (*Cymbopogon citratus* (DC. Ex Nees) Stapf.), citronella grass (*Cymbopogon nardus* Rendle.), star anise (*Illicium verum* Hook.f.), pepper (*Piper nigrum* L.), cajuput (*Melaleuca leucadendra* Linn. var. *minor* Duthie) and cinnamon (*Cinnamomum zeylanicum* Blume.) against adult of thrips (*Frankliniella schultzei* (Trybom)) by using leaf dipping method. The insecticidal property was investigated by applying all plant essential oils at concentrations of 0.0 (1% tween 20 in water), 0.2, 0.4, 0.6, 0.8 and 1.0%. The mortalities of insects were observed at 24 h after treatment. The results showed that the essential oils of clove, lemon grass and cinnamon were extremely toxic against the thrips with LC_{50} value at 0.25, 0.28 and 0.32%, respectively. As for the repellent property test, those plant essential oils at various concentrations of 0.2, 0.6 and 1.0% were applied for the bioassay as choice test, then percentage of repellent index (%RI) was observed at 24 h after treatment. The result revealed that the essential oil of star anise at 1.0% concentration showed the most effective when more than 90% RI was obtained.

Keywords: Thrips, *Frankliniella schultzei*, essential oils, leaf dipping method

Application of Bio-products for Organic Coffee Production in Lao PDR

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It is clearly demonstrated that cultivation of coffee var Arabica aged 2 year trees in Paksong, Chumpasak Province, Laos where seriously natural infested with anthracnose showed that organic method gave significantly better in cherry, wet parchment and dried beans than in chemical method as compared to the non-treated control in the field. Yield was gradually harvested foe 6 times which resulted organic method was highest cherry and followed by chemical method when compared to the non-treated control. Organic method gave the highest in wet parchment and followed by chemical method when compared to the non-treated control. The dried coffee beans resulted significantly higher than chemical method and non-treated control. Moreover, organic method resulted a good disease control which reduced leave anthracnose in organic method. Coffee bean anthracnose was reduced in organic method which better than chemical method.

Keywords: coffee anthracnose, Arabica variety

Efficacy of Nano Elicitor from *Chaetomium cupreum* to Control *Phytophthora* spp Causing Root Rot of Durian

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Durian is a tropical fruit crop which is highly prized culturally and economically in South-East Asia. Previous study showed that *Phytophthora* spp. was the pathogen causing root rot disease to durian. This study was confirmed pathogenicity test of the virulent pathogen on detached leaves. The nano particles; nano-CCH, nano-CCE and nano-CCM from *Chaetomium cupreum* to inhibit mycelial growth and spore production of *Phytophthora* spp. resulted ED_{50} values of 3.49, 3.47 and 3.80 µg/ml, respectively. This research finding is the first report using nano particle from *Chaetomium cupreum* to inhibit *Phytophthora* spp. causing root rot disease to durian.

Keywords: Nano Elicitor, *Chaetomium cupreum*, *Phytophthora* spp.

The Effect of Pre-sowing Treatments on Germination and Vigor of Upland Rice (*Oryza sativa* L.)

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High quality-seeds are required for successful germination, and seedling establishment however, deterioration decreases quality of all crop species seed. This experiment was conducted to determine the effectiveness of seed priming on germination, vigor and stand establishment of an upland rice (*Oryza sativa* L.). The deteriorated seeds were subjected to different priming as follow; traditional soaking for 24 h, hardening for 24 and 48 h, hydropriming for 24 and 48 h, osmohardening for 24 and 48 h, and a non-primed was control treatment. The seed qualities were assessed in both laboratory and field conditions. All 7 primed treatments markedly increased germination, emergence, and all the tested vigors. Germination and emergence of all primed were ranked from 90.50 to 97.00% and 90.00 to 95.75%, while the non-primed were 78.00 and 80.00%, respectively. In addition, those primed treatments showed significantly higher seedling performance comparing with the control. The seedling establishment of all primed were ranked from 84.50 to 94.25% while the non-primed was 78.25%. However, among those primed treatments, hardening for 48 h and hydropriming for 24 and 48 h had a greater tendency to enhance seed quality as well as seedling performance.

Keywords: pre-sowing treatment, seed quality, seedling establishment, upland rice.

Organic Farm's Model

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Organic farm model is demonstrated in all aspects of plant and animal organic production as well as reservation of agroecosystem foe environmental friendly. Organic crop cultivation are needed the certified agricultural inputs for production as well as the conventional methods used by the growers. Research findlings are needed to search for biological products eg specific biofertilizer, biofungicide, bioinsecticide and bioherbicide as well as organic seeds etc. Organic animal production are required the inputs as animal feeds and medicinal plants to protect diseases etc. Organic farm model would consist of organic production, processing after harvest and marketing. It is important to request some agency for organic certify eg. Bio-agriCert IFOAM etc. The environmental protection and reservation of surrounding environment are concerned for bio-gas production, solar energy etc.

Keywords: organic, agriculture, bio production

Controlling *Phytophthora* Causing Root and Stem Rot of Durian by Using Crude Extracts of *Chaetomium brasiliense*

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The sensitivity to the systemic fungicide Metalaxyl of three isolates of *Phytophthora* species, DJ001, DJ002 and DJ003, which cause root and stem rot of durian was tested by using the poison food technique, at a concentration of 1,000 ppm. All of the tested fungal isolates exhibited resistance to Metalaxyl. The ED_{50}s for colony growth of the three isolates, DJ001, DJ002 and DJ003, were 802.47, 672.10 and 937.23 ppm of the fungicide, respectively. In addition, the ED_{50}s for inhibition of spore production of these three isolates were 176.69, 204.98 and 131.00 ppm, respectively, indicating that these fungi are highly resistant to the fungicide. The bioactivity of hexane, ethyl acetate and methanol crude extracts of *Chaetomium brasiliense* were tested against the three *Phytophthora* isolates. We found that the crude methanol extract effectively inhibited the growth of the three fungal isolates, DJ001, DJ002 and DJ003 with ED_{50}s of 58.48, 122.22 and 66.79 ppm, respectively. Moreover, the ED_{50}s for spore production inhibition were 67.11, 78.66 and 77.47 ppm, respectively. It was also found that a nano-particle preparation of the MeOH crude extract from *Ch. brasiliense* at 5 ppm can inhibit the growth of colony and spore reproduction of all the tested isolates. The ED_{50}s of the MeOH nano-paticles to inhibit the colony growth of the three isolates, DJ001, DJ002 and DJ003, were 0.49, 0.07 and 0.39 ppm., respectively; and the ED_{50}s for inhibition of spore production were 1.21, 2.06 and 0.31 ppm, respectively.

Keywords: *Chaetomium brasiliense*, *Phytophthora* species, Metalaxyl, Crude Extracts, Durian

Validation and Documentation of Organic Production Systems for Lettuce *(Lactuca sativa*) Camarines Sur, Philippines

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The study documented and validated the agronomic and economic performance of various production systems for lettuce in Camarines Sur, Philippines. Specifically, it aims to a) document local farmers' current organic and conventional practices; and b) compare the agronomic, economic performance and soil changes of recommended organic production practices with local farmers' current organic and conventional practices.

Practices for lettuce organic production were documented through field surveys, observations and focus group discussions (FGD). The performance of production systems was determined through on-station trial which was conducted for 2 wet cropping and 2 dry cropping seasons. It was set-up in randomized complete block design (RCBD) consisting of three production systems as treatments and replicated four times. The treatments were: T1 - Recommended organic production practices from University of the Philippines (UPLB), T2- Farmer's organic production system (based from the survey and (FGD); and T3 - Conventional production system recommended by DA. The treatments were laid out in randomized complete block design with four replications

Plants in T1 performed better in terms of plant height and yield than T2 and T3. Lettuce farming in all production systems in any season had high economic returns. Highest rates of investment (ROI) were obtained when the vegetable was produced in T1 and T2 at prevailing market price and at premium price for organically grown lettuce These observations were true in all cropping seasons. Soils from organic systems was improved in terms of pH, K (me/100g soil) , and soil texture, but not the organic matter (%OM) and Nitrogen (N) contents. Hence, when production inputs are available locally, growing lettuce using the organic production practices both from UPLB and local organic farmers is economically better than conventional growing.

Keywords: Organic and conventional lettuce, production systems, validation and documentation

Effects of Sulfometuron-methyl as the Ripener on Growth and Yield of Sweet Sorghum

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The objective of this study was to determine the effects of sulfometuron-methyl concentration application on growth, stem yield and juice extract yield of sweet sorghum. The field experiment was conducted during August to December 2015 at the research field of Faculty Agricultural Technology, King Mongkut's Institute of Technology Ladkabang, Ladkrabang district, Bangkok, Thailand. The experiment was arranged in a split plot design with four replications. Sweet sorghum cultivars such as Ethanol 2, KKU 40 and Cowley were assigned to main plots and six sulfometuron-methyl concentration application treatments, 0 (control), 500, 1,000, 1,500, 2,000 and 2,500 ppm were allocated to the subplot. The results revealed that the interactions of sweet sorghum cultivars and sulfometuron-methyl concentration application on stalk yield and juice extract yield were not significantly different. Ethanol 2 cultivar produced higher stem growth, yield and juice extract than KKU 40 and Cowley cultivars, respectively. Sulfometuron-methyl concentrations affected on stem fresh weight and juice extract yields. Sulfometuron-methyl concentration at 1,000 ppm was found the best among different sulfometuron-methyl concentrations. The highest concentration of sulfometuron-methyl application (2,500 ppm) decreased not only brix value and stem fresh weight yield but also juice extract yield. However, optimum rate of sulfometuron-methyl concentration application (1,000 ppm) gave the highest brix degree of sweet sorghum. Based on these results, to have the highest brix value it may be suggested to apply sulfometuron-methyl concentration at 1,000 ppm in cultivar Ethanol 2.

Keywords: Sulfometuron-methyl, Sweet sorghum, Ripener, Yield

(DRT) Double Row Transplanting: An Innovation in Organic Rice Production

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In search for ways to increase rice yield in an environment friendly, energy efficient and economical ways, high yielding rice genotypes (3 hybrids -Mestizo 19, Bigante & SL-12H, and 3 inbreds -NSIC Rc 358, 222, 352) bred and varieties under high chemical inputs were grown under organic and double row planting method spaced 20 x 10 cm (the double rows) and 40 cm interval between the double rows. The other features included use of bokashi and liquid manure as fertilizer, use of rotary weeder in controlling the weeds and planting one seedling per hill at 20 kg seeds per ha. Hybrid seeds are expensive. The results showed that under Bokong, Labangan , Zamboanga del Sur rice growing conditions, NSIC Rc222 (an inbred) had the highest yield at 6.07 t ha followed by Mestizo 19 (a hybrid) at 5.37 t ha^{-1} (a 0.7 t ha^{-1} difference in yield, rice agronomists consider 0.5 t ha^{-1}as financially significant though not statistically significant).

This innovation in organic rice culture (double row transplanting, applying organic fertilizer and the use of rotary weeder) and using the most adapted inbred variety, rice yield had surpass the yield of conventionally grown rice in the area .The yield of 3 neighboring rice farmers whose rice were grown the conventional way (applied with chemical fertilizer and sprayed with herbicides) was only 3.93 t ha^{-1}. Compared with Rc222 the yield difference was 2.14 t ha^{-1} or 0.77 t ha^{-1} for Rc358, the next highest yielding inbred. Sold at P19/kg, the added income compared with the farmer's yield was P38,122.86 (US$749.64/ha). But organically grown rice are usually bought at 20% higher price from the conventional growing. An added income of PSB Rc 222 compared to farmers growing was P61,188.86 (USS 1203.20, 1US$=50.85PhP).

There was an added labor in transplanting one seedling per hill in the double rows since trans planters are still adjusting to the innovated transplanting technique and in manual rotary weeding (hence, the need to have motorized rotary weeder) and in preparing/applying liquid manure fertilizer (but 110 watt, 1/6 Hp submersible pump is available now in the market). Deducting all the incremental labor, the net income was still higher since no chemical fertilizer and pesticides were applied.

Organic rice is cash- and energy-cost saving, financially rewarding, environment- and health-friendly way of rice farming. It should be adapted by rice farmers in the Philippines and ASEAN countries.

Keywords: double row, transplanting, innovation, organic rice production

Effect of preharvest calcium chloride sprayed on growth and development and quality of mulberry fruit

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Effect of preharvest calcium chloride ($CaCl_2$) application on growth and quality of mulberry fruit were studied. The thirty two of mulberry trees were hard pruned then divided into 2 groups of 16 each non-sprayed and sprayed with 2% $CaCl_2$. After mulberry tree developed new branches for about 50 cm length, new flower started blossom. After fruits developed to about 0.5-1 cm fruits diameter, fruits were spray with 2% $CaCl_2$ every week for 4 week (set A), while another set B were non-sprayed. Fruit were harvested at ripe stage (purple red color), selected with uniform shape and size. All samples were packed in PE bag, then stored at 5℃ for 24 days. The experimental design was Completely Randomized Design (CRD), fruit growth, development and fruits quality included weight loss, firmness, total soluble solids (TSS), titratable acidity (TA), color change and anthocyanin content were recorded every 6 days. The results showed that, mulberry fruit sprayed with 2% $CaCl_2$ resulted in significantly different in number of fruit and number of branch, non-significantly different in number of leaf, branch length and fruit size. Fruit sprayed with 2% $CaCl_2$ had lower in percentage of weight loss (0.28%) when compared to non-sprayed fruit (1.61%). Significantly differences between non-sprayed and sprayed with 2% $CaCl_2$ were found in fruit firmness and TSS/TA ratio, sprayed fruits had higher in fruit firmness and lower in TSS/TA ratio than non-sprayed fruits. L* and a* values decreased throughout the shelf life, rapidly decreased in non-sprayed fruits. Development of anthocyanin content in fruit was reduced by $CaCl_2$, 2 time lower content than non-sprayed at the accumulation peak (days 12 in storage). Thus, $CaCl_2$ could enhanced number of fruits and delayed the ripening of mulberry fruits during storage.

Keywords: anthocyanin, firmness, total soluble solids, quality, ripening

Total Polyphenol Content and Antioxidant Activity of the Extracts from *Thunbergia laurifolia* Lindl. Leaves

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Thunbergia laurifolia Lindl. is commonly used as a medicinal herb and a tea in Thailand. In this study, water and various ratios (25, 50, 75 and 100%) of ethanol in water were used as a solvent in extraction of *T. laurifolia*. The total phenolic, flavonoid, tannin contents and antioxidant activity of the *T. laurifolia* leaves extracts were investigated. The extract obtained by 75% ethanol showed the highest total phenolic content (97.80 mg gallic acid equivalent/g crude extract) and the highest total tannin content (11.81 mg tannic acid equivalent/g crude extract). The same extract also exhibited the highest DPPH radical scavenging activity. The 100% ethanol extract showed the highest total flavonoid content (4.20 mg quercetin equivalent/g crude extract). These results indicate that *T. laurifolia* leaves may be considered a source of phytochemicals with important antioxidant properties.

Keywords: *Thubergia laurifolia*, Antioxidant activity, Solvent, Extraction.

Isolation and Selection of *Chaetomium* spp for Controlling Citrus Root-Rot Disease

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Twenty-five isolates identified morphologically as *Phytophthora* spp. were collected from the soil of citrus orchards in Northern Thailand. The pathogenicity of the isolates was confirmed by inoculating wounds in leaves with agar discs containing mycelia of the isolates. It was found that threeisolates, *Phytophthora* spp. YY002, WF185 and PS85, were the most virulent isolates and gave the highest disease severity. The antagonistic mechanisms of *Chaetomium* spp. to control root-rot disease of citruswere studied. A total of 29*Chaetomium* spp. isolates were isolated from 20 soil and plant debris samples from agricultural areas. All isolates were screened for their ability to control the three

Phytophtrora spp. isolatesusing the dual culture assays on potato dextrose agar (PDA). The results showed that inhibition percentages of *Chaetomium* spp. to *Phytophthora* spp. growth were significantly different. *Chaetomium* spp. CP2, CP3, HT1 and HT2 gave the highest percentages of mycelial growth inhibition of the three *Phytophthora* spp. up to 74% and parasitized the hyphae, resulting in degradation of *Phytohpthora* spp. mycelia after 25 days in vitro. Under greenhouse conditions, application of spores these Chaetomium species to tangerine citrus seedlings inoculated with *Phytohpthora* spp. reduced root rot by 35~50% compared to that in the control.

Keywords: *Chaetomium*, *Phytophthora*, Citrus Root rot, Antagonistic, Biological control

The Energy Bill of Inbred and Hybrid Genotypes Grown under Organic Rice Production System in Three Different Planting Patterns

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Organic production system is a less fossil fuel-dependent and agrochemical-free agriculture. It reduces burning of fossil fuel that reduces the energy bill and energy footprint (CO2 emission) in agriculture. But organic rice production gives low yields and getting higher crop yield is important to convince farmers to adopt organic rice farming. This study was conducted to determine the energy use and the energy footprint of rice of grown under organic methods. The total energy bill per ha delineated into direct and indirect energy, energy return to energy input (EROI) and energy use per ton and per kilogram of un-milled rice were calculated. Grown under organic method of rice farming, the field experiment was conducted at Barangay PuyPuy, Bay, Laguna, Philippines using three inbreds (Pbinhi-1, GSR-8, NSIC Rc222) and two hybrids (Bigante, M-20) and transplanted in three (3) planting patterns (20cm×20cm, (20cm×10cm)×40cm, also called double row and 30cm×30cm). The 15 treatments were laid out in Strip-Plot Design with three replications. For comparison, yield data from conventional production system beside the field experiment were gathered (the farmer planted NSIC Rc216 at 20cm×20cm).

The results showed that the total energy (direct and indirect) inputs and energy footprint were highest in Bigante grown in 20×20cm (5666 MJ/ha and 398 CO2eq) followed by M-20 in 20×20cm (5632 MJ/ha and 396 CO2eq). This was due to the added energy bill in producing hybrid seeds. The highest amount of energy (diesel fuel) used was in land preparation and threshing (45%) followed the energy used in compost (25%) and labor (20%). In the conventional, the total energy bill was 10875 MJ/ha which was 52% higher than organic. The main contributor were the agrochemical inputs (fertilizer 4804 MJ/ha (60%) and pesticides 849 MJ/ha (8%)) which were not used in organic.

Total energy output was highest in Bigante in 30×30cm (95737 MJ/ha) followed by NSIC Rc222 in 30×30cm (89517 MJ/ha). Grain yield is the determinant of energy output. High yield in Bigante and NSIC Rc222 led them to give higher energy productivity, net energy and energy return to energy input (EROI) at 1.05 kg/MJ, 90291 MJ/ha and 17, respectively, and 0.95 kg/MJ, 84122 MJ/ha and 16 , respectively. In the conventional, energy productivity, net energy and energy return to energy input (EROI) was at 0.484 kg/MJ, 77839 MJ/ha and 8, respectively. The least energy use per kg and per ton of un-milled rice was Pbinhi-1 in 30×30cm (0.97 MJ/kg, 967 MJ/ton) followed by Bigante in 30×30cm (0.98 MJ/kg, 977 MJ/kg). The energy use was 2.06 MJ/kg (2063 MJ/ton) in conventional production which was about two times higher than organic.

Agrochemical free organic production led to an overall 49% decrease in total energy use; hence, energy footprint.

Keywords: Organic rice, conventional rice, inbred rice, hybrid rice, energy bill

Production of Bacterial Cellulose from *Acetobacter xylinum* by using Rambutan Juice as a Carbon Source

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Rambutan juice was used as alternative carbon source in this research to produce bacterial cellulose (BC) by *Acetobacter xylinum* TISTR 107 and TISTR 975. The characteristics of BC such as concentration, yield and surface

morphology were observed in this research. The experiment was started to select the bacterial type by cultivating *A. xylinum* TISTR 107 and *A. xylinum* TISTR 975 in the rambutan juice at concentration of 4 °Brix. *A. xylinum* TISTR 107 was able to produce higher BC concentration as approximately 2.66 g/l compared to other inoculum. *A. xylinum* TISTR 107 was then inoculated under different rambutan juice concentration of 4, 8 and 12 °Brix to observe optimum concentration to produce BC. The rambutan juice concentration of 8 °Brix was found as optimum concentration for *A. xylinum* TISTR 107 to produce BC base on BC concentration and production yield, as approximately 5.89 g/l and 44.45%, respectively. The surface morphology of BC at each rambutan juice concentration was observed by field emission scanning electron microscopy (FE-SEM). The results showed that pure and contaminant-free BC was produce in all conditions. The micrographs of BC provided the dispersion and the strong interfacial adhesion between the BC fibers. More interfacial adhesion was detected when the concentration of juice increased.

Keywords: bacterial cellulose, *Acetobacter xylinum*, rambutan juice

Molecular Identification of *Chaetomium* spp From Soil in Vietnam

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Chaetomium spp is a saprophytic fungus and belongs to *Ascomycetes.* It has been reported antagonistic to various plant pathogens, especially soil-borne and seed borne pathogens. Many species of *Chaetomium have* suppressed the growth of bacteria and fungi through competition for nutrients, mycoparasitism, antibiosis, or various combinations. The research findings were conducted to isolate and identify the local strains of *Chaetomium* spp from cultivated soil in Vietnam. *Chaetomium* spp were isolated by baiting technique. All isolated were morphological and molecular analysis. At least four isolates of *Chaetomium* were found and identified. These strains were strongly antagonistic activity against *Neoscytalidium dimidiatum* causing brown spot disease of *Hylocereus undatus* (white-fleshed pitahaya) in Vietnam. Further research would be done the control mechanism and acute and dermal toxicology test for environmental safety. Finally it may be formulate as biological fungicide to control this serious disease on in the fields.

Keywords: Baiting technique, dragon fruit, soil samples.

Controlling *Phytophthora* Causing Root Rot of Citrus by Using Crude Extracts of *Chaetomium cupreum*

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The sensitivity to the systemic fungicide metalaxyl of three isolates of *Phytophthora* species, Ph71, Ph84 and Ph85, which cause citrus root rot, was tested. The results showed that at 1,000 ppm, metalaxyl could not inhibit the colony growth or spore production of the tested isolates. The ED_{50}s for colony growth of this fungicide of the three isolates, Ph71, Ph84 and Ph85, were 294.20, 385.94 and 25.45 ppm, respectively; and the ED_{50}s for inhibition of spore production were 176.69 , 204.98 and 131.00 ppm respectively, which indicated that these isolates are highly resistant to the fungicide. The bioactivity of hexane, ethyl acetate and methanol crude extracts of *Chaetomium cupreum* was tested against *Phytophthora* sp. isolates Ph71, Ph84 and Ph85. The results showed that the MeOH crude extract at 1,000 ppm could inhibit the growth and spore production of the tested *Phytophthora* isolates. The ED_{50}s of the MeOH crude extract from *Ch. cupreum* for colony growth of isolates Ph71, Ph84 and Ph85 were 588.99, 1614.21 and 167.15 ppm, respectively; and the ED_{50}s for spore production inhibition were 110.06, 425.24 and 79.57 ppm, respectively. A 5 ppm nano-particle preparation of the MeOH crude extract from *Ch. cupreum* inhibited the colony growth and spore production of all the tested isolates. The ED_{50}s of MeOH nano-particles to inhibit the colony growth of the three isolates, Ph71, Ph84 and Ph85, were 0.002, 0.02 and 0.24 ppm, respectively; and the ED_{50}s for inhibition of spore production were 0.05, 0.08 and 0.09 ppm, respectively.

Keywords: Root Rot, Citrus Disease, Fungal Extracts, Metalaxyl, *Chaetomium*

Effect of Biogas Effluent from Pig Manure and Durian Residues on Soil Chemical Property and Growth of Marigold

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The efficiency of biogas effluent fermented with pig manure and durian residues on soil chemical property and growth of marigold was investigated. The experimental design was carried out in Completely Randomized Design (CRD) with 4 replications. Six treatments were control (no fertilizer), four concentrations (10, 12.5%, 16.67% and 24%) of biogas effluent and chemical fertilizer. 10 days after planting, marigolds were transplanted to pots and the experiment was started. Each biogas effluent concentration was watered 400 ml per pot every 5 days. 15-15-15 and 12-24-12 formulas were used in chemical fertilizer treatment. The experiment was conducted for 90 days at Agricultural Technology Faculty in Rambhai Barni Rajabhat University. pH and electrical conductivity (EC) of soil were checked at the starting and end of experiment. The data of plant height, stem diameter, bush diameter, length around bush and SPAD value were collected every week. After flowering, number, diameter, fresh weight and dry weight of blooming flower were measured every day. The chlorophyll content of leaves, leaf water potential, fresh weight and dry weight of roots, branches and leaves were measured at the end of experiment.

The results showed that there was no significant difference in leaf water potential among treatments. The growth of marigold in the control was lowest as compared to that in biogas effluent and chemical fertilizer treatments. At the end of experiment, the highest of height, stem diameter, bush diameter, length around bush, SPAD value, chlorophyll content, blooming flower number, fresh and dry weights of branches and fresh and dry weights of leaves expressed in marigolds treated by chemical fertilizer and all results were significantly different. On the other hand, the length, fresh weight and dry weight of roots in chemical fertilizer treatment were lower those results in biogas effluent treatment. Moreover, pH and EC of chemical fertilizer treated soil was most severe than the control and biogas effluent treatment. These may be the cause of the similar size, fresh weight and dry weight of blooming flower between biogas effluent and chemical fertilizer treatments.

Keywords: Marigold, Biogas effluent, Durian, Soil Chemical property, Growth

Session 2: PLANT AND FOOD TECHNOLOGY

Wine from Wild: Production, Characterization and Utilization of Wine from Wild Edible Fruits

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Commercially, wine is produced from grapes through fermentation. However, there are ample opportunities for wine production from unutilized minor fruits, as most of minor fruits pose a severe post harvest loss during their glut season. The wine prepared from fruits other then grapes is generally referred to as 'fruit wines' and these minor fruits are basically tropical and sub-tropical and many of them are often neglected because of some unfavorable traits such as bitterness, astringency and often less juicy on comparable with common fruits available in market. These fruits are found mainly across rural areas where forest cover is more. Furthermore, many of these minor fruits are unfamiliar to major urban population. Hence in this context several minor fruits including wild, unutilized and underutilized fruits could act as potential substrate for the production of wine. Western Ghats of India offer a great habitat for many of the plant species. It has been recognized as biological hotspot as many of the plants are endemic to this area. Further, several wild fruits are found across this region. Nevertheless the availability of information of wild fruits is meager. There are several underutilized fruits which need to be explored and promoted for the larger cultivation and utilization. These fruits are consumed by the local people and are not commercially available. Hence, an attempt was made to utilize these minor fruits for the production of quality wine.

Initially, fifty fruits were documented and based on the literature survey twenty minor fruits were subjected for physicochemical characterization. Fruits were evaluated for proximate and mineral composition. Then three fruits were

chosen based on the results and suitability for wine production viz., *Carissa spinarum* L, (Apocynaceae), *Flacourtia montana* J. Graham. (Salicaceae), *Opuntia dillenii* (Ker Gawl.) Haw. (Cactaceae). Wine yeast *Saccharomyces cerevisiae* var. *ellipsoideus* (NCIM 3215) was used for winemaking. Optimization of process parameters was undertaken such as temperature, pH and inoculum size. Further the fermentation was carried for 21 days at optimized conditions temperature of 25℃, pH of 3.5 and inoculum size of 10% v/v. Upon fermentation with the optimal conditions the ethanol content was found to be maximum in all the three wines, viz., *C. spinarum* (8.30 % v/v), *F. montana* (7.20 % v/v) and *O. dillenii* (8.90 % v/v).

Three wines were chemically characterized using multiple analytical techniques such as Gas chromatography (ethanol and volatile constituents), High performance liquid chromatography (Sugars, organic acids and polyphenols) and spectrometry such as ultraviolet absorbance and attenuated total reflectance-flourier transform infrared spectroscopy. The results highlighted that all the three wines constituted essential nutrients and bioactive compounds. The therapeutic nature of wine was confirmed using four *in vitro* antioxidant assays viz. total antioxidant capacity, reducing power assay, and 2,2-diphenyl-1-picrylhydrazyl free radical scavenging assay and 2,2'-azino-bis(3-ethylbenzothiazoline-6-sulphonic acid) free radical scavenging assay. Results revealed that all the three fruit juices and wines were able to scavenge the free radicals in a dose dependent manner. Suitable statistical techniques such as response surface methodology, principal component analysis and Agglomerative hierarchy clustering were employed for the study.

Millets – The Miracle Grains the Future Food Crops

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Yield, Fruit Quality, and Growth of 4 Cantaloupe Varieties Grown in Hydroponic System and Drip Irrigation Systems of Substrate and Soil Culture

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At present, the cantaloupe plants are mostly grown under the open soil field condition during weather with frequent heavy rain that caused the loss of nutrients from the soil resulting in low yield and bad fruit quality. The study aimed to assess yield, fruit quality, and growth of four cantaloupe varieties grown in NFT hydroponic system and drip irrigation substrate culture system and drip irrigation soil culture system. The experiment was laid out in a randomized complete block design (RCBD), replicated four times (30 plants/time). The assigned treatments were cantaloupe variety and the planting system. The ten treaments were: Alpha TA209, Emerald Sweet 1225, and Sin Jiang TA212 grown in hydroponic system; Alpha TA209, Emerald Sweet 1225, Sin Jiang TA212, and Golden Lady 1382 grown in drip irrigation substrate culture system; and Alpha TA209, Emerald Sweet 1225, and Sin Jiang TA212 grown in drip irrigation soil culture system. The results showed that the yields of Alpha TA209, Emerald Sweet 1225, Sin Jiang TA212, and Golden Lady 1382 grown in drip irrigation substrate culture system were higher than in NFT hydroponic system and drip irrigation soil culture system, attributable to better fruit weight, flesh thickness, fruit height, and fruit diameter. These fruit qualities were positively associated with yield. Golden Lady 1382 grown in drip irrigation substrate culture system gave the highest yield at 24.14 t ha^{-1} and the heaviest fruit weight at 1.25 kg $fruit^{-1}$ compared with the rest, while Sin Jiang TA212 grown in drip irrigation soil culture system obtained the lowest yield and fruit weight. Most of the cantaloupe varieties had high total soluble solids content (TSSC) observed in the three planting systems, except Emerald Sweet 1225 and Sin Jiang TA212 grown in drip irrigation soil culture system. Based on correlation analysis, plant height was positively associated with fruit diameter, fruit height, flesh thickness, TSSC, fruit weight, and yield. Plant height was the tallest in drip irrigation substrate culture system than in drip irrigation soil culture system and NFT hydroponic system. Therefore, drip irrigation substrate culture system is the best cantaloupe planting system.

Keywords: Cantaloupe, yield, fruit quality, NFT hydroponic system, drip irrigation substrate culture system

Hybrid Performance and Heterosis in Sweet Corn as Grown Under Organic Cropping System at Tropical Highland Climate

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Growth and yield of sweet corn to large extent is dependent upon the climatic and edaphic conditions of the growing area. This study was undertaken to evaluate the agronomic performances and to estimate the heterosis of sweet corn hybrids as grown under organic cropping system at the tropical highland area. Thirty-six genotypes consisted of twenty-eight hybrids generated from a half diallel crossing scheme along with eight their eight parental inbreds and a check variety were row-planted and maintained under organic cropping system. Data were collected for the traits related to the plant growth, plant development, and plant yield. Analysis of variance accompanied with mean separation was employed for variability evaluation. The heterosis was estimated as mid-parent heterosis (MPH), best parent heterosis (BPH), and economic heterosis (EH). Significant variations among the genotypes were found for most of the observed traits, except row number ear^{-1} and Brix measurement. The hybrids resulted from crosses of Caps 5 x Caps 17A, Caps 15 x Caps 17A, Caps 15 x Caps 22, Caps 15 x Caps 23, Caps 17A x Caps 22, and Caps 22 x Caps 23 exhibited better general performances over the better parent and check variety. Both MPHs and BPHs for the plant growth traits were estimated in undesirable direction on all hybrids, vis. positive for plant height, negative for stem diameter, and positive for taller ear height. The desired significant negative directions in MPH and BPH were recorded on most of the hybrids for tasseling date and silking date. The maximum extent of significant positive MPH and BPH were found on Caps 22 x Caps 23 (MPH = 18.9 % and BPH = 14.9 %) for unhusked ear length, Caps 3 x Caps 22 (MPH= 22.3 %) and Caps 3 x Caps 23 (BPH= 17.9 %) for unhusked ear diameter, Caps 3 x Caps 23 (MPH = 85.1 % and BPH = 71.4 %) for unhusked ear weight, Caps 15 x Caps 23 (MPH = 35.7 % and BPH = 26.5 %) for husked ear length, Caps 3 x Caps 17A (MPH = 24.2 % and BPH = 19.9 %) for husked ear diameter, Caps 3 x Caps 17A (MPH = 99.7 %) and Caps 3 x Caps 23 (BPH = 70.2 %) for husked ear weight, and Caps 15 x Caps 23 (MPH = 37.8 %) and Caps 3 x Caps 23 (BPH = 31.5 %) for kernel number row^{-1}. Therefore, these promising hybrids are suggested for further evaluation in preliminary and advanced yield trials.

Keywords: organic sweet corn, F_1 hybrids, heterosis, heterobeltiosis, economic heterosis

Formulation, Sensory and Pulp Stability of Durian (*Durio zibethinus* Murr) Juice

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Durian (*Durio zibethinus Murr*) is a popular tropical fruit widely grown in South-East Asia. Due to it is highly nutritious. Thus, durian juice was formulated with different concentrations of 25, 30 and 35 % w/w of durain pulp, and, with or without the coconut milk. The effects of different concentrations of pulp and coconut milk on various parameters (e.g., color, pH, total soluble solids (TSS), viscosity and sensory evaluation) were investigated. The juice was fourel to be light yellow in color similarly to soy bean milk or to light brown color with depended upon time (min) and temperature (°C) of sterilization. The results indicated that pH, TSS, viscosity of the juice increase varied by the pulp concentration. Consumer rated this product at 30% of the pulp without coconut milk added to very much like of 7.56 from 9- point Hedonic scale while 25% and 35% got lower. Like many commercially available beverages, durian juice has unstable over a period of time. Therefore, the addition of stabilizing additive; gellan gum in various concentrations of 0, 0.01, 0.015, 0.02 and 0.025 %w/v to maintain the juice homogeneity at room temperature 27-34 °C was studied. As the result, there was significant increased in viscosity of the juice varied by the gellan gum

concentration which was found that the minimum concentration of 0.015 %w/v could be used to maintain the juice stability.

Keywords: Durian, pulp, gellan gum

Effect of Process Conditions and Shelf life on ORAC (Oxygen Radical Absorbance Capacity) Value of Supplement Mangosteen Juice

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The fruit of *Garcinia mangostana* Linn. (mangosteen) is a popular fruit in Thailand. The fruit rind contains antioxidants of which a major constituent are anthocyanin, polyphenol and xanthones. These are influent to ORAC (oxygen radical absorbance capacity) value content. The ORAC value has recently been proposed as a quality index of total antioxidant in supplement juice. This study was undertaken to evaluate the content of total anthocyanin (mg/100g), total polyphenol (mg eq GA/100 g) and ORAC (μmoles TE/100 ml) in fresh and dried mangosteen rind in 4, 5 and 6 ripe levels extracted. Study the stability of ORAC on supplement mangosteen juice in different process conditions by varies pH value at 3.0, 3.5 and 4.0 and temperature at 105, 110 and 115°C degree. Study shelf life at 0, 4 8 and 12 months. The process of this study was used plate heat exchanger method. Fresh rind extracted in 4, 5 and 6 ripe levels the total anthocyanin were 4.06±0.17, 4.04±0.24 and 5.09±0.18, total polyphenol were 632.73±21.14, 686.59±29.06 and 707.39±29.73 and ORAC were 17,063.36+883.25, 20,958.61±725.08 and 24,744.62±784.78 respectively. All of value was increased when the rind was more ripe level. Dried rind extracted the total anthocyanin were 1.10±0.01, 0.99±0.03 and 0.17±0.01, total polyphenol were 922.87±6.11, 1,010.03±42.95 and 798.37±6.97 and ORAC were 23,550.05±690.88, 26,634.41±1132.74 and 33,802.98±1,374.38 respectively. The total anthocyanin and total polyphenol were decreased when the rind was more ripe level but ORAC was increased. The temperature was influented to ORAC value but pH and interaction of pH and temperature were not. The ORAC value was decreased in 12 months shelf life, the value start at 2,183.56 ±51.47 in 0 month and decreased to 2,077.474±12.87, 2,057.05±49.64 and 1,945.58±10.98 at 4 8 and 12 months or decreased from 100% to 95.15% 94.23 and 89.10% respectively.

Keywords: supplement magosteen juice, ORAC shelf life, antioxidant in process conditions, ORAC in process condition, total anthocyanin, total polyphenol, ORAC content.

Yoghurt Production from Germinated Native Black Rice (Khaohawmmaepayatong dum)

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Seven incubation times (0h, 12h,24h, 36h, 48h, 60h, and 72h) of germination on the quantity of γ-amino butyric acid of native black rice (Khaohawmmaepayatong dum) were studied in this research. The result found that the 48h of germination time had significantly ($p \leq 0.05$) the highest amount of γ-amino butyric acid (27.99 ± 1.44 mg/100 g). This treatment was therefore selected to further determine the product development of germinated native black rice yoghurt. Changes in physical, chemical, and microbiological properties during fermentation under controlled conditions (42 ℃) at 0h, 2h, 4h and 8h fermentation were evaluated. The result found that change in the amount of titratable acidity expressed as lactic acid and apparent viscosity of germinated black rice yoghurt were increased at the end of 8h fermentation. On the other hand, the stability, pH, and total soluble solid were slightly decreased and the lowest at the end of 8h fermentation. From sensory evaluation, treatment 4 (germinated native black rice yoghurt fermentation by 20% w/w of Revon starter) had the highest overall acceptability (6.88: moderately like). This treatment was then chosen to study on the effect of shelf life on yoghurt properties every week until 4 weeks of storage. The stability, pH, and viable cell count were slightly decreased; while apparent viscosity, lightness, redness (a*) and lactic acid were increased when the shelf life was longer. Interestingly, the free radical scavenging capacity assayed by DPPH method shown that IC_{50} values had significantly ($p \leq 0.05$) higher than that of control (86.92±1.21 and 96.61±1.25 mg/ml, respectively).

Although, the amount of γ-aminobutyric acid (GABA) content exhibited significantly ($p \leq 0.05$) two fold lower than that of control (0.99 ± 0.03 and 1.80 ± 0.07 mg/100g, respectively). In conclusion, the results from this research could increase the value addition of native black rice and should be the guide for developing other healthy food in the future.

Keywords: yoghurt, germinated native black rice, probiotic,γ-aminobutyric acid (GABA)

Growth and yield of Chinese kale grown in dynamic root floating technique (DRFT) by reused nutrient solution

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In re-circulated nutrient solution of hydroponics may lead to the accumulation of NaCl and an imbalance of essential minerals when using for long-run. This phenomenon affects on a NaCl sensitive plant such as lettuce. Commonly, the nutrient solution should be periodically changed and refilled. However, the waste or used nutrient solution (UNS) still contains essential minerals. For that reason, we focused on using of the UNS from grown lettuce in nutrient film technique (NFT) to other growing system. In this experiment, UNS was recharged by adding with the stock nutrient solution of leafy vegetable (KMITL2) and adjusted the concentration to 2.5 mS/cm and pH 5.8 for growing Chinese kale by dynamic root floating technique (DRFT). Comparison with control, that was new nutrient solution (NNS) prepared by the same stock (KMITL2) and adjusted the concentration and pH to the same level of UNS. The result from 2 crops was found that Na accumulation was increased in both NFT and DRFT. The UNS showed higher Na content than that in NNS. Other growth parameters such as; number of leaf, stem diameter, average weight per plant, fresh weight, dry weight and total yield were not significantly different. Furthermore, using UNS was shown to reduce the water, fertilizer, and acid consumption for Chinese kale production around 84-100, 65-76, and 26-55%, respectively. This experiment is the first step to improve the efficiency use of water and fertilizer by using the UNS to the second growing system, Our further research will focus on utilizing the UNS to the other growing system in continuously which leading to reduce cost and be friendly to the environment with zero waste production system.

Keywords: Hydroponics, reused nutrient solution, waste nutrient solution

Growth and Yield Responses of Peanuts on Dolomite and Cow Manure Doses

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Ultisol soil is one that used in peanut cultivation in the province of Bengkulu. Ultisol soils have a high soil acidity characteristics, high levels of Al, poor nutrient content and organic matter is low, this can inhibit plant growth so that required the addition of organic matter and the Dolomites with the right dose to support growth and yield peanuts. This research aims to determine the dose of dolomite and a dose of cow manure for optimal growth and yield in peanut ultisol. The design of the research used Randomized Complete Block Design (RCBD) with two treatment factors are arranged in factorial. The first factor is the Dolomites with 4 degrees of treatment i.e. 0 ton Ha^{-1}, 2.5 ton Ha^{-1}, 5 ton Ha^{-1} and 7.5 ton Ha^{-1}. The second factor is the cow manure with 3 degrees of treatment i.e. 0 ton Ha^{-1}, 10-ton Ha^{-1} and 20-ton Ha^{-1}. There are 12 combination treatment where each treatment was repeated as many as 3 times so that the result in 36 units of the experiment. The results showed that a dose of dolomite 6.45 tons ha^{-1} in granting cow manure 20 ton ha^{-1} weighting variables produce the pods highest peanut plants namely 37.68 grams/plant and seed weight per plant the highest i.e. 34.19 grams. Doses of amendments 7.5 ton ha^{-1} on granting cow manure 20 ton ha^{-1} result in variables number of empty pods are lowest average 4.79 i.e. fruit/plant. Doses of amendments 5.36 ton ha^{-1} yield the maximum number of variables rhizobia 64.88 average fruit. Dolomite dosing on a peanut showed the higher dose of Dolomite is given then it is likely the higher the average number of pods pithy and weights 100 seeds plant peanuts. Application cow manure with a dose of 0 ton ha^{-1} -20 ton ha^{-1} does give influence on the growth and yield of the plant peanuts.

Keywords: peanut, Cow Manure, Dolomite and Ultisol.

Development of high-fiber crispy rice products from Jasmine Rice mixed with *Gracilaria* spp.

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Gracilalia spp is a red algae and can be found in the Gulf of Thailand especially in Trat province. Propose of this experiment and satisfaction high-fiber crispy from jasmine rice and dried seaweed. It is a local commercial seaweed. *Garcilalia* dried crushed into powder, which is the main ingredient in a ratio of 5 to 0, 2.5, 5.0, 7.5 and 10%, respectively, the ratio of the mixture in the same of jasmine rice and cassava flour at 100 and 1%. Sensory evaluation was determined by using 9-point hedonic scale. The results were found that most of consumer liked crispy rice mix seaweed powder 5.0 % with the highest score 6.87 (color), 7.37(odor), 5.70 (test), 6.13(texture)and 6.37(overall liking). The physical, chemical and microbiological characteristic of final product were Lab(41.60, -1.17, 11.31), chemical composition; moister, protein, lipid, carbohydrate, fiber and ash content were 4.65, 7.81, 18.62, 66.27, 1.22 and 1.40 (%wb), respectively. Total microbial counts ($<10^4$ CFU/g), Yeast and mold products ($<10^2$ CFU/g), were in the community standard product of Thailand.

Keywords: seaweed, crispy rice, *Gracilalia* spp.

Survivability and 1st Meiotic Completion *In Vitro* of Immature Bovine Oocytes after Vitrification

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Oocyte cryopreservation could be used to assist many reproductive processes and rescue gametes when female die unexpectedly or accidentally. In this study, GV stage bovine oocytes were exposed to a vitrification solution (VS_1) of 7.5% EG + 7.5% DMSO in TCM-199 medium with 10% FBS (BM) for 10 min to equilibrate before transferring to vitrification solution (VS_2) of 15% EG + 15% DMSO + 0.6 M sucrose in BM for 30-45 sec. Thereafter, the oocytes were either placed in the cryoloop and plunged into the LN_2 or directly drop into the LN_2. After a month of storage, the oocytes were warmed in a step-wise manner at 3 min each in warming solution with 0.6 M, 0.3 M and 0.15 M sucrose. Then, the oocytes were washed (3x) using the maturation medium before culturing for another 22 hr, fixed and analyzed

for meiotic progression. In the cryoloop method, the survival rate was 92.5% (49/53) with a meiotic resumption rate of 87.8% (43/49). The rate of completion of 1st meiosis was 49.0% (24/49). Using the MDS method, the survival rate was 91.1% (51/56) with a meiotic resumption rate of 74.5% (38/51). The rate of completion of 1st meiosis was 31.4% (16/51). The results showed that both vitrification methods could be used for the vitrification of GV stage bovine oocytes, although the cryoloop method appeared more efficient than the MDS method.

Keywords: vitrification, bovine, immature oocytes, meiosis, maturation

Production and Quality Improvement of the Tropical Fruit Tamarind (*Tamarindus indica* Linn.) Wine

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Tamarind (*Tamarindus indica* Linn.) is one of the most popular tropical fruit with many benefits in Thailand. It have been used as a food ingredient for a long time and has many therapeutic properties. Therefore, the aims of this research were to produce and improve the quality of tamarind wine. The two varieties of *Saccharomyces cerevisiae* var. *burgundy* and *montachae* were chosen for tamarind wine fermentation. Both varieties produced similar percentages of alcohol by volume but for the sensory evaluation showed that *montachae* was better than *burgundy* with the 3.87 ± 0.10 points. The optimal conditions for production of tamarind wine was 10% inoculum concentration, 5% tamarind juice and 20 °Brix soluble solid with the 0.67 percentage of alcohol by volume and 3.63 ± 0.10 points from sensory evaluation. Then the quality of tamarind wine was improved by mixing tamarind juice with pineapple juice and roselle juice. The result showed that, production of wine using only tamarind juice was obtained the maximum sensory evaluation point with 3.58 ± 0.24. In conclusion, tamarind can be used as substrate for production of wine. It will be an alternative way to add value to tamarind. Moreover, the produced tamarind wine had a good taste which the acceptance from the consumers without the quality improvement.

Keywords: Tamarind, Wine production, Sensory evaluation

Nutrient Use Efficiency, Yield and Fruit Quality of Sweet Corn (*zea mays saccharata* sturt.) Grown under Different Fertilizer Management Schemes

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Proper fertilizer management strategy is a very important consideration for optimizing crop productivity, food production sustainability, maximizing farm economic returns, and reducing adverse impacts of nutrients on soil fertility, health and the environment. A field experiment was conducted to evaluate the nutrient efficiency, yield and nutritive quality of sweet corn grown under different fertilizer management schemes in Baybay City, Leyte, Philippens. The treatments were: Main plot- sweet corn variety: Sweet Pearl and Sweet Grande; and Sub-plots- fertilizer management schemes: T_1– control, T_2 – conventional fertilizer management scheme (CFMS), T_3 – organic fertilizer management scheme (OFMS), T_4 – organic – based fertilizer management schemes 1 ($OBFMS_1$), T_5– organic- based fertilizer management scheme 2 ($OBFMS_2$), and T_6 – organic-based fertilizer management scheme 3 ($OBFMS_3$). The study was done in a Split Plot Design with three replications arranged in Randomized Complete Block Design (RCBD). Results showed that growth parameters (plant height, leaf area, growth rate, and dry matter yield) and yield and yield components (ear height, ear width, weight of ear/plant with and without husk, fresh ear yield/plot with and without husk, and stover) were significantly increased with application of organic (OFMS), organic-based (OBFMS) and conventional (CFMS) fertilizer management schemes. Application of CFMS resulted to highest increase in starch and sugar content, while application of $OBFMS_2$ gave the highest protein content in the sweet corn kernel.N use efficiency of Sweet Pearl was higher (543.2) than that of Sweet Grande (125.2) because of higher N recovery efficiency. Decrease in nitrogen use efficiency was attributed to low physiological efficiency as levels of nitrogen fertilizer increased. The highest P and K recovery efficiency, physiological efficiency and use efficiency among different rates of P and K (kg

ha^{-1}) were observed when applied at rates of 30 and 60 kg ha^{-1} for Sweet Pearl and Sweet Grande. Results also revealed a decreasing pattern in P and K use efficiency values with increasing rates of P and K application indicating that maximum crop production can be attained with lower fertilizer applications.

Keywords: nutrient use efficiency, fertilizer management schemes, fruit quality

Effect of Carboxymethyl Cellulose as Edible Coating on Postharvest Quality of Rambutan Fruit under Ambient Temperature

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Rambutan fruits are sensitive to water loss after harvest, because of the high density of stomata in the spinterns. Carboxymethyl cellulose (CMC) is one of polysaccharide edible coatings which can be extracted from plants. This research was to study the effects of commercial CMC and water hyacinth (*Eichhornia crassipes*) extracted CMC on postharvest quality of rambutan fruit cv. Rongrien. The experiment was performed under completely randomized design (CRD) with 3 treatments comprising of 0.5 % CMC_{com}, 0.5 % CMC_{wh}, and non-coated treatment. Each treatment was replicated 4 times, with 8 fruits per replicate. Treated fruits were placed in the plastic baskets and stored under ambient temperature for three days. The results showed that, fruits coated with 0.5% CMC_{com} and CMC_{wh} were not significantly different in weight loss and fruit firmness, but non-coated fruits tend to have higher weight loss and fruit firmness than coated fruits during storage. All treatments showed a decline in L*, a*, and b* values of the fruit pericarp which was negatively correlated with pericarp browning. On day 2 of storage, significant differences of browning were observed, the highest score (3) was found in non-coated fruits while the score of coated fruits was 1.5. The total soluble solids slightly decreased in all treatments to about 20 % at the end of storage, while the titratable acidity increased from 0.4 to 0.6 %. The sensory evaluation (score) of the fruits coated with 0.5% CMC_{com} and CMC_{wh}, and non-coated were 2.8, 2.5, and 1.5, respectively. Higher vitamin C content was found in coated fruits at the concentration of 4.5 mg/100g fresh weight. We conclude that, fruits coated with CMC could not effectively reduce weight loss, but could maintain eating quality and vitamin C content during storage.

Keywords: browning, edible coating, firmness, sensory, rambutan

Erythema Inhibiting Potential of Banana (*Musa paradisciaca* Linn.), Guava (*Psidium guajava* Linn.) and Lima Bean (*Phaseolus lunatus*) Leaf Extracts on Acute Models of Inflammation

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The study was conducted to determine the erythema inhibiting potential of banana, guava and lima bean leaf extract on acute models of inflammation in male and female guinea pigs.

A total of sixty three (63) 2-3 month old apparently healthy male and female guinea pigs, weighing 180-200g served as experimental animals of the study. Test animals were exposed to four treatment materials consisting of Treatment 1 (Saline), Treatment 2 (Banana), Treatment 3 (Guava) and Treatment 4 (Lima Bean) leaf extracts. Patch and scratch methods were used in evaluating the effects of the test materials on acute inflammatory conditions 24 hours and 72 hours post-treatment. All data gathered were statistically analyzed using ANOVA, LSD and Frequency distribution.

Results revealed a varying erythema and primary irritation index formation using the Patch and Scratch Test Method 24 to 72 hours post-treatment. Lima bean provided the most recorded anti-erythema (8/9) agent indicated by a score of 0 (No erythema) using the Patch Test 72 hours post-treatment. Lima bean provided support to three erythema scores of slight to moderate to severe types and one edema score classified as moderate to severe. Banana and guava were also observed to have anti-erythema effect in 6/9 and 4/9 treated animals. Statistical analysis of the patch test however provided no significant differences between plant treatments as anti-erythema agent.

Banana (8/9) 72 hours post-treatment provided the most effective anti-erythema using the Scratch Test Method. Banana, however, has limited efficiency on slight to moderate types of erythema. Anti-erythema effects of banana however were

found to be comparably the same with the effects of guava while lima bean was comparably the same with the effect of saline.

The computed primary irritation index that possibly accounted for the erythema formation were mostly recorded in saline (1.5) followed by lima bean (1.0), guava (0.67) and banana (0.61), all of which fall under the slightly irritating agent.

Conclusively, the observed results indicate that most of the plant materials were effective for acute inflammatory conditions.

Keywords: Erythema, patch, scratch, acute inflammation

Study on Type and Concentration of Plant Growth Regulator on Shoot Development of Pummelo [*Citrus maxima* (Burm.) Merr.] cv. Taptimsiam

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Pummelo [*Citrus maxima* (Burm.) Merr.] cv. Taptimsiam, economic fruit crops, is geographical indication of Nakorn Sri Thammarat province. It is most favorite pummelo because it's red pulp, the taste so sweet and soft. They are export and the premium for souvenir from Nakorn Sri Thammarat province. However, they had problem in Citrus tristeza virus and Greening. The present study was to produce the new plant that without this disease by apical meristematic tissue. Shoot explant were excised and cultured on solid Murashige and Skoog (MS) medium supplemented with 0-2 mg/l NAA (α-naphthaleneacetic acid) and BA (N_6-benzyladenine). The cultures were placed under light conditions at 14 h photoperiod, 27 ±1 ^{o}C to initiate callus induction and plant regeneration for 3 months. The result revealed that solid MS medium supplemented with 1.5 mg/l BA gave the average number of shoot at 7.83/explant better than another culture media. Solid MS medium supplemented with 0.5 mg/l NAA and 2 mg/l BA gave the highest average shoot length at 1.62 centimeter, significant different with another culture media. This technique can sole the farmer in the further.

Keywords: *Citrus maxima* (Burm.) Merr, plant growth regulator, shoot

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Genetic Diversity Analysis of Selected Philippine Traditional Rice (*Oryza sativa* L.) Varieties Using Simple Sequence Repeat (ssr)

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Globally, rice is an important crop. With a vast genetic diversity, only 15 percent has been utilized and partly preserved. Philippines is an archipelagic country which provides diverse genetic resources in different crops that includes rice. Traditional rice variety (TRV) is known morphologically diverse and demonstrates valuable traits used in crop improvement such as wide range of adaptation to different environment and desirable traits such as tolerance to abiotic stresses, resistance to pest and diseases, and nutritional and good grain quality traits. But phenotypic characterization is not enough alone to diversify the gene pool. Thus, molecular marker for genetic characterization is also used. Genetic diversity analysis in traditional rice varieties may provide farmers and rice breeders valued information to be used in breeding new rice varieties. Collected from different regions in the country**,** 111 traditional rice varieties were analyzed for their genetic diversity using 19 Simple Sequence Repeats (SSR) markers distributed in 7 chromosomes. Polymorphism were identified and compared with each samples. Number of alleles amplified, polymorphic information content (PIC) value and similarity coefficient were determined using PowerMarker and cluster analysis was done using UPGMA through NTSYS 2.0 to generate dendrogram. The selected TRVs revealed population mean allele number of 13.58 and genetic diversity mean of 0.7227 as an evidence of molecular differences between the samples. Two major clusters were identified among the samples. High polymorphism information content (PIC) value of 0.6992 and

relatively low similarity coefficient of 0.08 was identified. Therefore, high polymorphism complementary to low similarity coefficient that pertains to high diversity among the analyzed samples were determined.

Keywords: characterization, diversity, polymorphism, SSR, TRVs

Precision and Sustainable Management of *Phytopthora* Disease of Durian

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Thailand is the world's number one exporter of durian (*Durio zibethinus* L.). In 2013, there were 641,248 rai in durian production and exported 562,713 tons fresh of durian. Fresh durian (372,750 tons) accounted for the total output value of 7,513 million baht (66.24%) of the country. A number of biotic (pathogen-related) and abiotic (soil-related) factors can affect the overall production of durian. *Phytophthora* root, stem and fruit rot are diseases caused by *Phytophthora palmivora* that can destroy durian at any stage of growth. All parts of durian can be affected by this disease. We have found that *Phytopthora* drastically reduces the yield of durian and is the most important disease of durian crop in Thailand. From the durian field surveys in Chanthaburi and Trad in September 2016 and March 2017, respectively, it was found that all durian trees in the plantation areas exhibited root rot. Of these, up to 60% were markedly low in vigor. Severe symptoms and death were recorded in up to 30% of the cases, requiring tree removal and re-planting by farmers. However, without intervention, trees commonly become re-infected and die within 2 years after re-planting. In addition, surveys conducted in the Mae Ai and Fang districts, Chiang Mai in revealed a similar widespread incidence of *Phytophthora* diseases, and *P. palmivora* was consistently isolated from rotted roots. This research aim to identify precise and effective biological techniques to control *Phytophthora* diseases in durian transplants and establish a learning center for durian regeneration in a *Phytophthora*-infested area.

Regarding to the disease problem, we have planned to solve the following two main techniques including; 1) soil fertility regeneration and optimization by adding organic matter, adjusting the soil pH to a suitable value (6.5-7.0) and encouraging the farmers to use chemicals carefully and only as needed. 2) Preventive care of root rot disease of durian caused by *Phytophthora* by guiding the use of antagonistic microorganisms, and stimulation of durian's immune system to maintain a strong root system. Moreover, we also object to identify precise and effective biological techniques to control *Phytophthora* diseases in durian transplants and to establish a learning center for durian regeneration in a *Phythophthora*-infested area.

Keywords: Durian, *Phytophthora* disease, Die back disease, Bio-technique, Precision, Sustainable Management

Phytohormone and Phytochemical Analysis of *Gracilaria* sp. Extract and Its Effect on Callus Induction and Rice Seed Germination

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Today, synthetic plant growth and yield enhancers are widely used to improve performance of plants. However, excessive use of these enhancers has negative impacts on the environment and on human health. Furthermore, inorganic fertilizers are expensive, thus increases production costs. Therefore, the use of seaweed extracts as bio stimulant lessens adverse effects of synthetic plant growth enhancers to the environment and decreases the financial burden of farmers brought by excessive inorganic fertilization.
This study analyzed the chemical constituents of the macroalgae G*racillaria* sp and evaluated its potential in promoting seed germination and callus induction in cultured indica rice varieties, to provide basic information to researchers and plant growers on the bioactive components of seaweed extracts and their bio-stimulatory effects on plants. Phytochemical analysis on the isoprophyl extract of *Gracillaria sp* showed that among the eight (8) secondary metabolites tested, saponins, coumarins and terpenoids are present. Moreover, using standard addition technique and UV/VIS analysis in determining the amount of phytohormone present in *Gracilaria* sp. showed that auxin (naphthalene acetic acid) at 22% and gibberellin (GA3) at 97% are present in the seaweed extract in comparison with the commercially available hormones at 98% and 93% respectively. With the high concentration of gibberellin in

Gracilaria sp., the aqueous extract of this seaweed was tested in tissue culture for its possible effect in embryonic callus induction. However, in comparison with the standard media used in embryonic callus induction, percent occurrence of callus from the culture media with *Gracilaria sp*. extract was very minimal. To then further investigate the effect of *Gracilaria sp.* extract on plant development, germination of the six indica rice varieties which were used for callus induction and were subjected for germination for seven (7) days. Shoot and root length were measured and results showed that *Gracillaria sp*. aqueous extract has no significant effect on the germination rate of the selected indica rice varieties in comparison with the commercially available giberellic acid.

Keywords: *Gracillaria* sp., Gibberellic Acid, Saponin, coumarin, terpenoids, indica, callus, auxin, UV/VIS Analysis

Detection of Salmonella in Raw Pork Meat and Eggs Sold in the Wet Markets in Nueva Ecija, Philippines

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This study was conducted to determine the point prevalence of Salmonella isolated from chicken eggs and raw pork sold in the wet market and layer farms of Nueva Ecija, Philippines and to determine the antibiotic sensitivity patterns of *Salmonella* spp. isolates and the presence of tetracycline resistance genes.

A total of 420 eggs were randomly sampled 300 of which came from the wet markets while 120 from layer farms in Nueva Ecija. Likewise, 180 raw pork cuts were also randomly sampled from the wet markets. The swab samples from eggshells, albumen and pork juice were cultured in selected media and biochemical tests for putative Salmonella isolates. DNA was extracted and subjected to nucleic acid amplification using LAMP and PCR assays using specific primers for invA target gene. DNA extract from the *Salmonella* colony that showed positive PCR result were submitted for DNA sequencing at the AIT Biotech, Malaysia. PCR positive Salmonella isolates were swabbed on Mueller Hinton agar plates to determine their antimicrobial sensitivity profiles against a panel of antibiotics. Salmonella isolates showing tetracycline resistance were subjected to PCR to detect tetracycline resistance genes.

Twenty eight (28) putative Salmonella isolates grew in XLD agar from egg albumen and 16 from egg shell swabs; 18 were positive in LAMP assay from egg albumen and 4 from egg shell swabs and finally, 9 were positive in PCR from egg albumen and 2 from egg shell swabs. On the other hand, 65 putative Salmonella isolates from pork juice grew in the bacterial culture & biochemical tests. Direct LAMP assay of DNA extracts from pork juice yielded 77 positives while 30 out of 65 Salmonella colonies were positive by colony PCR.

DNA sequencing using BLAST NCBI showed significant alignments of Salmonella isolates from egg albumen to which 99% had matched identity to *Salmonella enterica* subsp. *enterica* serovar *Enteritidis.* Among pork samples, Salmonella isolates had a 99% matched identity to *Salmonella enterica* subsp. *enterica* serovar *Enteritidis* and 100% matched identity to *Salmonella enterica* subsp. *enterica* serovar *typhimurium.*

Antibiotic sensitivity test showed doxycycline and penicillin resistance by Salmonella isolates from egg albumen while these were susceptible to gentamycin and norfloxacin. In pork samples, 15 were resistant to Penicillin, 9 to Tetracycline, 6 to Streptomycin and 4 to Amoxicillin. PCR showed that 4 Salmonella strains in egg albumen carried the *tet* B resistance gene while 1 strain, both *tet* A and *tet* B. Nine (9) Salmonella strains from pork carried the *tet* A resistance gene while 2 strains, both *tet* A and *tet* B.

Effect of setting agent on quality of tubed-package sesame tofu

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Sesame tofu is a traditional Japanese healthy food made from sesame milk. Normally, it is mixed with kudzu, a kind of starch similar to arrowroot starch. Nevertheless, there are many textural characteristics of sesame tofu in Japan market. All are packaged in square tray and eaten as snack or dessert. There have not been sesame tofu packaged in tube, which will be used for cooking in savory dish, which should be stable in shape when cooked. Therefore, this study has been focused on the effect of setting agent on quality of tubed-package sesame tofu. The setting agent used in this study were carrageenan, agar, modified starch SS, modified starch MB, arrowroot starch and glucono-d-lactone (GDL). Two kinds of sesame seeds (roasted and unroasted) were studied. The results indicated that the increasing concentration of all

stabilizers except GDL affected the water activity. More concentration of setting agent was applied in tubed-package sesame tofu, more water activity was obtained. The textural properties of tubed-package sesame tofu showed that all textural value increased significantly when their concentration increased especially the hardness value. The tubed-package sesame added arrowroot starch and both modified starch was gained more acceptable score than the other two of setting agent added in tubed-package sesame tofu. The combination of two setting agent was also studied. The setting agent of each starch combined with carrageenan or agar affected significantly on textural properties of sesame tofu compared to that of one setting agent used.

Keywords: sesame tofu, roasted and unroasted sesame, modified starch, arrowroot starch, carrageenan, agar

Detection and identification of bacterial contamination in meat by matrix-assisted laser desorption ionization-time of flight -mass spectrometry

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The detection and species confirmation of bacterial contaminated in chicken and pork were demonstrated by selective media, morphology and biochemical identification and matrix-assisted laser desorption ionization-time of flight-mass spectrometry (MALDI-TOF MS). All meat samples both chicken and pork were randomly obtained from traditional market in eastern Bangkok, Thailand and 10 samples of each were taken for these studies. The selective media including xylose lysine deoxycholate agar (XLD) and salmonella shigella agar (SS) were used to detect *Salmonella* and *Shigella* species, while baird-parker agar (BP) and chromocult coliform agar (CC) were performed to analyse *Staphylococcus aureus* and coliform/*E. coli* bacteria. In addition, plate count agar (PCA) was also used for total bacteria count. Subsequently, bacterial randomly isolated from selective media were further identified by biochemical test. Meanwhile, bacterial contaminant from total plate count were studied using morphology test. Then, the species confirmation were performed by MALDI-TOF MS. There were 10, 12, 10 and 8 isolates, which were isolated from chicken and pork, collected from XLD and SS, CC, BP and PCA, respectively. All forty isolates were identified using MALDI-TOF MS as thirteen genera of *Proteus*, *Citrobacter*, *Staphylococcus*, *Salmonella*, *Serratia*, *Enterobacter*, *Escherichia*, *Lactococcus*, *Klebsiella*, *Aeromonas*, *Morganella*, *Macrococcus* and *Acinetobacter*. Considering to the isolate species, 8 isolates of *P. mirabilis*, *C. freundii*, *S. warneri*, *E. coli*, *K. pneumoniae*, *A. caviae*, *A. veronii* and *Salmonella* spp. were obtained from both chicken and pork. On the other hand, 4 isolates of *M. caseolyticus*, *M. morganii*, *S. aureus* and *A. baumannii* were only detected in pork, whereas only 5 isolates consisted of *S. pasteuri*, *S. epidermidis*, *S. fonticola*, *E. asburiae* and *L. lactis* were only detected in chicken.

Keywords: MALDI-TOF MS, bacterial contamination, meat

Session 3: MICROBIAL BIOTECHNOLOGY, BIODIVERSITY, TAXONOMY, BIOLOGICAL ACTIVITY

Moringa oleifera Extracts as Natural Fungicide against Some Plant Pathogenic Fungi Incited Tomato, Potato and Green Bean Crops in Egypt

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Plant diseases caused by pathogenic fungi cause greet losses in yield and products of agricultural crops. Controlling these pathogens manly depends on chemical fungicides treatments that cause hazards to human health and increase environmental pollution. The modern agricultural systems aimed to reduce and/or eliminate fungicide usages, through eco-friendly safely controlling systems and expansion in bio organic farming plantation. These systems leads to produce products free from any chemicals and fungicides (organic products) for exportation, moreover avoid environmental pollution. In this study the inhibitory effect of *Morienga oleifera* extracts (roots extract MRE, leaves extract MLE and seed oil MSO) was investigated *in vitro* against 18 phytopathogenic fungi the causal agents of major fungal disease on tomato , potato and green bean plants . Crude extracts of Roots, leaves and seed oil of *Moringa oleifera* significantly reduced radial growth and sporulation of all tested pathogens. *M. oleifera* extracts had different degrees of reduction in both growth and sporulation of the tested pathogens. Reduction effect was increased by increasing concentrations of *M. oleifera* extracts. The highest reduction records on radial growth and spore/sclerotia of all tested pathogens were at high concentrations of MRE, MLE and MSO respectively. *F. oxysporum , F. solani* and *A. solani , A. alternate* were highly affected by *M. oleifera* extracts than *R. solani , S. rolfsii and M. phaseolina* . MRE, MLE and MSO may be recommended as a potent bio-fungicide against fungal disease incited many crops. Extensive studies should be undertaken for the field application of *Moringa oleifera* extracts as strong antifungal agents against fungal plant diseases in future studies.

Keywords: *Moringa oleifera* , phytopathogenic fungi , Antifungal activity , plant extract

New Edible Fungi from Southeast Asia: Discovery To Production

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The forests of Southeast Asia have the potential to be a rich source of cultivatable edible fungi. Although significant amounts of research on the taxonomy and phylogeny of edible mushrooms have been carried out, their domestication remains relatively little studied. Today, the most commonly cultivated strains are temperate species, but tropical and subtropical mushrooms are both abundant and highly diverse, with many species having long histories of human consumption. In addition, many new species have recently been introduced to science, including numerous species of high nutritional and medicinal value. The domestication and cultivation of tropical mushrooms therefore provides an enormous opportunity for Southeast Asian countries. Due to the difficulties of cultivating mycorrhizal species, we have concentrated on saprobic species. Most tropical and subtropical mushrooms, if provided with appropriate conditions, grow and produce fruiting bodies more quickly than temperate species. Tropical and subtropical mushrooms can be produced using readily available, cheap waste products such as sawdust, corn cobs, rice straw, sugarcane bagasse, and other forest and agricultural residues, making them an ideal crop for smallholder farmers. We have collected and isolated numerous strains of species of wild mushrooms from Southeast Asian forests, and have published some initial results documenting our progress in domesticating these species. Using a variety of steps including sample collection, isolation, spawn production and fruiting body production in sawdust and compost media, we showed for the first time that it is possible to domesticate *Pleurotus giganteus*; new Thai and French hybrid strain of *Agaricus subrufescens*; *A. flocculosipes*; *A. subtilipes*; *Auricularia thailandica*; *A. cornea* (white); *Panus roseus* and *Ganoderma australe*. These advances may create new opportunities for the mushroom growing industry and for smallholder farmers in Southeast Asia in particular.

Keywords: compost media, edible mushrooms, sugarcane bagasse, temperate species

Molecular Marker SRAP and Bioactivity of Methanolic Seed Extract of Indian Gooseberry

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Indian gooseberry (*Phyllanthus emblica*) are consumed both medicinal and fruit purposes. Several studies have reported that this fruits contained several phenolic compounds and its antioxidant capacity. However, there are no previous data on the bioactivity of seed extracts. Therefore, the aim of this study was to evaluate the antioxidant and cytotoxic activity of seed coat and embryo methanolic extracts from Indian gooseberry. Furthermore, this study aimed to investigate the genetic variation and relationship among cultivars using Sequence-Related Amplified Polymorphism (SRAP) markers. DNA extraction from leaves of 15 Indian gooseberry cultivars which were collected from Phrae Horticultural Research Center, Thailand .Thirty sets of primer combinations that were combined by 5 forward primers and 6 reverse primers were assayed on some samples. Seven primer combinations which consistently produced well defined bands were used to investigate the genetic profile. Seven SRAP primer combinations amplified 172 fragments, out of which 145 bands (%84.30)were polymorphic. The dendrogram generated by NTSYS-pc (version 2.1X) based on UPGMA using similarity coefficient. Their genetic similarity coefficients ranged from 0.66 to 0.90 indicating that high genetic variation. Methanol extracts from seed coat and embryo were tested for bioactivities. Cells were exposed at 1000 µg/ml, the cytotoxicity against breast cancer cell lines (MCF7-), colon cancer cell lines (HT29-) and oral cancer cell lines (KB) which were assessed with MTT assay demonstrate poor cytotoxic activity. On the other hand, both seed coat and embryo extracts showed strong DPPH radical scavenging activity with 50% inhibitory concentration (IC_{50}) values of 18.91 and 22.13 µg/ml, respectively. These results suggested that the seed extract of Indian gooseberry could be natural sources of the bioactive compound which could be applied to facilitate development of spa and cosmetic products.

Keywords: Indian gooseberry, SRAP, Cytotoxicity assay, Antioxidant activity

Determination of Potential Bacteria from Six Different Types of Green Biomass Enriched Liquid Organic Fertilizer for Developing Bio-decomposer

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Bacteria plays significant roles in the production of liquid organic fertilizer (LOF) by degrading green biomass and other solid materials. This experiment aimed to determine the genus of bacteria present in five different types of green biomasses enriched LOF which were separately prepared and non-aerobically incubated for six weeks. Those green biomasses are (1) *Gliricidia sepium*, (2) *Leucaena leucocephala*, (3) *Ageratum conyzoides* L., (4) *Eichhornia crassipes* and (5) banana corms. Samples from each biomass-enriched LOF were grown in nutrient agar medium to be isolated for further determination. Bacteria identifications are conducted using Gram-staining technique and Bergey's Manual. Qualitative screening for cellulolytic bacterial isolates was conducted by streaking on the cellulose Congo Red agar media as indicated by its clear zone formations. Results indicated that at the genus level, bacteria of *Pseudomonas, Staphylococcus* and *Bacillus* were the predominant identified groups in all green mass enriched LOFs. Gram negative *Pseudomonas* was identified in four enriched LOFs of *Ageratum, Musa, Eichhornia and Gliricidia*. Gram negative *Staphylococcus* was found in *Leucaena* enriched LOF. Furthermore, gram positive *Bacillus* was found in Ageratum, *Eichhornia* and *Gliricidia* enriched LOF, while gram positive *Staphylococcus* was identified in *Musa* and *Leucaena* enriched LOF. Cellulolytic test indicated that gram positive *Staphylococcus* of *Musa* enriched LOF and *Bacillus* of *Eichhornia* enriched LOF had much higher cellulolytic ability than *Pseudomonas* group. In conclusion, both gram positive *Staphylococcus* of *Musa* enriched LOF and gram positive *Bacillus* of *Eichhornia* enriched LOF are the promising bacteria to be used for developing bio-decomposer. Further research should be addressed in developing carrier media for those promising bacteria for bio-decomposer.

Keywords: liquid organic fertilizer, cellulolytic bacteria, bio-decomposer

Isolation and Screening of Endophytic Bacteria against Rice Blast Pathogen

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This study aims for isolation endophytic bacteria from leaves, stems and roots of healthy rice and screening their potential to promote plant growth and inhibit *Pyricularia oryzae* caused rice blast disease. Forty-six isolates were obtained from this experiment. Initially, the effect on rice seedling were tested. It was found that 41 isolates showed their ability to promote plant growth that was referred to benefit isolates. Isolate Bar917 had the highest seedling vigor index that was 128.42 %, following by isolate sus617 at 128.03%. Then the benefit isolates were also tested their efficiency to inhibit *P. oryzae* by dual culture technique. It was found that all benefit isolates could inhibit *P. oryzae*. The group of isolates that was 60% inhibition higher than control including sus217, sur317, Bas417 and Bar917, which was 66.80, 66.66, 64.86 and 61.11% respectively. Characterization of benefit isolates by gram staining and 3% KOH test, found that most of them were gram-positive bacteria. From this experiment, we selected some benefit isolate for further study on seed bio-priming to improve its efficiency for rice production in the future.

Keywords: endophytic bacteria, rice blast, *Pyricularia oryzae*

Macroscopic Fungi in Isabela State University, Isabela as Baseline Information

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A preliminary study on the macroscopic fungi was conducted to determine the macroscopic fungi present in Isabela state University, Echague, Isabela. Specimens were collected on June to July 2017 and were identified based on their morphological characteristics. Thirty-one (31) species of macroscopic fungi were collected and identified to 18 genera and 15 families. These were *Auricularia polytricha, Auricularia auricular – judae, Termitomyces striatus, Calvatia cythiformis, Ganoderma lucidum, G. applanatum, G. adspersum, G. japonicum, Daedalea dickinsii, Phellinus linteus, P. ignarius, P. gilvus, Pleurocybella porrigens, Polyporus sanguineus, Pleurotus porrigens, Agaricus arvensis, Podoscypha* sp., *Trametes pubescens, T. elegans, T. hirsuta, T. versicolor, Geastrum triplex, G. fimbriatum Lentinus sajor – caju, L. tigrinus, Psathyrella candolleana, Clavulina cristata, Schizophyllum commune, Marasmius* sp., *Coprinus* sp. and *Cookenia* sp. Among the different substrate types, macrofungal species were mostly seen in decaying woods and logs. Some of the collected macroscopic fungi were non-edible and remained untapped and some are edible. Thus, macrofungi found in Isabela State University, Echague, Isabela are recommended to be evaluated for several biological potential. This is the first macroscopic study of fungi in Isabela, Philippines.

Keywords: baseline, Echague, fungi, Isabela, macroscopic, species

Efficacy of Nano Elicitor from *Chaetomium cochliodes* to control *Pythium* spp Causing Root Rot of Tangerine (*Citrus reticulate*)

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Tangerine (*Citrus reticulata*) is one of the most popular fruit in Asia. The seriously disease of tangerine is root rot caused by *Pythiaceous* fungi such as *Phytophthora* spp., *Pythium* spp. In this study tested nano particles from *Chaetomium cochliodes* to control the *Pythium* spp. in vitro. The result showed that the nano particles of these *Chaetomium* species exhibited antifungal activities against mycelial growth and sporangia formation of *Pythium* spp. with effective doses (ED_{50}) of 2.0~3.8 µg/mL and 1.2~3.7 µg/mL respectively. It is the first report of nano particles from *Chaetomium cochliodes* to control the *Pythium* spp. causing root rot of *Citrus reticulate*.

Keywords: nano particles, *Chaetomium cochliodes*, root rot of *Citrus reticulate*

Study of Optimum Mobile Phase for Determination of Phytoalexin in Rice by Thin Layer Chromatography

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Phytoalexins play crucial role in plant defense. These antimicrobial compounds are inducible and accumulated in plant after infection with biotic or abiotic stress. The highly accumulation of phytoalexin can be found in resistant plant varieties after induction compared to the susceptible varieties. In general, evaluation and characterization of the phytoalexin compounds are carried out using thin layer chromatography (TLC) method. However, mobile phase solvent is often limited the compound separation on TLC plate. Therefore, the aimed of this study was to select the optimum mobile phase for separating the extract of rice leaves for TLC. Four combinations of mobile phase included benzene: ethyl acetate (9:1), ethanol: chloroform (3:97), benzene: methanol (9:1) and benzene: methanol (1:9) were compared for best migration obtained on the TLC plate. Each mobile phase migration was done with 6 replications and the experiments were repeated 4 times. After comparing band appearance on TLC plate, the results showed that the combination of benzene: methanol (9:1) could separate 15 spots with clear R_f on TLC plate. This mobile phase combination will be used in further analysis on the characterization of induced resistance in rice plant.

Keywords: induced resistance, UV-radiation, rice leaves extraction

Effects of Microbial Biocontrol Agents and Botanical Extracts for the Management of Bulb Rot and Twister Diseases of Onion

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Field experiment was conducted to determine the effects of microbial biocontrol agents and botanical extracts in managing bulb rot and twister diseases of onion and to evaluate the effects on growth and yield parameters of onion.

The different treatments were T_{1-} Ketomium® (10 g/liter), T_{2-} *Trichoderma* (20 g/liter), T_{3-} Ketomium® + *Trichoderma* (10 g/liter+ 20 g/liter), T_{4-} Botanical extracts of kakawate+ yellow ginger+ hot pepper (20 ml/liter), T_{5-} Botanical extracts + *Trichoderma* (20 ml/liter+20 g/liter), T_{6-} *Bacillus subtillis* (4 gm/liter), T_{7-} Dithane (5 tbsp/16liters), and T_{8-} Control.

Results showed that plants applied with the combination of Ketomium® and *Trichoderma* numerically produced the tallest (52.65 cm) plants among other treated plants. Onion plants sprayed with the combination of botanical extracts and *Trichoderma* produced bulbs with widest diameter of 3.88 cm. Ketomium® + *Trichoderm*a consistently produced plants with the least incidence of twisting and lowest percent disease severity rating in all observation periods. Lowest bulb rot infection and highest number and weight of marketable bulbs were obtained from plants sprayed with the combination of botanical extracts and *Trichoderma.* Highest yield of 23,425 kg onion bulbs per hectare was harvested from plants sprayed with the combination of botanical extracts + *Trichoderma.*

Keywords: Ketomium®, *Trichoderma*, botanical extract, onion, twisting

Isolation and identification of *Pythium* sp and *Phytophthora* sp from durian orchard in Chumphon province, Thailand

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Thailand is the world's largest durian producer and exporter which Chumphon province is the second durian cultivation. The major problems of durian are root and stem rot disease caused by *Pythium* and *Phytophthora* species. Therefore, the objective of this study was to identify and investigate virulence of pathogenic fungi isolated from durian orchard soils in Chumphon province. Identification of the pathogen was made using morphological and molecular analysis. Based on morphological, ten isolates were identified as *Mortierella* sp., *Phytophthora* sp., *Pythium cucurbitacearum* and *Pythium* sp. DNA barcoding has been used to distinguish species. Molecular identification was based on internal transcribed spacer (ITS)-nrDNA sequences. Comparing the sequences in the NCBI database, the samples were identified down to a species level, namely *Phytophthora palmivora*, *Pythium cucurbitacearum, P. splendens, P. deliense, Mortierella capitata, M. chlamydospora* and *M. hyalina*. Pathogenicity test by detached leaf method, the most serious cause of Monthong durian leaf rot is *P. palmivora* (CHP25-S08). Other major causes of Monthong durian leaf rot are *Pythium cucurbitacearum* and *P. splendens*. However, *P. deliense* and *Mortierella* sp. are not pathogenic to Monthong durian leaf.

Keywords: internal transcribe spacer, *Phytophthora* sp., *Pythium* sp., root and stem rot disease

In Vitro Testing of Nanoparticles from *Chaetomium globosum* against *Sclerotium rolfsii*

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Philippines is well known for having a widespread usage of agriculture as a form of living. The production of sufficient good-quality crops is essential to human existence. Plant pest and diseases have ruined crops, bringing widespread shortage. Many plant pathogens are fungi that cause tissue decay and eventual death of the host. In addition to destroying plant tissue directly, some plant pathogens spoil crops by producing potent toxins. One disease of tomato plants, a crop commonly produced in the Philippines, is the Southern blight caused by *Sclerotium rolfsii*, a filamentous fungus that remains one of the most abundant and destructive pathogens of several economic crops. It causes the yellowing of the leaves and girdling of the stem that becomes watery-soaked in appearance.

This study tested the capability of *Chaetomium globosum* to control *Sclerotium rolfsii* through bi-culture antagonistic test. Results in the bi-culture antagonistic test showed that *C. globosum* decreases the sclerotial body formation. The efficacy of nanoparticle from *C. globosum* to control the growth of *S. rolfsii in vitro* at different concentrations was also tested through disk diffusion assay. There were three types of nano-particles used: Nano-*C. globosum* hexane (Nano-CgH), Nano-*C. globosum* ethyl acetate(Nano-CgEA and Nano-*C. globosum* methanol(Nano-CgM). Delay in mycelial growth was observed in treated plates wherein, growth was only observed 4 days post inoculation compared with the negative control where growth was observed 1 day post inoculation. Results also showed that nano-particles from *C. globosum* can inhibit the growth of *S. rolfsii*. Percent inhibition was found to be directly proportional to the concentrations wherein, the higher the concentration, the higher the percent inhibition. Nano-CgEA can best inhibit the mycelia growth of *S.rolfsii* compared to Nano-CgM and Nano-CgH. It was found out that NanoCgEA can inhibit the growth of *S.rolfsii* at 1ppm concentration while NanoCgM can inhibit at 3 ppm and NanoCgH at 5 ppm. Sclerotial body formation was also found to be inhibited in the treated plates.

Keywords: nanoparticles, *Chaetomium globosum, Sclerotium rolfsii*, biocontrol

Researches on Enhancement of Control Effect of Tobacco Bacterial Wilt by *Piriformospora indica*

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Tobacco bacterial wilt is caused by *Ralstonia solanacearum*. The bacterium pathogen mainly infects the roots or secondary roots of tobacco, leading to serious damage as the withering or even final death of tobacco. The management of bacterial wilt with pesticides has caused serious environmental pollution. Therefore, it is required to develop new methods to control this serious desease of tobacco effectively.

Piriformospora indica is an endophytic fungus with a very extensive host range. It can not only promote the growth of host plants, facilitate photosynthesis, increase its biomass, but also improve stress resistance of plants at the same time and reduce the occurrence of plant diseases significantly. Up to date, the induction of *Piriformospora indica* resistant to plant diseases mainly on fungal diseases, resistant to bacterial diseases are rarely reported. According to the reality that it is difficult to control tobacco bacterial wilt at practice, in the present research, *Piriformospora indica* is applied to control of tobacco bacterial wilt combined with chemical bactericide.

Results in this research showed that the combined application of *Piriformospora indica* and pesticides can postpone the occurrence, and reduce the disease index of tobacco bacterial wilt. Compared to pesticides or Piriformospora indica used alone, the combined method of Piriformospora indica and pesticides increases the effect of control plant diseases, and has obviously better prevention and control effect than that in the use of antibiotic bacteria or *Piriformospora indica*.

The activity of enzymes involved with defense resistance and gene expression related to induction of systemic resistance were assayed for investigation of resistance mechanism that tobacco induced to against bacterial wilt disease by *Piriformospora indica*. Results in this research revealed that the activity of tobacco defensive enzymes PAL, POD

and PPO was significantly higher in integration management than bactericide treatment. The expression of induced systematic resistance-related genes in the roots of tobacco is up-regulation highly in combined control method than bactericide treatment. These results indicate that *Piriformospora indica* can enhance the resistant capability of tobacco bacterial wilt by increasing gene expression and enzymatic activity related to plant systematic resistance.

Keywords: Tobacco bacterial wilt, integration control, *Piriformospora indica*

Utilizing Microorganisms for Sustainable Land Productivity in Coffee and Pepper Crops

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Coffee and pepper is 2 of 7 main perennial crops of Vietnam with the cultivated area as 622 kha and 59 kha sequentially. Many of microorganisms are utilized and managed to support the yield of crops as fertilizer and bio-pesticide. The main purposes of microbial fertilizers in those crops are for N fixation; soluble phosphate; organic matter decomposition and nutrient absorbance enhance (vesicular-arbuscular mycorrhizal fungi - VAM). Most of microbial bio-pesticide applied in coffee and pepper crops are for control plant pathogenic fungi and nematodes.

From the collection of domestic microorganisms in southern Vietnam, the set of microbial products was achieved for serving those above crops. Besides, the process is being developed to apply all of those kinds of microorganisms combine with reasonably managing the agricultural community of grass/herbaceous plant as share host of microorganisms, especially mycorrhizal fungal flora. Biochar from coffee husks and other waste of those crops can be used to enhance the effect of those microbial products. The proposed process will be able to improve crop quality and yield, decrease the use of chemical farming as well as maintaining the sustainability of those agricultural ecosystem.

Keywords: Microorganisms, Coffee, pepper

Growth and Development of *Ooencyrtus* sp.

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Ooencyrtus sp. (Hymenoptera: Encyrtidae) is considered as the important parasitoid of the crepuscular hawk moth (*Nephele hespera* (F.). Developmental growth of this egg parasitoid was performed under the laboratory conditions (25.68±1.14 ℃, 68% RH) and the results showed that the egg laying period was 22.87 ± 16.39 minutes. The life cycle of *Ooencyrtus* sp. involves 4 stages: egg, larva, pupa and adult. The entire life cycle period from egg to adult emergence was about 15-34 days. The egg was oval, transparent and white colored egg is 0.17±0.02 mm. long and 0.11±0.01 mm wide. The period of incubation was 1 day. The larva of *Ooencyrtus* sp. develop in eggs of crepuscular hawk moth, and it breaths through the egg stalks protruding on the egg shell of its host. (0.26±0.02 mm long). The 1st instar is 0.33±0.06 mm. long and 0.19±0.04 mm wide. The last instar larva was 1.05±0.14 mm long and 0.51±0.07 mm. wide. The larval stage lasted for 1-2 days. Pupa body measurement was 0.86±0.12 mm long and 0.49±0.07 mm wide and this stage takes 6-7 days. Males were observed smaller than females. Antenna with a scape is 0.25±0.04 mm long. *Ooencyrtus* sp. was found widely distributed in the central parts of Thailand.

Keywords: *Ooencyrtus* sp., *Nephele hespera* (F.)

Antioxidant and Cytotoxic Activities of Methanolic Extract from *Mimusops elengi* Flowers

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The purpose of this study was to examine the total phenolic content, antioxidant and cytotoxic activity of methanolic extract from the petals and sepals of *Mimusops elengi* flowers. The total phenolic contents of methanolic extracts from petals and sepals using Folin-Ciocalteu method showed 49.32±3.04 and 93.36±3.58 mgGAE /g extract, respectively. The methanolic extract from sepals showed higher antioxidant activities than petals with IC_{50} (50% Inhibitory Concentration) values in DPPH and ABTS radical scavenging assay of 98.20 and 236.13 ug/ml, respectively. In addition, Fe^{3+}-TPTZ reduction in FRAP method was 63.11 mgAAE /g extract. Furthermore, MTT assay was applied used to evaluate cytotoxic activity against eight cell lines.

The sepals extract exhibited high cytotoxic activity against six cancer cell lines, TK6, HeLa, HepG2, HT-29, MCF-7 and KB with CC_{50} (50% Cytotoxic Concentration) values of 179.38, 379.06, 442.61, 500.66, 517.98 and 541.06 ug/ml, respectively. Nevertheless, the sepals extract exhibited cytotoxic activity against normal cell lines (L929 and Vero) with CC_{50} of 493.96 and 413.69 ug/ml. The results suggest that methanolic extract from sepals of *Mimusops elengi* flowers revealed high antioxidant and cytotoxic activities. Further studies are needed to evaluate the constituent of bioactive compounds that beneficial for medicinal and cosmetic application.

Keywords: Antioxidant activity, Cytotoxic activity, *Mimusops elengi*, Total phenolic content

Proximate Nutrient Composition of *Pleurotus florida* on Corn-based Substrate

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In pursuit of finding cheaper but efficient materials in the production of oyster mushrooms, byproducts of common agricultural processes were exploited. The effective bioconversion of corn wastes into edible biomass such as fruiting body production of Pleutorus florida was further amended in this study. Fragmented sweet corn cobs served as spawning material and carriers of mycelia. Mixtures of corn cobs and corn stubbles in different proportions were evaluated for the best production of fruiting bodies. Five parts corn cobs in combination with five parts corn stubbles rendered the highest yield of 150.43 grams and biological efficiency of 20.06%. Proximate nutrient analysis of the fruiting bodies from the best substrate formulation revealed appreciable amounts of nutrients having 11.67% moisture, 6.43% ash, 27.69% crude protein, 13.89% crude fat, 2.07% crude fiber, and 38.25% nitrogen free extract. Computed total carbohydrates was 38.45% with energy value of 283.19 kcal/100g.

Keywords: Pleurotus, corn cobs, corn stubbles, proximate analysis

Species Diversity of Insect Pollinators in the Area of Plant Genetics Conservation Project under the Royal Initiation of Her Royal Highness Princess Maha Chakri Sirindhorn (RSPG) at the Rambhai Barni Rajabhat University, Chanthaburi Province, Thailand

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Insect pollinators are benefit insect to human and environment. They are main factor to bring food to beyond food security. The objective of this research was to study insect pollinators diversty. Species diversity of insect pollinators was conducted in the area of plant genetics conservation project under the royal initiation of her royal highness princess Maha Chakri Sirindhorn (RSPG) at the Rambhai Barni Rajabhat University, Chanthaburi province, Thailand for 12 months from April 2016 to March 2017. The studies were used scan sampling method and collected by sweep neting. The results indicated that nine hundred and fifty five samples were collected that belong to 60 species under 15 families and 4 orders. The order Lepidoptera were highest found on flowers with 45 species, followed by Hymenoptera, Diptera

and Coleoptera with 9, 3 and 3 species, respectively. All value indices, the species diversity index ($H^{/}$) and evenness index were shown highest in October at 2.61 and 0.64, respectively. Meanwhile, abundance insect pollinator is *Tetragonula laeviceps* (F. Apidae O. Hymenoptera) that shown at 32.04% of all.

Keywords: Insect pollinator, species diversity, abundance

Anti-proliferative and Cytotoxic Activities of Ethnobotanicals from Imugan, Nueva Vizcaya, Philippines against Human Cancer Cell Lines

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Plants and plant-derived products have proven effective and safe in the treatment and management of cancer. Many natural products and their analogues have been identified as potent anti-cancer agents.

This work presents the anticancer potential of ethanolic extracts of ethnobotanicals from Imugan, Nueva Vizcaya against three human cancer cell lines: colon (HT-29), breast (MCF-7) and lung adenocarcinoma (H69PR); and in one normal cell line, normal primary dermal fibroblast, neonatal (HDFn), *in vitro*. Ethanolic crude extracts of *Bidens pilosa* L. (Anwad), *Cestrum nocturnum* (Dama de Noche), *Sarcandra glabra* (Thunb) (Hag-ob), *Oreocnide trinervis* (Lal-latan), *Pittosporum pentandrum* (Blanco) Merr. (Lahwik), Lop-lopiit, *Derris elliptica* Benth. (Opay), *Alstonia scholaris* (L.) R. Br. (Palay), *Ageratina adenophora* (Spreng.) R. M. King & H. Rob (Panawel) and *Ayapana triplinervis* (Vahl) R. M. King & H. Rob (Pantallion) were subjected to cytotoxicity testing through cell viability assay using Presto Blue®.

The ethnobotanical extracts exhibited high cytotoxic activities against the cell lines tested. All ethnobotanical extracts exhibited most anti-proliferative and cytotoxicity effects against colon cancer cells (HT-29). With the exception of *B. pilosa*, all ethnobotanical extracts also showed anti-proliferative and cytotoxic activity against breast adenocarcinoma cells (MCF-7). *A. Triplinervis, A. scholaris, S. glabra* and Lop-lopiit exhibited high anti-proliferative and cytotoxicity effects against breast adenocarcinoma (MCF-7) cancer cells. Five extracts, *B. pilosa, S. glabra, P. pentandrum, Lop-lopiit* and *A. adenophora* showed anti- proliferation and cytotoxic activities against the H69PR cells. The extracts of *O. trinervis* and *A. triplinervis* showed no toxicity to normal primary dermal fibroblast (HDFn) cells while exhibiting cytotoxic effects to colon cancer cells (HT-29) and breast adenocarcinoma cells (MCF-7). Given the anti-proliferative and cytotoxic activities of the ethnobotanical against the three human cancer cell lines, these plant extracts are potential candidates for the discovery and development of anticancer drugs.

In vitro Study of Endophytic Bacteria Isolated from Tomato Plant against *Fusarium oxysporum*

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In this study, 43 isolates of endophytic bacteria isolated from healthy tomato plants against *Fusarium oxysporum*, which causes Fusarium wilt disease of tomato, was studied. Initially effects of endophytic bacteria on the growth of tomato seedlings were tested. The results showed that most endophytic bacteria did not affect the growth of tomato seedlings. Characterization by *gram* staining *revealed that most of them* were gram-positive bacteria. Subsequently they were tested on the antagonistic activity against *Fusarium oxysporum* by dual culture technique. It was found that only seven isolates showed the ability to inhibit the pathogen more than 30 percent. The best isolates including SuRW02 SuRW01 and LbRW03 were highest inhibition percentage of 71.94, 68.33 and 68.19%, respectively. The potential isolates found in this study will be further study and develop for coating tomato seed which an alternative method to control Fusarium wilt disease in the future.

Keywords: endophytic bacteria, *Fusarium oxysporum*, Tomato

Endophytic Colonization of Rice by *Beauveria bassiana* and *Metarhizium anisoplae* and its Effects on Brown Planthopper (*Nilaparvata lugens* Stal.) Longevity under Controlled Condition

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Successful artificial inoculation of entomopathogenic fungi (EPF) for high value crops colonization has been reported to effectively reduce economic losses due to insect pests. In the Philippines, however, despite the burgeoning research on integrated pest management in rice (*Oryza sativa* L.) the use of EPF as biocontrol agents, particularly as endophytes, remains fragmentary. Hence, this study aimed to establish a protocol for endophyte colonization in rice using *Beauveria bassiana* and *Metarhizium anisoplae*, and assess the negative effects of EPF-colonized rice seedlings on brown planthopper (BPH, *Nilaparvarta lugens*). Rice seeds were inoculated with *B. bassiana* and *M. anisoplae* conidia and maintained in pots with sterilized artificial growing substrate. The potted plants were then placed in insect rearing cages and maintained under screen house conditions. At 21 days after inoculation (DAI), 3rd instar BPH nymphs were allowed to feed on the seedlings. Scanning electron microscopy analysis revealed successful colonization of shoot of rice seedlings with *B. bassiana.* A higher percentage of colonization, as indicated by hyphal growth and appresoria formation, were recorded in the culm and leaf sheath than in the leaf lamina for all the treated seedlings. All colonized seedlings did not manifest any detectable damage. More interestingly, the presence of hyphal growth was also observed in the gut of BPH 7 days after exposure (DAE) to the EPF-colonized rice seedlings, suggesting the direct transmission of EPF from the host plant to the insect. The establishment of EPF as endophytes in rice and subsequent EPF infection to BPH was further confirmed using Koch's postulate tests. The infected nymphs exhibited stunted growth and disrupted development. Prolonged exposure to the colonized rice seedlings (up to 50 DAE) resulted to 50% to 65% BPH mortality in all treatments, while only 5% to 10% BPH mortality was observed in the control. In addition, the EPF-colonized seedlings remained healthy and vigorous, while those seedlings in the control group exhibited severe yellowing and subsequent drying due to BPH feeding until 50 DAE. This is the first report on establishment of endophytes in rice seedlings via seed inoculation using *B. bassiana* and *M. anisopliae*. Our results also showed that *B. bassiana* and *M. anisoplae,* as rice endophytes, effectively reduced BPH damage by disrupting the insect growth and development and causing mortality. Thus, establishment of EPF as rice endophyte provide an alternative delivery option to utilize EPF as biocontrol agent for the management of economically important insect pests of rice. This approach of BPH management would help meet the food demand of the growing human population amidst climate change and sustainable development production constraints.

***Acherontia styx styx*: The Lesser Death's Head Hawkmoth**

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Lesser death's head hawkmoth (*Acherontia styx styx*) is a sphingid moth in the order Lepidoptera. They are considered one of the important insect pest of the genus Clerodendrum in the family Lamiaceae. The lesser death's head hawkmoth or bee robber occurs in the northern and central part of Thailand. The biological observation of this insect was conducted under the laboratory conditions (34 °C; 70% RH) using young leaves of Clerodendrum for rearing larval stages. Males and females were fed with 25% of honey solution. The eggs were laid singly on the lower surface of the host plant leaves. Egg incubation period was 3.52±0.36 days. Newly hatched larvae consume their eggshells. They go through 4 molts before pupation. The mean of head capsule width of 1st, 2nd, 3rd, 4th and 5th instar larvae were 0.76±0.04, 1.33±0.05, 2.09±0.07, 3.43±0.14 and 5.96±0.27 mm and corresponding dorsal horn lengths 2.02±0.11, 3.90±0.16, 6.01±0.28, 8.68±0.61 and 9.38±1.02 mm, respectively. The total development time for the larval phase is about 18.53±0.89 days. The length of pupal stage was 14.36±1.27 days. The lifespan of the female lesser death's head hawkmoth is slightly longer than that of the male 13.53±3.54 and 10.00±2.20 days, respectively.

Keywords: *Acherontia styx styx,* Clerodendrum, lava host plant.

Antifungal Activity *of Emericella nidulans* against *Pyricularia oryzae*

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Fungal metabolites of *Emericella nidulans* were tested against *Pyricularia oryzae*. The experiment was designed as two factor factorial experiment in Completely Randomized Design (CRD) with four replications. Factor A represented crude extracts and factor B represented different concentrations of 0, 10, 50, 100, 500 and 1000 ppm. Result showed that EtoAC crude extract and methanol crude extract were the best inhibition of pathogen and were not significantly differed between treatments, and followed by hexane crude extract when compared to the non-treated control. In this study showed that all tested crude extracts affected the pathogen cells to become abnormal cells and possible loss of pathogenicity. Further research finding is to evaluate *Emericella nidulans* to control rice blast pathogen in pot experiment and possible in the field trial.

Keywords: *Emericella nidulans*, antifungal activity, *Pyricularia oryzae*

Efficacy of Predatory Spiders (*Agelenopsis* sp.) on Asiatic Pennywort Cutworms

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The grass spider (*Agelenopsis* sp.) is known as American grass spider which is one of the most commomly found in Asiatic pennywort plantations. It belongs to the family Agelenidae, order Araneae. It is a predatory spider and consume various type of insect pests in pennywort growing area including *Spodoptera litura*. *Empoasca* sp, *Aphis craccivora* Koch and Asiatic pennywort cutworms. The efficiency of grass spider was investigated under the laboratory conditionon(30 degree celcius: 70%RH). There was no significant interaction between gender and larval stage($p>0.05$). Both gender and larval instar had effect on efficiency test($p<0.01$). The grass spider prefer the first instar larvae of pennywort cutworms the most.

Keywords: *Agelenopsis* sp., pennywort cutworms, efficacy test

Detection of Potentially Toxigenic Filamentous Fungi and Economically–Important Mycotoxins in Samples of Soybean Curd Produced in The Philippines

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Two variants of soybean curd (firm tofu or *tokwa*, and silken tofu or *taho*) sold at selected areas in Sta. Cruz and Calamba City, Laguna, Philippines, were evaluated for total viable counts of filamentous fungi (molds) and the probable presence of toxigenic molds, and assayed for aflatoxin B1, ochratoxin and fumonisin.

The mean viable counts of filamentous fungi obtained from the *tokwa* and *taho* samples from both sites were 9.4×10^2 and < 10 EAPC, respectively.

Twenty molds were isolated from 57 pooled tofu samples (39 *tokwa* and 18 *taho*). Consensus analyses of their ITS rDNA sequences revealed that fifteen of the isolates (SA3, 4, 7-12, 14, 16, and 19-23) were *Geotrichum candidum* (99 to 100% sequence similarity) while one (SA2) was probably either *Aspergillus flavus* or *A. oryzae* (each with 99% similarity). Isolates SA 26, CB 37 and CB 39 were molecularly identified as *Trichoderma reesei* (100% similarity), *Aspergillus sydowii* (100% similarity) and *Arthrinium sacchari* (99% similarity), respectively. One isolate (CB21) had 87% similarity with *Saprochaete* sp.

Cultural and morphological characterizations of the six representative isolates (SA2, SA16, SA26, CB21, CB37 and CB39) revealed that all, except CB39, had characteristics which generally conformed with the molecular identity of the strains as determined by ITS rDNA sequence analysis. SA2 shared similarities with both *A. flavus* and *A. oryzae* though it appeared to be more closely similar to *A. flavus* due to its dark green conidia. SA16 and SA26 shared similar characteristics with *Geotrichum candidum* and with *Trichoderma reesei*, respectively. CB21, although similar to *Saprochaete clavata*, also resembled *Magnusiomyces capitatum*; CB37 was similar to *A. sydowii*. CB39, however, did not share most of the characteristics of *A. sacchari*.

On the basis of their molecular identity, two out of the twenty (10%) mold isolates were, thus, potentially toxigenic (SA2, as either *A. flavus* or *A. oryzae*, and SA26 as *T. reesei*). The prevalence of potentially toxigenic filamentous fungi in the samples collected was, thus, 3.5% (two out of 57 pooled samples). Isolate SA2 was obtained from *tokwa* while SA26 was isolated from *taho*.

When the mycotoxins aflatoxin B1 (AFB1), ochratoxin A (OTA) and fumonisin (FUM) were assayed for and quantified using competitive ELISA in soybean curd samples obtained from the same areas, four *tokwa* samples and one *taho* sample contained AFB1 at concentrations ranging from 8.33 to 14.06 ppb but which are still within the acceptable limit of 20 ppb set by the Philippine National Standard. None of the samples had detectable OTA but two *tokwa* and three *taho* samples contained FUM. Of these, two samples (one *tokwa* and one *taho*) had concentrations (6131 ppb and 6533 ppb, respectively) which exceeded 4000 ppb, as based on the internationally established FUM limit for food products.

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Ethnostudy of Mushrooms and Nutritional Composition of *Cantharellus* sp. Newly Discovered in Ukwa-East, Abia State Nigeria.

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Indigenous knowledge of mushrooms of Ukwa-East in Abia State was surveyed and nutritional compositions of *Cantharellus* species were analyzed. Eighty-five (60.71%) of the 140 administered questionnaires successfully retrieved were fully responded to. The results were analyzed by gender, age groups, and locations. The study showed that more than 85% of the respondents consume edible mushrooms because of its palatability and nutritional importance, also 23% respondents take them as substitute for meat, while 10% of the respondents consume mushrooms because of its medicinal purpose. The study also showed that more than 95% of respondents use sun drying, 13% use refrigeration, 9% make use of flaming, 1% oven dry while 2% of the respondents use salt solution to preserve harvested mushrooms. Over 87% and 54% of respondents regarded mushroom hunting as work for young women and children respectively. More than 84% of the respondents have interest in mushroom cultivation. The people in the study area consume about fourteen mushroom species. Results revealed that the phytochemical constituents of *Cantharellus* species were Alkaloids (3.725±0.00%), Tannins (0.036±0.00%), Phenols (0.67±0.00%), Saponins (01.21±0.01%), and Flavonoids (7.25±0.00%). The results of proximate composition include 16.916±0.00% Protein, 12.333±0.056% Fats, 3.75±0.00% Fibre, 42.339±0.064% Carbohydrate and 9.236±0.006% Ash. The nutrient and mineral compositions of the mushroom were Nitrate (410±0.00mgkg^{-1}), Nitrite (1.98±0.01 mgkg^{-1}) and Sulphate (6.1±0.01 mgkg^{-1}), Calcium (180.3±0.00mgkg^{-1}), Magnesium (84.2±0.1mgkg^{-1}), Potassium (202.4±0.00mgkg^{-1}), Sodium (53.1±0.00mgkg^{-1}), Phosphorus (80.41±0.01mgkg^{-1}), Nitrogen (0.82±0.02mgkg^{-1}), Iron (321±0.00mgkg^{-1}), Zinc (31.2±0.00 mgkg^{-1}), Copper (10.38±0.01 mgkg^{-1}) and Manganese (11.53±0.01mgkg^{-1}). Heavy metal concentration indicated Nikel (0.33±0.00ppm) only. Pure culture of *Cantharellus* species was not established. The residents of Ukwa-East Local Government Area of Abia State have indigenous knowledge of mushrooms and their uses and the results obtained indicate that *Cantharellus* species is a good source of phytochemicals, proximate components and minerals.However, further studies on its polysaccharide contents, toxicity, medicinal value and establishment of pure culture are highly recommended.

Keywords: *Cantharellus*, Edible Mushroom, Phytochemical constituents, Nigeria

Meiotic Resumption and Completion *In Vitro* of Immature Buffalo Oocytes after Vitrification

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Cryopreservation of buffalo oocytes can be done in using various methods of vitrification with different success rate. In this study, germinal vesicle (GV) stage buffalo oocytes were exposed to VS_1 (7.5% EG + 7.5% DMSO in BM) for equilibration (10 min) before transferring to VS_2 (15% EG + 15% DMSO + 0.6 M sucrose in BM) for 45 sec loaded in cryoloop and plunged directly into LN_2 or directly plunging into LN_2 in microdrops. After a few weeks of storage, the oocytes were warmed in step-wise dilution pattern for 3 min each in 0.6 M, 0.3 M and 0.15 M sucrose in BM, transferred to a washing solution (3x) before culturing in maturation droplets. In using the cryoloop method, the survival rate recorded was 86.5% (64/78) with a meiotic resumption rate of 85.9% (55/64). The maturation rate was 34.4% (22/64). In using the MDS method, the survival rate was 88.5% (54/75) with a meiotic resumption rate of 88.9% (48/54). The maturation rate was 42.6% (23/54). These findings indicate that both vitrification methods can be used for cryopreservation of GV stage buffalo oocytes. Future studies should be directed on attaining a higher maturation rate post warming, including its fertilizability, capacity for embryo development and eventual production of live birth.

Keywords: Vitrification, buffalo, immature oocytes, meiotic resumption, maturation

Cultures of Siamese Fighting Fish (Halfmoon variety) Fed with Commercial Feed Mixed EM (Effective Microorganisms)

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The study was done on culturing Siamese fighting fish (Halfmoon variety) fed with commercial feed mixed with EM (Effective Microorganism). The experiment design was CRD with 5 treatments and 6 replications. The study used commercial feed mixed with EM in different ratios. The treatments were as follows- treatment 1 the used commercial feed (control), treatments 2, 3, 4, and 5 the used commercial feed mixed EM 5, 10, 15 and 20 %, respectively. The Siamese fighting fish was an averaged initial weight and length of 0.44 g and 3.84 cm, respectively. Aquarium measuring was 10×10×20.5 cm and 1 fish per aquarium for 30 days. The results showed that the averages weight, length, average weight gain, length gain, and survival rate of Siamese fighting fish were not significantly different ($p>0.05$). There was an average weight of 0.928-0.980 g, average length 4.91-5.13 cm, average weight gain 0.471-0.546 g, average length gain 1.05-1.30 cm and survival rate 100%. Characteristics of the head and eyes dorsal fin, anal fin, other fin, postural and swim, fight blistering and overview of the Siamese fighting fish were not significantly different ($p>0.05$). Result showed the head and eyes as 4.66-5.00 scores, dorsal fin 7.66-10.00 scores, anal fin 8.16-9.50 scores, other fin 4.83-5.00 scores, postural and swim 4.83-5.00 scores, fight blistering 4.5-5.00 scores, and overview 16.83-19.66 scores. The fuselage and scales, caudal fin, color and tracery of the Siamese fighting fish were significantly different ($p<0.05$). The Siamese fighting fish fed with commercial feed mixed with EM at 10%, of the fuselage and fish scales, caudal fin, color and tracery were the best results. The capital cost of Siamese fighting fish per fish each treatment found that commercial feed mixed with EM at 20 %, revealed the highest production cost, and followed by the commercial feed mixed with EM at 15 and 10 %. The commercial feeds mixed with EM at 5 %, were the lowest production capital cost.

Keywords: Siamese fighting fish (Halfmoon variety), Effective Microorganism, commercial feed, culture

Growth, Population Dynamics and Optimum Yield of Indian Mackerel, *Rastrelliger kanagurta* (Cuvier, 1816), in the Eastern Gulf of Thailand

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Thailand's marine fisheries have been intensively developed since 1950s. Catches are comprised of the pelagic and demesal fishes as well as other aquatic animals. Among the pelagic species, Indian mackerel *Rastrelliger kanagurta* (Cuvier, 1816) is one of species that has created significant economic value in the country. Meanwhile the precise information on stock assessment, population dynamics and optimum yield of *R. kanagurta* were still rare, especially in the Eastern-Golf of Thailand. The objectives of this study was to estimate the growth and mortality rates to optimize the fishing pressure of the stock of the Indian mackerel in the Eastern-GoT, base on an otolith approach. In this study, the age-based approach of growth and mortality estimation and the relative yield per recruit were analyzed using the FiSAT software. For the results, the growth parameters of von Bertalanffy growth model were K=4.24 year^{-1} and L_∞ = 214.37 millimeters, respectively. The total mortality coefficient (*Z*) was estimated at 6.09 year^{-1} and the natural mortality coefficient (*M*) was estimated as 2.70 year^{-1}. The current fishing mortality (*F*) was calculated as 3.39 year^{-1} and the actual value of exploitation rate (*E*) = 0.56. The relative yield per recruit was estimated from the knife-edge selection of size at first capture yielded the E_{max} and $E_{0.5}$ values at 0.49 and 0.32 respectivelly and the actual value of exploitation rate was higher than both E_{max} and the $E_{0.5}$, implying the overfishing of the stock. The possible fisheries management regime for this situation is increase size at first capture (L_c) and decrease fishing pressure, i.e. *E*-value. In addition, The yield isopleth diagram also shows that eumetric fishing can be achieved at a reasonable length at first capture (L_c) of between 150.06 and 214.37 millimeters. For conclusion, this study illustrated the information on stock assessment, population dynamics of the *R. kanagurta* resources in the Eastern-GoT, as well the way forward for optimum exploitation. These findings can be further applied in the sustainability of Indian mackerel in the Eastern-GoT.

Keywords: Fish stock assessment, otolith, age and growth, mortality, relative yield per recruit

Utilization of Mangosteen (*Garcinia mangostana* Linn.) Pericarp Extract to Treat *Zoothamnium* sp. Infection in White Leg Shrimp (*Litopenaeus vannamei*).

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Zoothamnium sp. is an aquatic protozoan that causes lifeless, defective appendage and immune reduction in the shrimp (*Litopenaeus vannamei*). *Zoothamnium* sp. infections causes secondary infection by bacterial, viruses and fungi. This study investigated optimum concentration levels of mangosteen pericarp (peel, rind or hull) extract, effective against *Zoothamnium* sp. from the *L. vannamei*. The against test, toxicity test and water quality were conducted at the RBRU labarotory experimental. The most effcetive concentration of mangosteen pericarp extract to treat *Zoothamnium* sp. was 0.5 g/L, follow by 1.0, 1.5 and 2.0 g/L respectively, which can eliminated all *Zoothamnium* sp. at 21, 18, 15 and 12 hour, respectively. By consequence, however, the concentration of mangosteen pericarp extract also caused mortality of *L. vannamei*. From the total 10 individual of *L. vannamei* from the begin of the experiment. The concentration at 0.5 g/L caused the *L. vannamei* mortality of 2.33 ± 0.58 (average ± SD) individuals, follow by the concentrations of 1.0, 1.5 and 2.0 g/L, which caused the mortality values of *L. vannamei* 3.00 ± 0.00, 4.00 ± 1.00 and 4.67 ± 0.58 individuals, respectively. For the concentration of 0.5 g/L, during the experimental period, the average DO, pH and water temperature were beginning at 3.87 mg/L, 9.08 and 27.41 ℃ respectively. At the end of the experiment, the average DO, pH and water temperature were 0.39 mg/L, 7.79 and 28.89 ℃, respectively.

Keywords: *Garcinia mangostana* Linn., *Zoothamnium* sp., *Litopenaeus vannamei*

Utilization of Shrimp Shell Substitute Soybean for Hybrid Catfish (*Clarias macrocephalus* × *Clarias gariepinus*) Diet

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The objective of this study was to investigate the effects of shrimp shell-powder inclusion and treatment on growth of Hybrid Catfish (*Clarias macrocephalus* × *Clarias gariepinus*). The 225 individuals Hybrid Catfish (11.19 ±0.38 cm body length and 8.36 ± 0.61g body weight) were fed with five practical diets containing 39% of crude protein for 45 days. Diet 1 was a control diet containing 100% soybean meal. Diet 2 -5 contained 25%, 50%, 75% and 100% shrimp shell powder substituted to soybean meal. Post experiment, fish growth (weight gain, length gain and average daily gain) did not show any significant differences ($p>0.05$) between the treatments. Meanwhile, feed conversion ratio (FCR) and survival rate also showed the non-significant differences ($p>0.05$) among treatments. The present study indicates that shrimp shell-powder may be included in the hybrid catfish diet, up to 75% as a substitute for soybean meal without detrimental effects.

Keywords: Hybrid catfish, shrimp shell powder, diet, soybean meal replacement

Preliminary Guideline for Replacement of Fish Meal for Good Aquaculture Moving Towards Organic of Maejo Buk-Siam Hybrid Catfish

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The experiment was conducted to evaluate the fish culture of Maejo Buk-Siam Hybrid Catfish (*P. gigas x P. hypothamus* F2) with three different feed formulas (1=control, 2= 50% replacement for fishmeal with Napier grass and 3=50% replacement for fishmeal with Hydrilla) to find out the preliminary guideline for organic Maejo Buk-Siam Hybrid Catfish. The initial body weight of 2 months Maejo Buk-Siam Hybrid Catfish is 47.28±13.81 grams. Which were reared in 3x5 m^2 eastern pond (1.5 fish/m^2) at HuayTong and 6 months Maejo Buk-Siam Hybrid Catfish is 440±64. 14grams which were reared in 1x1 m^2 cages (4 fish/m^2) at PlaBuk knowledge base, Maejo university. The results showed that final body weight containing different feed formulas have no significant differences ($p>0.05$): 108.2±17.40, 122.17±35.10, 122.50±18.83,respectively in eastern pond at HuayTong and 642.92±54.86 ,685.70±41.19, 625.00±54.87 in cages at PlaBuk knowledge base, Maejo university. Brightness (L* Brightness), redness of meat (a*red), yellowness of meat(b*yellow), percentage of protein and lipid in meat and percentage of meat of fish with three different feed formulas were have no significant differences (**$p>0.05$**). While the smell of meat in fish was fed with dietary formula-3 has the value of satisfaction higher than control. These results verified that, it is possible to replacement for fishmeal with Napier grass or Hydrilla to real Maejo Buk-Siam Hybrid Catfish from 5-6 months. Consequently, those are beneficial to reduce production costs and develop the fish production for food security and preliminary guideline for Good Aquaculture Moving Towards Organic of Maejo Buk-Siam Hybrid Catfish as well.

Keywords: Maejo Buk-Siam Hybrid Catfish, Napier grass, Hydrilla , growth performance ,organic aquaculture

Cryopreservation of *Bubalus bubalis* L Rumen Bacteria: Effect on Viability and Conversion of Crop Residues into Soluble Sugars for Bioethanol Production

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The study had determined the effect of glycerol, 100%, 80% and 60% as cryoprotectant on bacterial cell viability and efficiency of conversion of carbohydrates in bagasses of sweet sorghum and sugarcane, and rice straw hydrolysis using rumen bacteria after cryopreservation at low temperature (-20^{0}C) and ultra low temperature (-156^{0}C) vapor phase of liquid nitrogen for 54 days. Pellet of fresh culture of rumen bacteria isolate was mixed with glycerol at 1:1 ratio of culture and glycerol solution. Cryovials were kept in cryoboxes for low temperature storage while vials in cryocanes inside canisters were kept at vapor phase of liquid nitrogen tank. New Bauer Hemacytometer was used to count viable

cells before and after cyrovial was thawed at 37^0C for 5 minutes. For the hydrolysis, recovered viable cells were sub-cultivated in seed culture liquid medium. Carbohydrates in biomass and hydrolysates were analyzed using 3,5 Dinitrosalycilic acid assay for reducing sugars. Results showed that level of glycerol had insignificant effect on the viability at prolonged storage in the vapor phase of liquid nitrogen. Rumen bacteria *Clostridium* RS91 preserved in three glycerol solutions had averaged viability 17.28% after 54 days in the vapor phase of liquid Nitrogen while corresponding conversion of carbohydrates into sugars efficiency at 36 and 48 hours hydrolysis was 57% and 53.4%, respectively. The performance of the LN2 cryopreserved carabao rumen bacteria was significantly effected by duration of hydrolysis($p>0.05$). Three seed culture inoculants with species combinations of *Bacteroides, Clostridium, Lactobacillus,* and *Streptococcus* from low temperature cryopreservation had carbohydrates conversion efficiency that was insignificantly effected by composition of culture(MCI) while 64.84%, 38.27% and 30.52% efficiency of carbohydrates conversion of the mixture for bagasses of sweet sorghum, sugarcane, and rice straw showed that feedstock had significantly affected performances of the bacterial seed culture($p>0.05$). Periodic testing revealed ethanol was produced by *Saccharomyces cerevisiea* fermented carbohydrates of bagasses of sweet sorghum, sugarcane and rice straws hydrolyzed by frozen and thawed carabao rumen bacteria. To our knowledge, this is the first report on cryopreservation of Philippine carabao rumen bacteria and was vital in the elucidation of the nature of rumen bacteria as microbial inoculant in hydrolysis pretreatment of alternative feedstock intended for biofuel production.

Keywords: liquid nitrogen vapor phase, low temperature, cryopreservation, rumen bacteria, hydrolysis, glycerol

Commercial Feed and Algae for Feeding *Pinna Bicolor* in Indoor Tanks

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The purpose of this research was to determine the growth rate and survival rate of *Pinna bicolor* fed with commercial feed mixed with algae in 3 different proportions under the indoor condition. *Pinna bicolor* with the size more than 13 cm. length were caught from the natural in Chonburi province and were acclimatized in the concrete pond for 10 days. 30-33 ppt. of seawater was used in the experiment. After acclimatization, *P. bicolor* were divided into 3 treatments with 3 replications. Treatment 1 was fed with 0.5 g. of commercial feed and 1 liter of mixed *Isochrysis* sp. + *Tetraselmis* sp. in 25-liter indoor tank. Treatment 2 was fed with 1.0 g. of commercial feed and 1 liter of mixed *Isochrysis* sp. + *Tetraselmis* sp. Treatment 3 was fed with 1.5 g. of commercial feed and 1 liter of mixed *Isochrysis* sp. + *Tetraselmis* sp. All three groups of were fed with the same microalgal species at the same density and the same kind of commercial feed. All treatments were fed once a day for 3 months. Water was changed every day at least 1 liter and sediment was removed. Length, width, weight and survival rate of *P. bicolor* were recorded every month. At the end of the experiment, it was found that all treatments had survival rates of 100% and growth rates showed no difference in length and width. Only weight had little higher than the initial weight but showed no statistical difference. This experiment revealed that *P. bicolor* could be cultured under the indoor condition.

Keywords: *Pinna bicolor*, commercial feed, algae, growth rate

Growth Performance of Tilapia (*Oreochromis niloticus* Linnaeus) Fingerlings Fed Diets Containing Different Levels of Spirulina (*Spirulina platensis* Geitler)

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In the present, the problem of solid waste in Mahasarakham caused rapid economic and social expansion. Solid waste management is inadequate and with the use of technology is not appropriate. Because most of the waste is collected by disposal method being used to collect solid waste collected from the community on the ground for landfill and letting the natural degradation affect the quality of the environment in various ways. The objective was to study the Initial Environmental Examination: project of effective waste management with production as a renewable energy of the Mahasarakham Provincial Administrative Organization. The results were divided into 4 aspects 1) physical environmental impact: surface water had a BOD value that exceeds the established standards, groundwater values were

standard. 2) effects on the biological environment, including the forest and wildlife effect was low. 3) effect on the value of human use, including land use was in low level in residential areas in the industrial areas. And the use of the area livestock, did not have any effect on the project area. 4) impact on economy and society. Project of solid waste management effectively with the production of renewable energy changing from the area of no use was the value added of land use by the impact on the well-being of society or community was very low. The employment of the people in the community and surrounding area led to generate income, flow of money in the economy, help the economy and the income of the community better, quality of life and well-being of helping people in the community better as well as improves the utilities of the community. It is good for the economy and the society of overall space.

Keywords: *Spirulina platensis*, Nursing, Tilapia (*Oreochromis niloticus*, Linnaeus)

Insoluble Fiber Prepared From Rice Hulls for the Dietary Supplementation of Growing-Finishing Pigs

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Rice hulls consist of mostly insoluble dietary fiber. When insoluble fiber is ingested, it is not broken down in the gut, but rather, absorbed into the bloodstream. This increases the rate of passage and fecal bulk, which helps to keep pigs regular and prevent constipation. This experiment aims to determine the effects of insoluble fiber that is prepared from ground rice hulls in terms of growth performance in growing-finishing pigs and the nutrient digestibility of growing pigs. The growth performance of growing-finishing pigs is studied using basal diets that contain different levels of insoluble fiber from rice hull meal (RHM). Three treatment groups with body weights (BW) of 20–50, 50–80, and 80–100 kg receive 0/0/0, 0.5/1.0/2.0, and 1.0/2.0/3.0 percent of RHM, respectively. Thirty pigs (initial weight 20±0.10 kg) are used in this study. They are housed in individual pens and fed diets containing corn-soybean meal and rice bran as the main ingredients. All of the groups show similar average daily gains (ADG) compared to the control (T1) group, whereas the T3 and T4 animals show significantly better ($P<0.05$) feed conversion at 20–50 kg BW compared to the control group. This result is related to the lower feed intake in the T3 animals. The T2 and T3 animals have significantly higher feed intake ($P < 0.05$) and worse FCR than the control group in the finishing pig1 (50-80 kg BW) period. No significant differences are observed in terms of growth performance during the finishing-2 (80-100 kg BW) period or throughout the whole period from 20–100 kg BW. The nutrient digestibility of growing pigs is studied in five pigs (initial BW= 20±0.5 kg). The pigs are allotted five treatments in a replicated 5×5 Latin square and are provided a corn-soybean meal-rice bran control diet or a diet in which rice bran is partly replaced by 0.5%, 1%, 2%, and 3% RHM. The apparent total tract digestibility (ATTD) of the nutrients and energy are measured. For the RHM supplemented diets, the ATTD of dry matter, ash, and crude fiber decrease with as the inclusion of RHM ($P<0.05$) increases. There are no differences in the ATTD of crude protein and ether extract in terms of digestible and metabolizableenergy. In conclusion, the diets of growing-finishing pigs could be supplemented with 3% RHM. The metabolic utilization of dietary energy and crude protein are not affected by the inclusion of RHM up to 3% in growing pigs under the conditions of the present study.

Keywords: dietary fiber, rice hull, digestibility, growing pigs, finishing pigs.

Life History of Jumping Spiders (*Plexippus paykulli*)

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The jumping spider (*Plexippus paykulli*(Audouin)) is ranked in the Araneae, family Salticidae. It isone of the common spider in asiaticpennywort growing areas and its surrounding areas. It is a small spider that can eat various types of insect pests. A female lays egg in a silken sac around 30-65 eggs. Egg incubation period is 11-12 days. It undergoes 7 spideringbofore being adults. The immature stages take 112.38 days and adults live for 19-30 days. Hairs are found cover its entire body and legs. The females are nearly the same size as males. Color of carapace and abdomen of adult spider can be used for identification of males and females including palpi.

Keywords :Asiaticpennywort, *Plexippus paykulli*

Effect of Feeding Wheat Pollard as Feed Supplementation on Dry and Organic Matter Digestibility in Indonesian PE Goats Fed Native Grasses

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The aim of this study was to evaluate the effect of feeding wheat pollard as feed supplementation on dry and organic matter digestibility in Indonesian PE goats fed native grasses. Twelve (12) Indonesia PE (*Peranakan Etawa*) goats with an average body weight of 19.1 kg., aged 7-8 months, with similar BCS (Body Condition Score) were used in this experiment. All 12 animals were distributed into 3 treatments with 4 goats in each, namely T-1: feed supplementation containing 20% wheat pollard, T-2: feed supplementation containing 25% wheat pollard, and T-3: feed supplementation containing 30% wheat pollard. All goats were fed native grasses *ad libitum* and were given of free access of clean water. Dry matter and organic matter digestibility was measured in 7 days collection period after 10 days adaptation period. During measurement period, where all goats were kept in metabolic cages, feed offer and residue as well as fecal output were collected and weighed daily. Around 20% of feed and feces were then sub-sampled and analyzed for their dry matter and organic matter content. The results obtained were analyzed using ANOVA followed by DMRT to test the difference between the means.

Result indicated that T-3 (feed supplementation containing 30% wheat pollard) has the lowest dry (75.2 ±7.97%) and organic matter (76.7 ±7.8%) digestibility compared with the other two treatments.

Keywords: wheat pollard, PE goat, dry and organic matter digestibility

Bioaccumulation of Cadmium in Selected Tissues of *Hoplobatrachus rugulosus* Wiegmann

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Bioaccumulation of cadmium in selected tissues of *Hoplobatrachus rugulosus* Wiegmann was analyzed using atomic absorption spectrophotometer. Frogs was sacrificed for the determination of the extent of bioaccumulation in the stomach, liver, kidney and muscles. Digestions of samples were done at Chemistry Section of the Department of Science and Technology (DOST). The heavy metal concentrations were determined with a Fast Sequential Atomic absorption spectrophotometer (AA280FS Series). Furthermore, results of this study showed that stomach showed the highest cadmium level with 466mg/100g, followed by liver with 388.12 mg/100g, muscle with 226.46mg/100g and the

least is in urogenital (kidneys) with 57.89mg/100g. It should be noted that the *Hoplobatrachus rugulosus* used in this study was directly collected from the places where garbage with suspected cadmium content materials is present to determine the real long term effects of cadmium. This study showed that the contamination of cadmium into the environment and could bio-accumulate to amphibians and other animals living in the area and threaten their survival. The results obtained indicated that the heavy metal is toxic and could be lethal as it bio-concentrates along the food chain. Different effects of cadmium were discussed in this study but this needs to be further ascertained with regards to the effect of heavy metals on the entire population of the anuran amphibians.

Keywords: Bioaccumulation of cadmium, *Hoplobatrachus rugulosus*, stomach, liver, kidney, muscles

Association of Dik2670 Microsatellite Marker with Carcass Trait in Crossbred Beef Cattle

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This research is aimed to study a relationship of DIK2670 microsatellite marker with carcass trait of the fattening crossbred beef cattle. A total of one hundred and ninety eight Brahman-Charolais fattening crossbred beef cattle from member farms of the Pon Yang Khram Livestock Cooperative in Sakon Nakhon Province, were used as a sample. The cattle were raised under the cooperative feeding system. After slaughter, cold carcass weight, dressing percentage, marbling scores, rib eye area, and rib fat thickness were measured. The data was analyzed as a descriptive statistic. DNA from blood of the sample was extracted and amplified for the locus of microsatellite. PCR products were tested using agarose gel electrophoresis. The alleles of the microsatellite marker were separated by using denaturing PAGE SSLP technique. The sizes of alleles were visual read and recorded. Frequency of the alleles was studied. General linear model was used to analyze the association of the carcass trait with the genotype of DIK2670. The independent factors were slaughtered times, genotype, and final weight as co-variable. The results showed that 6 allele with the sizes of 226, 223, 221, 215, 212, and 210 based pairs (namely A, B, C, D, E, and F) were appeared. The E allele had the highest frequency, 0.28, while the lowest was the allele F, 0.03. In addition, 19 genotypes were found. The top three genotypes which had higher frequencies were BE, BD, and EE, respectively. The genotypes of the microsatellite had not significantly influenced cold carcass weight, dressing percentage, rib eye area, and rib fat thickness, ($P>0.05$), but it had highly significantly affected the marbling score ($P<0.001$). It meant the DIK2670 microsatellite marker was associated with the marbling score in the Brahman-Charolais crossbreds. Therefore, the DIK2670 microsatellite could be utilized as a marker to improve intramuscular fat in the crossbred population.

Keywords: Microsatellite marker, Carcass, Crossbred beef cattle

A Novel Furan Fatty Acid, 7,10-Epoxyoctadeca- 7,9-Dienoic Acid as Potential Livestock Antimicrobial

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Furan fatty acids (FFAs), as an alternative feedstock for specialty chemicals have gained much research interest in recent times, however, functional benefits of FFAs in the food and feed industry are largely remained unexplored in controlling food-borne, agricultural and antibiotic resistant pathogens especially in livestock as non-antibiotic feed additives as well as clean labeling in agriculture. The present study was able to produce a high purity 7,10-EODA (>95%) with a recovery of greater than 40% using flash chromatography. Comparison with the natural antimicrobial fatty acids, 7,10-EODA showed lower MIC values at about 4-8 folds with *Staphylococcus aureus* ATCC 29213 when compared with the oleic acid and DOD, the precursor molecule of 7,10 EODA. The 7,10-EODA showed selective antibacterial property towards gram-positive bacteria *Staphylococcus aureus* (ATCC 10784) strains completely preventing the growth of *S. aureus, Coryneabacterium glutamicum,* and *Bacillus subtilis* ATCC 6051 without

recurrence of growth, while a decrease in *Escherichia coli* exhibited an initial delay in the lag phase at higher MIC of 7,10-EODA. Further, the anti-MRSA and MSSA of 7,10 EODA was comparable to vancomycin. MIC of 7,10-EODA inhibited completely the growth of MRSA and MSSA with mild bacteriostatic to the tested pathogens ranging 62.5-500µg/ml. Finally, the ability of 7,10 EODA to control food-borne, agricultural and antibiotic resistant pathogens strengthen our claim the possible utilization of 7,10-EODA along with minimal antibiotics or natural organic acids in animal feed to promote the health of livestock and to prevent the dissemination of MRSA and MSSA.

Keywords: Furan fatty acid; 7,10-epoxy octadeca-7,9-dienoic acid (7,10-EODA); antibiotic resistance; anti-MRSA and MSSA

Evaluation of Different Carbon Sources for Polyculture of Hybrid Catfish (*Clarias gariepinus x Clarias macrocephalus)* and Nile Tilapia (*Oreochromis niloticus*) under Biofloc Technology

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This study aimed to investigate the appropriate carbon sources for produce biofloc and growth performance of hybrid catfish (*Clarias gariepinus x Clarias macrocephalus*) and nile tilapia (*Oreochromis niloticus*) under biofloc technology. Molasses was designed to be main combination between wheat flour and rice bran with 50:50 ratio and its individual as different carbon sources. The plastic tanks contain 3.5 ton of water was prepared. The stocking density of hybrid catfish and nile tilapia fingerlings were prepared for 40 and 30 fishes per cubicmeters moreover fishes were fed with feed pellet under catfish and tilapia program within 4 and 6 months, respectively. The C/N ratio was controlled within 10 ratio. The water quality particularly dissolved oxygen (DO) and NH_3-N were maintained at 5 ppm minimum and 1 ppm maximum, respectively. The results showed that there were no significant of biofloc production between different carbon sources included the single molasses, molasses with wheat flour and molasses with rice bran with 53±1.85, 57±1.24 and 60±1.77 ml/liters, respectively (P>0.05). While, weight gains, average daily weight gains (ADG), feed conversion ratios (FCR) and survival rates of hybrid catfish and nile tilapia were no significant too (P>0.05). This was indicated that wheat flour and rice bran can be used to be the other carbon sources for develop biofloc production and it could effected growth performance of hybrid catfish and nile tilapia (r=0.37 and 0.51, respectively) (P<0.05) with high survival rates (97.60±1.73 and 95.11±0.59, respectively) and low FCR (1.65±0.82 and 1.68±0.96, respectively)

Keywords: carbon sources, hybrid catfish (*Clarias gariepinus x Clarias macrocephalus*), nile tilapia (*Oreochromis niloticus*), biofloc

Sex Ratio of Genomar Supreme Tilapia Strain Exposed to Elevated Temperature

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The study evaluated the sex ratio of Nile tilapia exposed to elevated temperature. It also investigated the best family from Genomar Supreme Tilapia (GST) strain with the best response on temperature induced sex differentiation. The study used 2x5 factorial design with Factor A, the two temperatures (28℃ and 36℃) and Factor B, the 5 families of GST strain. The study consisted of ten treatments with three replicates. Yolk sac fry undergo a 10-day exposure to temperatures 28°C (T28) and 36°C (T36), after exposure to these temperatures, the fish were nursed in indoor tanks for 30 days before gonad squashing.

Mean survival rate of different families of tilapia exposed to the two temperatures was significantly affected by the interaction between family and temperature (P<0.05) and were also significantly different between families and between temperatures. Mean survival rate of Family 3 (F3; 71.47%) was significantly higher than those of the other families. Moreover, Family 5 (F5, 69.33%), Family 4 (F4, 69.00%) and Family 1 (F1; 62.83%) were comparable to each other but significantly higher than Family 2 (F2, 45.22%). Mean of survival rate after 30-day nursing of previously exposed GST strain in T28 and T36 was not affected by the interaction between families and temperatures and was also not significantly different between families and between temperatures. Generally the survival rate was high ranging from 85.46±17.32 – 96.66±1.25% and this might be attributed to the ideal temperature of 28℃ during the nursing period.

Comparing results of the two temperature treatments showed there was apparent increase of male at T38 as compared to T28. Chi-square test for fixed ratio analysis, however, showed that all families including those exposed to T28, deviated from the expected sex ratio of 1:1. Percentage male was significantly affected by the interaction between family and temperature ($P<0.05$) and was also significantly different between families and between temperatures. On the effect of family, mean male percentage of F3 (78.00%) was highest but was comparable to that of F5 (77.83%) and F2 (76.91%), then, followed by that of F4 (73.67%), that was not significantly different to F1 (72.42%). Moreover, significantly lowest mean male percentage was recorded in F1.

The study concluded the following: 1) survival rate of GST was affected by the temperature of the water with significantly lower survival rate at elevated temperature; 2) elevated temperature of 36 ℃ was effective in sex reversal of GST; and 3) F3 had the best response on temperature induced sex differentiation based on sex ratio and survival rate.

Effects of different mushroom by-product types and levels on growth performance and survival rate in dietary of Nile tilapia (*Oreochromis niloticus*)

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The utilization of 2 different types of mushroom by-product, *Pleurotus sajor-caju* (Fr.) Sing (MBPP) and *Schizophyllum commune* (MBPS), in Nile tilapia diets was investigated. Seven isonitrogenous (crude protein 32%) and isolipidic (crude lipid 7%) practical diets were formulated by replacing fishmeal protein with mushroom by-product protein (MBP) at 3 different levels (20, 40 and 60%) of each MBP type comparing to control diet (Diet 1). Each diet group was randomly allocated to triplicate groups of fish in aquaria (80 Liters) and each aquarium was stocked 10 fish with initial weight 7.5 g/fish. Fish were fed by hand twice daily with apparent satiation for 6 weeks. Two-way ANOVA was used for evaluation of main effects of variables, i.e. MBP type and inclusion level, as well as interaction effects between MBP type and inclusion levels on survival rate, growth performance, protein efficiency ratio (PER) and fish production cost from feed. The results showed that MBP type affected growth performance, PER and fish production cost in that fish fed diet containing MBPP showed the higher result than those fed MBPS diets ($p<0.05$). However, the inclusion level of MBP was not significantly difference. Those fish fed the diet containing MBPP replacement fishmeal protein at 20-60% and fish fed diet containing MBPS replacement fishmeal protein at 20% was not significantly difference to control diet fed group ($p>0.05$).

Keywords: Mushroom by-product, protein replacement fishmeal, Nile tilapia diet

Production and Evaluation of High-Protein Biomass from Sweet Potato for Broilers and Aquatic Species

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A fermentation setup to mass produce high-protein biomass from sweet potato for broiler and aquatic animal feed was established at Tarlac Agricultural University. Following the establishment of the solid state fermentation facilities for the project, solid state bag-based fermentation of sweet potato was initiated. This system completes the fermentation for a month and the fermented material was used as feed for broilers and some aquatic species. The high-protein biomass was analyzed for its protein and other nutrient contents which defined the potential of this material as broiler and fish feed.

Proximate analyses (using AOAC methods) show that the fermented product is high in protein, contains medium chain fatty acids, and some antibacterial metabolites that were produced by the fermenting agents. The material is also free of polyaromatic hydrocarbons. At very high moisture content, the high-protein biomass from sweet potato can contain from 30.93% to 44.68% crude protein. Three species of micro-fungi and two species of macro-fungi were used as fermenting agents. The micro-fungi species can produce high-protein biomass containing 33.77% to 36.28%, while the macro-fungi species can produce high-protein biomass containing 31.08% to 38.51% crude protein.

Feeding trials with boilers showed that 5-20% by weight substitution of the commercial rations with high-protein biomass from sweet potato elicited comparable weekly, gain and final weights, feed consumption and feed conversion efficiency when checked against the control ration which was without high-protein biomass.

The digestibility coefficient of protein biomass for shrimp, tilapia and bangus (milkfish) is high ranging from 71.8% to 91.2%. Feeding trials with milkfish and tilapia showed that increasing the dietary inclusion of high-protein biomass by up to 50% showed no inhibitory activity on growth and overall physiological performance of the fish. The feed conversion ratio (feed efficiency), specific growth rate and protein efficiency ratio were not affected by the increase in dietary inclusion of up to 50%. Results of the trial on shrimp (*P. vannamei*) suggest a different pattern of response as compared to the other two fish species. Growth of *P. vannamei* was found significantly higher with higher (25-50%) dietary inclusion levels of high-protein biomass. Specific growth rate (SGR) was also found better in these treatment groups but feed conversion efficiency was found slightly higher than the control group.

Keywords: protein enrichment, biotechnology, solid-sate fermentation, protein biomass, feed resource

Performance of Red Tilapia (*Oreochromis* sp.) Fed Diet with Fermented Banana (*Musa acuminata* ×*balbisiana*) Peel at Different Stages of Ripeness Following *Aeromonas hydrophila* infection

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This study evaluated the dietary effect of fermented banana (*Musa acuminata* × *balbisiana*) peel at different stages of ripeness on growth, antioxidant capacity, metabolic response and survival of Red tilapia (*Oreochromis sp*.) reared for nine weeks following *Aeromonas hydrophila* infection. The fermented banana peel (FBP) with 100 ml DW was sprayed unto one kg of commercial tilapia feed; 200 ml immature FBP (iFBP), 200 ml ripe FBP (rFBP), 200 ml over ripe FBP (oFBP), while 300 ml DW for the control diet (C). Significant effects of treatments on growth were observed from 3rd to 9th week of rearing. Final weight, specific growth rate and protein efficiency ratio of oFBP-fish were significantly higher and FCR was significantly lower than that of C-fish. WG of oFBP, rFBP, iFBP-fish was increased by 80%, 43% and 29% than that of C-fish, respectively. On the other hand, disregarding ripeness, percentage survival of FBP-fish was significantly higher than that of C-fish after nine weeks of rearing. SOD of oFBP, rFBP and iFBP- fish was decreased by 59, 43 and 35 % as compared to that of C, respectively. GPx and GR activity of oFBP-fish were higher than that of the C-+fish. oFBP and rFBP-fish had 52 and 44 % lower Gluc level as compared to that of C-fish, respectively while Lac level of oFBP-fish was lower than that of C-fish. However, no significant difference was found on Trigs. Interestingly, all FBP-fed groups exhibited higher percentage survival than that of C-fish group and the highest post-challenge survival (70%) was recorded in the oFBP-fish group. Disregarding ripeness, higher extrapolated fish yield per 1000 m2 was obtained in FBP-fish than that of C-fish, oFPB>rFBP>oFBP>C while the results for cost-benefit ratio was as follow: oFBP<rFBP<oFBP<C. Overall, these results indicated that FBP at different stages of ripeness, especially oFBP enhances growth performance, stabilizes both antioxidant capacity and metabolic response, improves resistance of Red tilapia against *A. hydrophila* infection and provides better cost-benefit ratio. FBP could be therefore considered as potential alternative to synthetic growth promoter and antioxidant products used in aquaculture industry.

Keywords: Aeromonas hydrophila; Fermented Banana Peel, Tilapia

The Differences and Relationship in the Gene Expression of Calpain System and Pork Tenderness Between Duroc Purebred and Crossbred Pigs

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Meat tenderness is the most important attribute for consumers' demands which affected by calpain enzyme activity. The objectives of this study were 1) to compare the gene expression of calpain system and meat tenderness of Duroc purebred and crossbred pigs and 2) to investigate the relationship between gene expression of calpain system and pork tenderness. Longissimus dorsi (LD) muscle of pigs 1) Duroc purebred (D), 2) two-way crossbred of Large White and Landrace (LWLR), and 3) three-way crossbred of Duroc, Large White, and Landrace (DLWLR) were taken for measuring the gene expression of calpain system by real-time PCR technique and shear force analysis, respectively. The results revealed that gene expression of calpain system of Duroc purebred and crossbred pigs were statistically

significant differences ($P < 0.01$). The expression of CAPN1 of DLWLR was higher than LWLR and D ($P < 0.01$). The expression of CAPN2 of LWLR and DLWLR pigs were higher than D pigs. Shear force value of LWLR was the highest following by DLWLR and Duroc purebred ($P < 0.01$). There were statistically significant relationship between CAPN1 and CAPN2 ($r = 0.71$, $P < 0.01$) and also between CAST and CAPN1 ($r = 0.53$, $P < 0.01$) as well as CAST and CAPN2 ($r = 0.44$, $P < 0.05$).

Keywords: Duroc purebred, crossbred, gene expression of calpain system, meat tenderness

Seed Production of Nile Tilapia (*Oreochromis niloticus* L.) as Affected by The Breeders' Stress-Coping Style

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Physiological and behavioral responses to stress can form distinct profiles in a wide range of animals. These profiles are widely known as proactive and reactive profiles or stress-coping styles. This study determined the effect of stress-coping style on the reproductive performance of *Oreochromis niloticus*. The stress-coping style of the breeders was determined through the changes of their eye color pattern (ECP) after the two-day isolation period. The proactive breeders (PB) were those individuals that manifested shorter period of adjustment in the new environment as indicated by the lower ECP values (0 to 3) at the end of the isolation period; whereas, the reactive breeders (RB) were those individuals that exhibited longer period of adjustment in the new environment as manifested by the higher ECP values (5 to 8) at the end of the isolation period. Different combination of breeders were tested: T1 (PB♂ PB♀); T2 (RB♂ RB♀); T3 (PB♂ RB♀); and T4 (RB♂ PB♀). Breeding was carried-out using twelve (1 x 2 x 1m) hapas installed in a pond. The sex ratio was one male: three females with stocking density of 8/m^2. Collection of egg and fry was done after fourteen days of breeding. Results showed that the sperm quality of proactive male was significantly different ($P<0.05$) to the sperm quality of reactive male. In terms of sperm motility, PB had significantly higher ($P<0.05$) motility of 9.2±0.577 than the RB (7.0±0.854). On the other hand, in terms of sperm density, PB also had significantly higher ($P<0.05$) sperm density (2.025x109±2.481x108) than the RB (9.688x108 ±2.11x108). On spawning success and seed production per female that spawned, the four treatments showed homogeinity. In total seed production, however, it was found that T1 (PB♂ PB♀) had significantly higher ($P<0.05$) total seed production of 1442.33±80.41 than the other treatments. The total seed production of Treatments 2 (RB♂ RB), 3 (PB♂ RB♀) and 4 (RB♂ PB♀) were found comparable to each other with only 658.00±144.78, 900.00±20.00 and 597.00±170.66 seeds, respectively. Results of the study demonstrated that the stress-coping style as determined by ECP changes during isolation, can influence the reproductive performance of *O. niloticus*. These differences of proactive breeders and reactive breeders in terms of sperm quality and seed production, demonstrated that the determination of stress-coping style by observing the changes in ECP during the two-day isolation was an effective tool in the determination of the breeding quality of the fish.

Keywords: Stress coping style, proactive breeders, reactive breeders, Nile tilapia, breeding, seed production

Session 5: ENVIRONMENTAL SCIENCE, SOIL AND WATER CONSERVATION

Clean Water Resources are of Crucial Importance for a Society

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The need of water will drastically increase during the coming decades for increase of population, increase of energy needs, and climate change. The problems are regional: some have not enough water and some suffer from floods. The climate change and overuse of water will lead to the situation that about half of the global population will suffer from lack of water until 2030. There are also problems of pollution caused by organic wastes and chemicals. Most water resources are distributed over countries like Mekong river. This may cause local conflicts.

Energy production is bound to water in its all forms. Even coal power plants use big amount of water.

Communal water management is technically solvable but only few countries do it in sustainable way. Many developing countries have no proper legislation for waste waters. They are introduced directly into rivers without purification, including dangerous industrial wastes. From the present population of 7.6 billion, 71% has safe water source, 89% has at least basic water service. Globally > 2 billion people use drinking water contaminated with faeces. Contaminated water can transmit diseases like diarrhea, cholera, typhoid and polio. Contaminated water causes 850,000 deaths only for diarrhea annually.

Agriculture is using about 70 % of water what is more than industry and house holds together. It is forecasted that the need of water in agriculture doubles until 2050 because of increased population. To produce 1 kg of rice consumes 3.5 m^3 water but 1 kg of meat 15 m^3. Hence, the choice of food is important. The waste loads from industry and communities are more easily technically controllable than from agriculture. Agriculture is not paying for water for the real price. When water will be limiting resource, farmers shall pay for water. In South-East Asia, governments – or preferably governments together - must be proactive in protecting their water resources since it will be strategic property. Water must be managed like money in bank: outcome and income must be known. Those who use more, must pay more.

Monitoring Urban Heat Island in the Eastern Region of Thailand and its Mitigating through Cities Greening and Urban Agriculture

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This research aims to explore the characteristic of urban heat island of the region, by analyzing and estimating a thermal of Urban Heat Island (UHI) phenomena that cover agricultural, industrial, and urban areas in the eastern by using climate models in Geographic Information Systems (GIS) and RS (Remote Sensing) data, which it integrates land surface temperature (LST), with estimated by single-channel algorithm for Landsat satellite data and ground-based weather stations in 2006, 2011 and 2017 years. The Eastern Region of Thailand is the intensive industrial development region of the country, as a result, the region has developed and expanded into a city more than other regions. There are many changes on land use pattern and human settlement in the region. Many of vacant land and agricultural land were replaced by roads, infrastructures, and buildings. There are many of urban communities and industries located spread throughout the region especially, Chon Buri and Rayong.provinces. Buildings and its surfaces and transport systems which constructed by brick, concrete and asphalt act as enormous heat storage also, it accumulates with the human and industrial activities of urban areas, have caused urban zone to have higher temperatures than the surrounding countryside area. From the study, many cities in the region has increasingly temperature, the highest temperature data shows that between year 1951 to 2014, an increase of summer temperature which was observed in during February to May, the average temperature is 37.81, 38.5, 39.50, 36.41 degrees Celsius, respectively. The result is urban and industrial areas that have a higher temperature compared to the surrounding agricultural areas. These different temperatures cause the formation of UHI in the eastern region. Especially, UHI has covering Eastern Economic Corridor: EEC. This study recognizes that UHI effect is a significant factor linking to anthropogenic sources, to protect the environment and to mitigate the UHI effect there involves different environmental strategies, one of the important strategy is a cities greening, increased of green cover surface area in cities, within green infrastructure methods and techniques, urban agriculture is an alternative mitigation which currently being considered. Urban Agriculture is considered as an opportunity to mitigate the environmental impacts, because, urban agriculture can play a strong role in enhancing food security by providing agricultural products to the residents of the city, greening the city and improving the urban climate.

Keywords: Urban Heat Island(UHI), Urban Agriculture, GIS, Environmental Mitigation

Soil Chemical Improvement Under Application of Liquid Organic Fertilizer in Closed Agriculture System

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Soil degradation due to prolong and excessive application of synthetic fertilizer for last 3 decades has been acquired a lot of attention from soil scientists and practices. As the only sources of nutrients for organic farming, organic fertilizer is believed to improve soil properties. The study aimed to determine the improvement of soil chemical properties in closed agriculture system as influenced by the application of liquid organic fertilizer. The experiment was carried out at Closed Agricultural Production System (CAPS) Research Station in Air Duku Village, Bengkulu, Indonesia, employing Randomized Block Design (RCBD) with 2 factors. The first factor consisted of 3 varieties of sweet corn, i.e. Talenta, Jambore and Asian Honey. The second factor was the rates of liquid organic fertilizer (LOF), i.e. 0, 25, 50, 75, and 100 mg l^{-1}. LOF was applied at 2, 3, 4, 5, 6, and 7 weeks after planting with total volume of 600 ml per plant. At sweet corn harvesting, soil samples were collected at the depth of 0-20 cm. Samples were air-dried for 2 days, ground, and sieved with 0.5 mm screen and analyzed for selected soil chemical properties. The experiment pointed out that sweet corn varieties exhibited alike Total Organic Carbon (TSOC), NO_3-N, available P, exchangeable K, exchangeable Al and soil pH but Total Soil Nitrogen (TSN). Sweet corn variety of Asian Honey provided noticeably highest TSN as compared to other varieties. Another significant finding was that application of LOF substantially increased TSN, NO3-N, exchangeable K, and soil pH even though had no effect on TSOC, available P, and exchangeable Al. Liquid organic fertilizer is a useful tool for supplementation of solid organic fertilizer to improve soil quality and plant nutrient supply in closed agriculture system.

Key words: Liquid Organic Fertilizer, Closed Agriculture System, Soil Chemical Properties.

Assessment Monitoring of Watershed Management to Reduce Risk Disaster and Community Adaptation to Climate Change in Pasak River Basin Area, Thailand

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This qualitative study was conducted to assessment monitoring of watershed management to reduce disaster risks and community adaption to climate changes in Pasak river basin. This study also employed participatory action research by using learning exchange venue, survey, interview, and focus group discussion methods. Locale of the study was at Pong sub-district, Dansai district, Loei province and the study lasted one year. Research instruments in this study were observation form, data recording form, and in-depth interview conducted with a target group of 105 people obtained by purposive sampling. Obtained data were analyzed by using frequency, percentage, and mean. Results of the study were the following:

Almost all of the informants were engaged in agriculture as their main occupation particularly on ginger and maize growing and some other occupation included artisan and hired-water. Most of the informants migrated from neighboring provinces and aged between 41-50 years. Most of the informants living in Pasak river basin had problems in water management. This included the following: 1) water sources for agricultural purpose were lower than agricultural areas making a high investment expense on bringing water up to the agricultural areas; 2) unable to use ground water due to the limitation in a topographic condition (mountainous area); and 3) surfaced soil erosion particularly due to heavy rain and deforestation for cultivation/capitalist' residential area. However, some natural water sources such as creak, waterfall, and a natural fountain can be utilized during the rainy season but the water was turbid and inadequate for household consumption/agricultural purpose during the dry season. Therefore, the community tried to solve these problems by keeping water in big containers, building cluck-dams, and digging a big pond for public use.

Regarding the past Pasak river basin management, there was a basin management policy mostly focused on check-dam construction. Besides, the management of Pasak river basin emphasized on utilization rather than natural resource conservation. It was observed that community participation in the conservation was rather little and not consistent with the development plan of concerned agencies. In addition, it was found that legal limitation was an important problem encountered, including a policy of the public sector had a negative impact on people around the upstream area.

The following were management guideline gained from the study: 1) coordination of all parties in preparing a strategy on the improvement of the eco-agricultural area which was consistent with the area condition of each farmer; 2) support on in-depth eco-agriculture guidelines for the adaptation to global warming condition and natural calamity; and 3) using the public policy to solve the problem in natural resources/environment and disaster n Pasak river watershed area based on community and concerned party participation for sustainable utilization.

Keywords: monitoring for situation assessment, watershed management, disaster, community adaptation, participatory process, Pasak river watershed

Colored Plastic Mulches Influence Weed Growth and Soil Temperature in Tropical Highland

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Plastic mulch is commonly used in organic farming practice to suppress weed growth, increase soil temperature, and maintain soil moisture, leading to enhancement of crop yield. The study aimed to determine weed shifting and soil temperature under solarization with color plastic mulches in the long-term organic farming system and to find out the weed dominance after soil solarization. The experiment was carried out at the CAPS Research Station located in Air Duku Village, Rejang Lebong, Bengkulu at 1054 m above sea level. Completely Randomized Block Design (RCBD) was assigned to 4 treatments, consisting of silver-black, black, clear, and without mulch (control). The treatment was replicated 3 times. Plastic mulches were laid on 1m x 2 m raised soil bed for 2 months of soil solarization treatment. Soil temperature was measured every day in the morning (9.00 am), at noon (12.00 am) and in the afternoon (03.00 pm) for 2 months at the depth of 5, 10, 15 cm from the soil surface. Soil samples at the depths of 0-5 cm, 5-10 cm, and 10-15 cm were collected after 2 months of solarization and weed seed germination was tested in the greenhouse. The experiment revealed that soil temperature at noon and in the afternoon was higher than that in the morning and the lower temperature was observed at a deeper part of the soil. Soil treated with plastic mulch exhibited higher temperature than the control with the temperature range between 24^{o}C-46^{o}C and the highest temperature was achieved by treatment of clear plastic mulch. In addition, green house test showed that two months of soil solarization treatment did not affect both the dominance and shifting of weed species, being *Croton hirtus* as dominant weed species at all treatments. There were 10-11 growing weed species with the total number of 501, 498, 418, and 368 at black plastic, silver black plastic, clear plastic, and control, respectively. A number of weed species at control were lower than other treatments was due to that weed species had grown in the field before soil sampling. Clear plastic mulch was more effective to inhibit weed growth in comparison to the other plastic mulches. Nonetheless, soil solarization for 2 months using plastic mulch for organic farming practice in a highland area has not been effective to control weed since soil temperature for weed inhibition was not achieved.

Keywords: weed control, soil solarization, plastic mulch, soil temperature

Impact of Microbial Inoculation on Herbicide Affected Soil

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Glyphosate is the most widely systemic herbicide in agricultural practice. It is characterized by high efficiency and low production costs. Its worldwide use has expanded because of extensive use of certain agricultural practices such as no-till cropping, and widespread application of glyphosate- resistant genetically modified crops. In the present study was investigated on Morphological, photosynthetic pigments and soil glyphosate characteristics were investigated in vegetable crops such as *Abelmoschus esculantus, Solanum lycopersicum* and *Capsicum annuam* with various microbes inoculation under herbicide and non-herbicide treatment. Soil sample collected from Dalmiya Colony of located in the Salem District, Tamil Nadu, India. 1% of glyphosate herbicide was sprayed the sterilized soil. Vegetable crop seeds were sown in each pot at green house. Bioinoculants inoculated plants of leaf, stem, root length, fresh and dry weight were compared to non-herbicide plants and control of uninoculated bioinoculants plants at 45 DayAfter Inoculation (DAI). The highest increase of photosynthetic pigments such as chlorophyll a, b and total chlorophyll content was higher in bioinoculants inoculated crops of *Solanum lycopersicum*, followed by *Capsicum annuam* and *Abelmoschus esculantus* in glyphosate containing herbicide. Glyphosate-tolerant crops had a major impact on use of other herbicides. Herbicide content was significantly decreased of bioinoculants inoculated soil compared to herbicide uninoculated control. One of the toxic herbicide of glyphosate was degraded by inoculated bioinoculants such as *Bacillus* spp., *Rhizobium* spp. and *Pseudomonas* spp. with vegetable crops. The result was showed that bioinoculants may possess potential to be used in bioremediation of herbicide. Further studies, analysis of the effect of glyphosate on microbial and vegetable crops may also gave information on the effects of the herbicide on the ecosystem and the environment.

Keywords: Glyphosate, Bioinoculants, Herbicide, Plant growth , Bioremediation, Environment.

Assessment of Sustainability of Urban Water and Water Demand Management by Using Geo-information Technology for Vientiane Municipality, Vientiane Capital, Lao PDR

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According to the economic and population growth and after Lao People's Democratic Republic (Lao PDR a member of ASEAN Economic Community (AEC)), the water consumption and demand from 1997 to 2016 are continuous increasing, especially the Vientiane Capital is a fastest-growing city in the Lao PDR by population growth rate of 1.6% in 2016, economic growth rate of over 10.98% in 2016. Due to the National Action Plans of Lao PDR, to achieve government water supply and sanitation access targets for 2020, it was examined the priority actions on water supply development in urban area, ensure that finance is effectively turned into services, and also support the Sustainable Development Goals (SDGs) to make sure everyone to access the clean water to improve the quality of life, however this plan is still far to achieve. The objective of this study was to analyze water supply demand, water resources and urban changed of the Vientiane Municipality by using Geo-information technology, and to create five years plan for water supply system development based on analysis results of Vientiane Municipality. The questionnaire survey which consisting of a series of water supply demand by collect from 400 peoples (households) in the Vientiane Municipality was conduced, the results were shown that the customers require the NPNL (Nam Papa Nakhone Luang – Water Provincial Authority) to improve three issues such as 1) water volume and pressures; 2) fast water installation and repair; and 3) water quality problems. Moreover, the relation of water demand and water supply, this research found that the percentages of water supply demand are 30% higher than recent water supply, especially water supply consumption at the commercial areas in the peak hours, it needs to produce more water supply and also improve water supply pipe system by replacing the poor and small sizes of old water pipe. Furthermore, the amounts of water supply consumption will increase year by year, the ways to balance regional water supply and water demand is needed to increase the production capacities from 180,000 m^3/day into 330,000 m^3/day in 2020 and 460,000 m^3/day in 2030, which is possible by taking more raw water from Mekong River and Nam Ngum River in the present and future situations.

Keywords: sustainability, urban water, water demand, water supply system, geo-information technology.

The Project Feasibility Study and Analysis of a Waste-Electric Power Plant of Kamalasai Sub-district Municipality, Kamalasai district, Kalasin province

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Kalasin province has a lot of solid waste and the problems encountered in solid waste management in the community as a whole were : trash stink, trash was not categorized, trash was not enough, location bins inappropriate, the ferret waste of people and animals and also drop around, wastewater from the garbage collection vehicle, the garbage truck comes not in time, including the lack of motivation to participate and the lack of the campaign and promote continuously. Therefore, joint problems should be solved in the management of solid waste in Kalasin province by bringing refuse derived fuel (RDF) from solid waste to produce electricity. The purpose was to the project feasibility study and analysis of a waste-electric power plant of Kamalasai Sub-district Municipality, Kamalasai district, Kalasin province. The study found that

1) The model of the project: using gasification technology. The process of manufacturing uses refuse derived fuel (RDF); category 5: Densified RDF. 2) finance and economics : the IRR is 3% and the NPV is 187,678,311.38 baht, which has a payback period of 13 years and 1 month, which shows that the 8 MW. It is possible to invest in construction being economically feasible and feasible to invest because of the return on investment of the project in the appropriate range of investment. 3) impact of the waste electrical power plant project : the expected impact on direct and indirect power plants is the instability of the power generation system, electricity purchase prices during periods of different power requirements, impact on society and environment. 4) risk and risk management : the risks that may result from implementing the project are technical issues,financial problems and management issues along with the risk management of the project and the solution to problems and obstacles. 5) the availability of the junk power plant

project : there aere the preparation of the project in various areas such as the readiness of the local governmence organization, readiness of area, readiness of technology, readiness of personnel and readiness of budget. Therefore, this project is feasibility and appropriate in all aspects; the model of the project, finance and economics, impact of the waste electrical power plant project, risk and risk management and the availability of the junk power plant project.

Keywords: The Project Feasibility Study and Analysis, Waste-Electric Power Plant, Kamalasai Sub-district Municipality Kamalasai district Kalasin province

Synthesis and Characterization of Zinc Oxide Nanoparticles as a Source of Zinc Micronutrient in Biofertilizer

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Deficiency of micronutrients in plant will result to a reduced yield and in severe cases it may cause plant death. Among these micronutrient deficiencies, Zn deficiency is the most damaging to crop yield. Zinc is a co-factor that is involved in enzyme systems and metabolic reactions in plants. In this study, aloe vera leaf extract was utilized to synthesize ZnO nanoparticles. The synthesized ZnO nanoparticles were dispersed in organic fertilizer (fish amino acid + chitosan) which can be a potential source of zinc for plants. Zinc oxide nanoparticles were synthesized using aloe vera leaf exract as stabilizing agent. The synthesized nanoparticles were characterized using UV-Vis Spectrophotometer, Fourier Transform Infared Spectrophotometer (FTIR) and Scanning Electron Microscopy (SEM). The zinc oxide nanoparticles were dispersed in organic fertilizer and was applied to tomato plant to determine its effect on the growth performance of the plant. The synthesized ZnO nanoparticles exhibited SPR peak at 290 nm and a vibrational frequency peak at 478 cm-1 on its UV-Vis and FTIR spectra. Analysis of the SEM micrograph shows average particle size of 50.67 ± 10.22 nm. Application of the ZnO nanoparticles dispersed in organic fertilizer to tomato plant for seven weeks in pot experiment shows significant increase in height for treatment 1 (15 ppm ZnO NPs) and treatment 2 (30 ppm ZnO NPs) by 17.36% and 22.64% respectively, when compared to the control (0 ppm ZnO NPs). Similarly, the total mass of fruits yield in treatment 1 and treatment 2 was significantly increased by 121.50% and 127.23% relative to the control. Application of ZnO NPs dispersed in organic fertilizer to tomato plant can significantly enhance its growth performance.

Keywords: zinc oxide nanoparticles, zinc deficiency, micronutrient, growth performance, nanotechnology

The Energy Costs of Producing Lowland Rice Established in Different Practices in Cambodia

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Agricultural practices play an important role in increasing crop yields but high crop yield is associated with high energy use. In Cambodia, rice is established differently. This study was carried out to estimate the energy inputs and the energy footprints of lowland rice established in 4 methods, namely: direct seeding, transplanting, System of Rice Intensification (SRI) and no till rice cropping system. 166 rice farmers in the lowland areas were interviewed to determine the energy used in the field level production of rice established in 4 methods. Results revealed that the total energy inputs (TEI) in the field production were in the following order: transplanting, direct seeding, no till rice cropping system and SRI at 15278.08 MJ ha^{-1}, 14108.79 MJ ha^{-1}, 11682.74 MJ ha^{-1} and 10866.16 MJ ha^{-1} respectively and the output-input energy ratio was 3.48, 3.64, 4.87, 5.30 respectively. The least energy used and energy footprint per kg of rice was in SRI.

SRI consumed the lowest energy inputs at 10866.16 MJ ha^{-1} and gained more energy outputs at 57589.20 MJ ha^{-1} followed by no till rice cropping system. This was due to least amount chemical fertilizers and no chemical pesticides applied in the field. The energy inputs such as: human and animal labor, seeds, composts, chemical pesticides and fertilizers, fossil fuel and machinery contributed the significant different energy inputs of each practice, Chemical fertilizer especially nitrogen shared the highest among those energy inputs at 4074.48 MJ ha^{-1}. The average energy footprint in the farm of the 4 practices was 1786.33 kg CO2e ha^{-1}. The lowest energy bill, hence energy footprint was in SRI which consumed 3.20 MJ kg-1 paddy rice while the inputs of transplanting, direct seeding and no till rice system

was 4.881 MJ kg^{-1}, 4.672 MJ kg^{-1}, 3.489 MJ kg^{-1} respectively. The Minimizing tillage and optimizing nitrogen application can reduce high amount of energy inputs and energy footprints of producing rice under Cambodian growing conditions.

Keywords: energy inputs, direct seeding, transplanting, System of Rice Intensification, no till rice cropping system, energy footprint

Development Indicators of City Resilience for Water Resources Management in Chiang Rai Province, Thailand

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Chiang Rai province is located in the north of Thailand, and is one of the cities facing effects of climate changes: floods, landslides, inadequate water supplies, as well as urbanization. Regarding climate changes, there must be the process of building city's response and development of indicators in order to cope with the climate changes. Thus, the objectives of this study were to develop indicators and provided information, which are useful for related organizations and communities to understand the situation of city resilience for water resource management. The indicators development process were comprised of three steps: 1) literature review of knowledge about concepts, theories, research, as well as forming the proposals of development indicators of city resilience, (2) selecting evaluation criteria , and (3) grouping and developing indicators. The results revealed that there were totally 13 indicators divided into two targets to develop city resilience indicators. The first target was Chiang Rai must have sufficient clean water for sustainable use (9 indicators), and the second target was agriculture and community must have adequate and goo quality water (4 indicators). The good indicator for the first target was Chiang Rai required sufficiently clean water for sustainable use, while the bad indicator was there must be an improvement is enhancing community level to participate in water management. Regarding the second target, the good indicator was agricultural and community sectors had sufficient water and quality, whilst the bad indicator was there was a requirement for planning improvement to seek new or alternative water sources.

Keywords: Resilience Indicator, Water Resources Management, Chiang Rai Province

Agricultural Innovation System in Selected Non-Irrigated Rice Municipalities in Nueva Ecija, Philippines

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This study sought to analyze the agricultural innovation system in selected non-irrigated rice municipalities in Nueva Ecija. Specifically, it aimed to: 1) discuss the innovations that exist in the area, 2) analyze actors and their roles in the innovation system, 3) analyze their interactions in terms of sharing and utilizing generated innovations on rice, and 4) analyze the effects of innovations on farmers' yield. Through key informant interviews, focus group discussions, and field observations, primary data were primarily collected from 37 key informants representing the actors of the innovation system and 70 farmers who have at least tried using the innovations. Case study was used as an approach to this qualitative research.

Results revealed that in both rainfed lowland and rainfed upland rice areas, efficiency innovations were found available and used by the farmers. In rainfed lowland however, farmers mostly used product innovations while in rainfed upland rice areas, strategy innovations were the most common. Production strategies mainly focused on capital lending, deployment of village-based extension workers, and water harvesting. Most actors were under the extension and support systems domain and performed limited roles while almost no actor was engaged in research and entrepreneurial activities other than those from the private sector. Farmers remained to be project beneficiaries and recipients of government subsidies. In terms of interaction, actors remained passive as they wait for others to initiate something instead of pushing for things on their own. All innovations used by farmers directly and indirectly contributed to their increase in yield.

Given the results, it is recommended that government investments in these areas be focused in generating revolutionary innovations, empowerment of farmers, and in the development of rural-based enterprises.

Keywords: Agricultural Innovation System, innovations, actors, interactions

Factors Influencing People Participation in Community Forest Management in Phrae Province, North Thailand

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This study investigated the factors that influenced people participation in the community forest management by using the questionnaire for data collecting at Mae Sai villages Phrae Province, North Thailand. The results showed that factors influenced people participation in community forest management included the people participation in decision making and setting community forest zones that led to their satisfaction. In addition, their livelihood was better as they earned more the income. The study suggested that people participation in community forest management resulted in human well-being and sustainable community forest resource management.

Keywords: community forest, management, participation

Multi-temporal mapping of seagrass distribution by using integrated Remote Sensing data in Kung Kraben Bay (KKB), Chanthaburi province, Thailand

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The seagrass beds are a unique marine productive ecosystem that provides a shelter, a food source for the marine community of animals and act as a biofilter in marine environments. Now the seagrass situation shows the current number of seagrass beds have been continuously decreasing in Thailand. The objective of this study was to present the comparison of a high-resolution satellite imagery and aerial photograph by Unmanned Aerial Vehicle (UAV) to change detection in the Kung Kraben Bay between 2011 and 2017. The study area was a 5.59 km^2, shallow (depth 2.5 m) and clear water in the Tha Mai district, Chanthaburi province, Thailand. The WorldView-2, GeoEye-1 and aerial photograph by UAV were composited to the Normalized Difference Vegetation Index (NDVI) image and classified to 3 classes such as a long leaf seagrass type (*Enhalus acoroides*), short leaf seagrass type (*Halodule pinifolia* and *Halodule uninervis*), and another object. The visual interpretation with in situ data and supervised classification technique assisted to seagrass detection in very high-resolution image. The classification results show that the visual interpretation with in situ data that the overall accuracies and Kappa coefficients were higher than supervised classification with maximum likelihood such as 74.42% and 0.568, respectively. From 2011 to 2017, the total area of seagrass distribution has not changed, but the seagrass density has changed in some area. The resultant maps provide a changing of landscape scale seagrass dynamic data and the advantage of an aerial photograph by UAV for seagrass detection in a shallow water environment.

Keywords: Seagrass beds, Multi-temporal, Aerial photograph, UAV, NDVI, WorldView-2, GeoEye-1, Remote Sensing, Kung Kraben Bay

Impact of Temperature on Distribution of Diamondback Moth (Lepidoptera: Plutellidae) on Cabbage Leaves

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Diamondback moth (*Plutella xylostella* L) is an important pest of head cabbage. It is one of very destructive insect pest of cruciferous vegetables. The larvae prefer leaves of all plants in the Brassicacea family. It has a short life cycle and very high fecundity. Pattern of egg distribution was clumped rather than spread evenly. High number of eggs and pupa was found on the dorsal side of the leaves. The larvae occur more on the ventral side of the leaves than the dorsal side in the morning and evening and vise versa at noon. High temperature might make the larvae move toward the shaded area, consequently during noon the larvae were found more on the dorsal leaf surface than the ventral part.

Safe and Potable Water for the Community- Science City of Munoz T.U.B.I.G. Project in Focus and the Central Luzon State University Water Potability Testing Activity

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Tap water from deep well is the common source of drinking water in the Science City of Munoz (SCM) and inside the campus of Central Luzon State University (CLSU), water pumped from deep well supplies all colleges and buildings. As part of the Millenium Development Goals set for the Philippines, one of the agenda of the SCM is to ensure that safe water is available for its community.With this on hand; the available water should meet the potability requirements to be rendered safe for drinking, cooking and laboratory use. Water supply is essential for the daily living and activities of the SCM community and inside the CLSU campus, thus clean sources of water must be maintained and analysis must be done regularly in the SCM community and the university. Methods: Two kinds of media were used in this test, namely Nutrient Agar (NA) and EMBA. The first medium permitted the growth of all the bacteria that were present in the sample, while the second one detected the presence of *E-coli.* Samples were diluted using the standard serial dilution procedure. Results: After conducting serial dilution for each water sample, the total number of colonies was observed after the first 12 hours of incubation in NA. Average number of colonies was computed by taking the average count. All the water samples tested from the different barangays yield negative result for the presence of enteric bacteria. In CLSU however, the College of Agriculture and College of Home Science and Industry consistently gave the highest and the lowest number of bacterial growth respectively. Moreover, all the water samples collected from the university revealed positive growth of enteric bacteria by showing a metallic green sheen, indicating presence of *E. coli.* Conclusions: The available tap water from all the barangay of the Science City of Munoz is potable while the tap water tested from the different colleges tested inside the Central Luzon State University is not potable.

Keywords: potability, tap water, eosin methylene blue agar, nutrient agar, *E-coli,* green metallic sheen, Eosin Methylene Blue Agar (EMBA), Millenium Development Goals (MDG).

Bulbsets as Planting Materials for Off-Season Onion Production under Rainy Simulated Condition

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Onion bulbsets as planting materials for off-season production as affected by different rainfall simulations (watering as needed-control, watering twice a day until bulb maturity and watering four times a day until bulb maturity) and different sizes of bulbsets (≤1.0 cm, 1.1 to 2.0 cm diameter and 2.1 to 3.0 cm diameter) of Rio Bravo variety (yellow granex) were evaluated under the tunnel-type rain shelter during wet season (August-October 2013) at the experimental area of Research Office, Central Luzon State University. The experiment was laid-out in 3 x 3 factorial in Randomized

Complete Block Design (RCBD) with three replications. The research aimed to identify the most appropriate diameter of bulbsets that will give the best survival rate and to determine the quality and quantity of harvested bulb in terms of size.

Results showed that percent germination was significantly higher when subjected to watering twice a day and watering four times a day until bulb maturity. In terms of percent survival, watering as needed (control) garnered the highest mean of 69.8%. In terms of disease incidence, percent bulb rot (*Fusarium oxysporum L.)* was significantly higher at 40.4% when watering four times a day until bulb maturity was done. Anthracnose-twister disease (*Colletotrichum gloeosporiodes*) was also observed at watering four times a day until bulb maturity with an average of 19.3%. Mortality increases as water application increases which further underscore the susceptibility of onion to frequent wetting.

Bulbs produced from using bulbsets with 1.1-2.0 and 2.1-3.0 cm diameter had an average of 5.3 cm diameter classified as large. Bulbsets with 2.1-3.0 cm diameter produced computed yield of 29.7 t/ha. The computed yield when watering was done when needed (control), on the other hand, was recorded at 35.1 t/ha after 60 days.

Keywords: Bulbsets, anthracnose-twister disease, bulb rot, off-season, tunnel-type rain shelter

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Analyzing Meteorological Factors which affected the Cultivation and Growth of Rice, Sugarcane and Cassava in Thailand Using Geoinformatics Technology

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Most of Thailand's population is a farmer who cultivates an economic crop. Planting of economic crops depends on physical factors such as soil, nutrient content, and weather factors such as rainfall, moisture and so on. The weather factors is an important factor, there is a variability of weather, which is an uncontrollable factor. The phenomenon of flood, drought, precipitation, rain, and/or temperature change, it will directly and/or indirectly affect the cultivation and growth of plants, including causing widespread damage, especially outside the irrigation area. This paper presents Geoinformatics Technology that integrated Remote Sensing (RS) and Geographic Information Systems (GIS) for studying weather variable based on satellite imagery and how to apply its result to GIS database. Firstly, the physical and climate factors which affected the cultivation of economic crop, namely, rice, sugarcane and cassava, also plant diseases and insect pests of economic crops are defined, based on review a literature and a research related to weather variables (i.e. rainfall, temperature, and relative humidity) that have a positive and a negative impact on the growth of economic crops. Secondly, the development of empirical model from studying weather factors that influence to grow plants for surveillance in agricultural sector is developed. Lastly, the development of a weather monitoring and surveillance system as a guideline for promoting the cultivation of crops in the agricultural sector and for preventing and mitigating the risk of the impact on the cultivation of the plant is developed, by using the Web Map Service which standardized by the Open Geospatial Consortium (OGC). As the result, the aim of this study is to reduce the risk of damage on economic crops for farmers as well as it can be used as a database and transfer knowledge to next generation farmers in the future.

Keywords: Geoinformatics, GIS, Metrological Factors, Agriculture, Rice, Sugarcane, Cassava

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Initial Environmental Examination Report: Project of Effective Waste Management with Production as a Renewable Energy of the Mahasarakham Provincial Administrative Organization

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In the present, the problem of solid waste in Mahasarakham caused rapid economic and social expansion. Solid waste management is inadequate and with the use of technology is not appropriate. Because most of the waste is collected by disposal method being used to collect solid waste collected from the community on the ground for landfill and letting the natural degradation affect the quality of the environment in various ways. The objective was to study the Initial Environmental Examination : project of effective waste management with production as a renewable energy of the Mahasarakham Provincial Administrative Organization. The results were divided into 4 aspects 1) physical environmental impact : surface water had a BOD value that exceeds the established standards, groundwater values were

standard. 2) effects on the biological environment, including the forest and wildlife effect was low. 3) effect on the value of human use, including land use was in low level in residential areas in the industrial areas. And the use of the area livestock, did not have any effect on the project area. 4) impact on economy and society. Project of solid waste management effectively with the production of renewable energy changing from the area of no use was the value added of land use by the impact on the well-being of society or community was very low. The employment of the people in the community and surrounding area led to generate income, flow of money in the economy, help the economy and the income of the community better, quality of life and well-being of helping people in the community better as well as improves the utilities of the community. It is good for the economy and the society of overall space.

Keywords: Initial Environmental Examination Report, Project of Effective Waste Management with Production as a Renewable Energy, Mahasarakham Provincial Administrative Organization

Energy Accounting : A Quantitative tool for Determining the Sustainability of Corn Production in Barangay Vitali, Zamboanga City, Philippines

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This study was conducted to calculate the energy usage as basis for determining the sustainability of white corn production grown under upland rainfed conditions of Barangay Vitali, Zamboanga City, Philippines. A total of 2,637.76 Mcal ha^{-1} was calculated energy bill of corn produced in Barangay Vitali. Of the total energy bill, 91.76% (2,420.37 Mcal) was derived from indirect energy bill. The high indirect energy was attributed to nitrogen fertilizer 1,472.41 Mcal (55.8%), chemical pesticides 229.34 Mcal (8.6%), phosphorus and potassium fertilizers 165.30 Mcal (6.25%), and seeds 70.20 Mcal (2.6%). The direct energy or the diesel oil used in operating the machines was estimated at 185.70 Mcal (7.01%) while the embedded energy (EE) or the energy spent in the manufacture of machines, farm implement, vehicles used for transport and draft animal utilized from land preparation to harvesting and postharvest operations summed up 31.69 Mcal(1.2%).

With an average yield of 1,870.0 kg per ha (equivalent to an energy output of 6,563.70 Mcal per ha), the energy balance (EB) was 2.49 or 1 cal of energy was used to produce 2.5 cal of white corn (unmilled) . The current average yield of white corn (1.87 ton ha^{-1}) is suggestive that there are yields below it in the uplands of Bgy. Vitali, Zamboanga City. The break even energy for milled corn is 1.2 ton ha^{-1} .This means that yields below 1.2 ton ha^{-1} are unsustainable yields, energy wise. Where this low yields are obtained, soils are severely eroded or degraded. Despite the application of high dosage of inorganic fertilizers, particularly nitrogen, yields are low which explains the high energy bill to produce grain corn . Hence, it is impractical to continuously plant corn in these areas of Bgy. Vitali, Zamboanga city.

Zamboanga del Norte is predominantly hilly, sloping, to mountainous terrain. There must be an urgent assessment of corn areas with similar growing conditions of Bgy. Vitali, where producing corn is energetically a loss. Suitable, ecologically sound, and soil restorative technologies (agroforestry systems centered on fruit trees or wood trees) should replace the soil erosive, energy negative monoculture corn farming in these fragile upland ecosystems.

Keywords: Liquid Diesel Oil Equivalent (LDOE), Energy Bill (EB), Direct Energy (DE), Indirect Energy (IE), Embedded Energy (EE), Net Energy (NE)

The Project Feasibility study of Solid waste Management in Kalasin Local Governance Organization to Produce Refuse Derived Fuel (RDF)

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The purposes of this research were to study the situation and waste management of the Kalasin local governance organizations and to project feasibility study of the construction waste management in order to produce a fuel. The sample is used Kalasin province local governmence district of 150 purposively selected. Tool in research was an interview of solid waste management in local governmence organization of Kalasin province. The data were analyzed

by statistics ; percentage and mean. The results showed that the Kalasin province was divided into two municipalities, the rule of 79 and break a rule of area of tambon administrative organization of 71 of total 150. They had garbage collection of 99 and no garbage collection of 51. The floor was made of Kalasin waste quantities 402.97 tons / day, there were 47 waste disposal pond. Most of the place of waste disposal to the bulk had illegally burned by the pond of waste disposal system in the removal of hygiene, powerful, and also affect the people who live nearby. The budget in solid waste management was 182,178,902 baht per year which department was the possibility of creating waste management to produce refuse derived fuel (RDF). The waste caused a 402.97 tons / day used in production is the refuse derived fuel (RDF). and can reduce the problems in solid waste management using the style being appropriate in the management of solid waste management in the form set disposal system by producing refuse derived fuel(RDF).

Keywords: The project feasibility study, Solid waste management, Kalasin Local Governance Organization, produce refuse derived fuel (RDF)

Evaluating the Irrigation Efficiency using Rapid Appraisal Process Technique (RAP) in a Large Scale Irrigation, Case Study: Mae Lao Operation and Maintenance Project and Chiang Rai Irrigation Project, Thailand

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The purpose of this research was to evaluate the irrigation efficiency using Rapid Appraisal Process technique (RAP) in a large-scale irrigation in order to propose the improvements on water distribution system for the Mae Lao operation and maintenance project and the Chiang Rai irrigation project as a case study. The irrigation projects in Thailand play the important role in agriculture which can be harvested twice a year. However, in order to irrigate water to the targeted areas as planned, there are many problems such as water deficit, staff shortage in irrigation operation, broken irrigation structures, water distribution management and conflict between upstream and downstream water users. As mentioned, the irrigation project cannot achieve the objective of water distribution. Therefore, the evaluate for the irrigation efficiency is required and the RAP technique is used to evaluate the irrigation efficiency of the Mae Lao operation and maintenance project and the Chiang Rai irrigation project. It was found that the Chiang Rai irrigation project (63%) has more efficient in irrigation than the Mae Lao operation and maintenance project for 149%. The main cause of the irrigation inefficiency of the Mae Lao operation and maintenance project is the irrigated water did not meet the water users' requirement while the problems of the Chiang Rai irrigation project were the fairness of irrigated water between upstream and downstream irrigation areas and broken irrigation structures.

Keywords: Evaluation for Irrigation Efficiency, Rapid Appraisal Process, Evaluating for Large Scale Irrigation

Method Development for Pesticide Determination in Paddy Rice Using Near Infrared Spectroscopy

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A growing world population leads to an increase in demand for agricultural products and foods. In order to increase crops yield, pesticides have been extremely used, resulting in a high risk to environment and human health. A large number of pesticides are used on paddy rice field in Southeast Asia countries. Carbofuran is a highly toxic insecticide to vertebrates that has been illegally used on paddy field and other crops in developing country with a poor application and management. In order to maintain public health conditions, the control and determination of pesticide residues in agricultural products is extremely needed. This study aimed to investigate the feasibility of near infrared (NIR) spectroscopy for a rapid determination of carbofuran in paddy rice. Thai jasmine paddy rice artificially contaminated with carbofuran ranging from 0-50 ppm was used as samples. The NIR measurements of the paddy rice were performed using reflectance FT-NIR spectroscopy as a nondestructive determination. The attempt to improve prediction efficiency of carbofuran residue was then performed using the dry-extract system for (near) infrared (DESIR) technique. The reflectance NIR spectra of DESIR samples were also obtained. For data analysis, partial least square (PLS) regression

was used to develop a calibration model for the carbofuran prediction. It was found that the spectra of the contaminated paddy rice provided insufficiently accurate calibration results with coefficient of determination (R^2) of 0.87 and root mean square error of prediction (RMSEP) of 7.20 ppm. Superior prediction accuracy was obtained from the calibration model based on the spectra of DESIR samples (R^2 = 0.99, RMSEP = 3.05 ppm). It was concluded that NIR spectroscopy combined with DESIR technique had a potential to be a rapid and effective method for the determination of carbofuran in paddy rice. This method could be a powerful tool for coping with the environmental and health risk caused by a misuse or overuse of pesticides.

Keywords: Paddy rice, Pesticide, Carbofuran, Near infrared, Rapid method

Session 6: AGRICULTURAL BIOTECHNOLOGY

In Vitro Culturing of Mycorrhiza and Mycorrhiza Like Fungi

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Arbuscular mycorrhizal (AM) fungi exist in rhizosphere of several vascular plants and have important roles in sustainable agriculture as well as agricultural ecosystems management. These fungi could be able to colonize host plants by their three sources including spores, mycorrhizal roots and extraradical mycelia. There are obvious differences among fungal families and genera in life cycle and ecology. Fungi in Glomeraceae and Acaulosporaceae families could be able to colonize host plants by 3 mentioned sources while in Gigasporaceae, the only inoculum sources are spores. Spore formation depended on different factors such as seasonality, nutrient levels as well as interaction with other soil microorganisms. There are so many efforts in order to get pure isolates of arbuscular mycorrhizal fungi but most of them faced to problems and failed due to biotrophic nature of these fungi. In vitro culturing of these fungi is very important especially for studying on host plant growth and taxonomic studies. First time, Mosse used toot tissue culture method for obtaining pure culture. Also, in vitro culturing of AM fungal species using carrot (*Daucus carota* L.) transformed hairy roots by Ri plasmid of *Agrobacterium rhizogenes* (Ricker) Conn. is also another method. Using this method, several fungal species could be propagated in vitro such as *Gigaspora margarita*, *G. gigantea*, *Rhizophagus fasciculatus, Rhizophagus intraradices*, Diversispora versiformis and Funneliformis caledonium. Using this method, it could be possible to study on molecular as well as biochemical aspects of arbuscular mycorrhizal symbiosis. Unfortunately, there have not been studies on in vitro culturing of these fungi isolated from rhizosphere. The main purpose of this study is possibility of in vitro culturing of most prevalent mycorrhiza and mycorrhiza like fungi using transformed hairy roots system as well as study on fungal life cycle under laboratory conditions.

Keywords: Arbuscular mycorrhiza fungi, In vitro culturing, Monoxenic culture, Transformed roots

Plant Growth Promoting Rhizobacteria (PGPR) against Plant Disease in *Cicer arieti*

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The present study was investigated on isolation of *Rhizobium spp* were isolated from root nodules of *Vigna radiata* , *Arachis hypogaea* , *Vigna unguiculata* , *Clitoria ternatia* , and *Lablab purpureus* and the plant pathogens was *Fusarium oxysporum* were isolated from *Cucumis sativus* leaf. The isolates were futher characterized for their different plant growth promoting activities like Indole acetic acid production (IAA), ammonia production, phosphate Solubilization ,and HCN production. From bio chemical and enzymatic it was found that this bacteria belonged to the genes of *Rhizobium* spp. In vitro studies inoculation of *Rhizobium spp* increased morphological growth parameters and photosynthetic pigments such as shoot and root length, fresh weight, dry weight and photosynthetic pigments of chlorophyll a, b, total chlorophyll component and decreased by the plant pathogen of *Fusarium oxysporum.* The results showed in *Rhizobium* was used as biocontrol agent of *Cicer arietinum* (chickpea) against *Fusarium oxyporum.*

Keywords: Biocontrol, PGPR, Plant pathogen, *Rhizobium* spp.

Antimicrobial Activity of Some Natural Dyes Extract from Different Plants against Human Pathogens

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Antimicrobial textiles have gained interest from both academic research and industry because of their potential to provide high-quality life and safety benefits to people Antimicrobial activities of some natural dyes extracted from different plants i.e., prickly pear, onion, curcuma, saffron and madder against some species of pathogenic bacteria and fungi i.e., *Escherichia coli* and *Staphylococcus aureus* and fungal strains *Aspergillus* spp. and *Pencillium* spp was studied. The antimicrobial activity of wool fibers pretreated with chitosan and/or dyed with the tested natural dyes was evaluated. The all tested natural dyes showed considerable inhalation against all tested microbes .The results indicated that wool samples pretreated with chitosan and dyed with these natural dyes exhibit higher inhibition percent against all tested pathogens than the untreated samples.

It could be suggested that using natural dyes can be successfully used to replace traditional synthetic dyes and avoid environmental pollution.

Spatial and Sexual Variation on Morphometrics, Length and Weight, and Condition Factor Dynamics of Endemic Silver Therapon (*Leiopotherapon plumbeus*, Kner)

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Despite of the ecological and economic importance of silver therapon (*Leiopotherapon plumbeus*), biological information on this endemic terapontid is very scarce. Two populations of silver therapon were characterized based on their morphometrics, length-and-weight relationship, ($W = aL^b$) and condition factor (K) dynamics to assess the present status of the stocks in two different aquatic habitats. Fish samples were collected from the selected fishpond in Orani, Bataan (n=96, 66 females and 30 males), and in Laguna de Bay in Los Baños, Laguna (n=78, 46 females and 32 males). The morphometrics of silver therapon were highly affected by genders, with females being significantly larger than male in all sampling sites ($P<0.05$). Significant difference in mean length and weight were observed between populations from Bataan and Laguna ($P<0.05$). Negative allometric growth was observed in Bataan population ($b= 2.66$), whilst Laguna showed positive allometric growth ($b= 3.18$) ($P<0.1$). Condition factor (K= 1.0) showed sexual dimorphism, with significanlty higher K obtained from females in all sites ($P<0.05$), albeit site variation was not observed ($P<0.05$). All observations in body condition factors achieved higher than 1.0 (range= 1.06–1.30). This study could provide information to fisheries biology and environmental management towards stock enhancement of the fish as well as for artificial breeding and production. This is the first time that these three biological parameters have been studied in this fish species in the said sites.

Keywords: Bataan, condition factor, length-and-weight, silver therapon

The Bioactivities of Seed Coat and Embryo Extracts from Indian Gooseberry (*Phyllanthus emblica*)

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Phyllanthus emblica Linn., commonly known as Indian gooseberry, belongs to the family Euphorbiaceae. Indian gooseberry fruit is rich in antioxidant, which has been used as traditional medicine. However, the seed coat and embryo have not been reported in bioactivities. Therefore, the aim of this study was to evaluate the bioactivities of Indian gooseberry seed coat and embryo extracts. The hexane, ethyl acetate, *n*-butanol and aqueous extracts were extracted successively by liquid-liquid partition of each crude methanolic. The total phenolic content (TPC) was determined by the Folin–Ciocalteu assay. The ethyl acetate seed coat extract showed the highest TPC with values of 439.09±5.49 mg gallic acid equivalents (GAE)/g extract. The antioxidant activity was examined using ferric reducing antioxidant power

(FRAP) and 2, 2′-azinobis-(3-ethylbenzothiazoline-6-sulfonic acid) ($ABTS^{\bullet+}$) assay. The ethyl acetate seed coat extract revealed the highest of reducing antioxidant power and $ABTS^{\bullet+}$ free radical scavenging activity with 751.92±5.22 mg ascorbic acid equivalents (AAE)/g extract and 50% inhibitory concentration (IC_{50}) of 31.53±0.36 µg/ml. The antibacterial activity was performed using disc diffusion method. The ethyl acetate seed coat extract inhibited against *Bacillus subtilis* ATCC 6633, *Bacillus cereus* DMST 5040, *Micrococcus luteus* ATCC 9341 and *Staphylococcus epidermidis* ATCC 12228. Whereas, *Staphylococcus aureus* TISTR 1466 was inhibited by the *n*-butanol seed coat extract. These results suggested that the seed coat extract with ethyl acetate could be natural sources of the bioactive compound. Furthermore, it could be applied to facilitate development of products such as drugs, anti-aging and cosmetic.

Keywords: Bioactivity, Embryo and Seed coat, Indian gooseberry, *Phyllanthus emblica*

Gross Anatomy of the Female Reproductive Organs of Philippine Native Pig (*Sus scrofa* L.)

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In the Philippines, one of the fastest growing enterprises in the local swine sector is the production of organically-raised native pigs, which is mainly attributed to the increasing demand for the popular Filipino delicacy, lechon. In swine operation, farrowing rate and litter size are very essential in measuring reproductive success of a sow. To achieve these optimal reproductive rates, basic understanding of the anatomical and physiological function of the female pig reproductive system is needed in anticipating and troubleshooting reproductive problems, and in facilitating decisions which impact performance of the breeding herd. Moreover, it could be used to exploit recent advances in assisted reproductive biotechniques (ARTs) such as artificial insemination and embryo transfer. At present, theriogenological studies and anatomical data on the reproductive organs of Philippine native pigs (PNPs) are sparse if not absent, hence this study. Overall, the results obtained has provided preliminary informations on the morphometry of the reproductive organs of PNPs.

Keywords: Gross anatomy, reproductive organ, *Sus scrofa L.*

The Effect of Betel (*Piper betle* L.) Crude Extract on the Growth of *Colletotrichum* sp and *Fusarium* sp Causing Agent of Chili Diseases

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Colletotrichum sp. and *Fusarium* sp. are fungi that cause major diseases in chili, resulting in damages and low yields of this plant. The chemical fungicides are common used for management the diseases but they also result in the development of fungal resistance to the chemicals and residue in the environment. Therefore, this research aimed to study the effect of Betel (Piper betle L.) crude extract against the growth of *Colletotrichum* sp. and *Fusarium* sp. These two fungi were isolated from diseases of chili and proved for their pathogenicity. The crudes were extracted with water, hexane, ethyl acetate, and methanol. The experiment was done by mixing the crude extract with potato dextrose agar (PDA) at the concentrations of 0, 400, 600, 800, 1,000 ppm with 5 replications. The agar plugs of pathogenic fungi were placed on the middle of the PDA plates. The percent inhibition was recorded. This research found that crude ethyl acetate extract with 1,000 and 800 ppm could inhibit the mycelium growth of *Fusarium* at 100.00 and 43.76%, respectively followed by crude methanol extract which inhibited the mycelium growth of *this* fungus at 39.78%. The crude methanol extract and crude ethyl acetate extract at 1,000 ppm were gave the highest percent inhibition at 98.22 and 98.00, respectively followed by crude ethyl acetate extract at 800 ppm which gave the percent inhibition at 93.11. The crude water extract could not inhibit the growth of both *Colletotrichum* and *Fusarium*. The experiments were showed the significant different at 95%.

Keywords: Chili, crude extract, Betel

The Canker Damage on Yield of Pummelo (*Citrus maxima* (Burm.) Merr.) var. Tabtimsiam in Nakhorn Si Thammarat Province, Thailand

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Canker is one the most severe disease of citrus all over the world. Pummelo (*Citrus maxima* (Burm.) Merr.) var. Tabtimsiam growing in Pak Panang, Nakhon Si Thammarat as well as all citrus was severe damaged by canker caused by *Xanthomonas axonopodis* pv *citr*i especially on the fruits. This research was done to estimate severity and yield effecting from this disease by monitoring this disease on leaves and the mature fruit. The disease severity on leave monitoring at orchard at 3-5 and 6-8-year age trees were 13.22 and 16.63 % and on fruits were 18.92 and19.27 % respectively. While most of fruits appeared of canker symptom with incidence of both age trees of 78.58 and 86.29 % respectively. They were not significantly different between 3-5 and 6-8-year age trees. The disease severity of canker on fruit was non-effect on all fruit yield component included fruit weight, fruit without peel weight, peel weight, peel thicken, diameter, solid sugar content and titratable acidity. However, the canker appearance reduced the domestic market price from 7.14 to 2.28 USD/fruit (68%) and they were not marketable quality for exporting.

Keyword: canker, yield, severity

Isolation and Characterization of the Gonadal Primordial Germ Cells (gPGCs) of Turkey (*Meleggris gallopavo*) from 11-14 Days Old Embryo

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Primordial germ cells are the only cells in developing embryos with the potential to transmit genetic information to the next generation. The recent development of techniques for germline chimaeric production through germ cell transfer and its long-term culture without losing their germline transmission capability have provided important breakthroughs for the preservation of germplasm, transgenic bird production and the study of germ cell system. While efforts on the study of chicken germ cells had peaked, similar endeavour in turkey is lacking. In this study, a simple isolation method described in chicken for gPGCs was tested in turkey embryos. The results showed that gPGCs could be isolated/collected from 11-14 day old embryos of turkey. The highest initial discharged of germ cells was in the 1st hr of incubation with more than 60% purity rate. Discharged of germ cells appeared higher in the left gonad than right gonad. The gPGCs of turkey embryos are nucleated almond shaped cells or oval-shaped cells with tapered ends. The results of this study can be a starting point on further researches about the gPGCs of turkey embryos. Moreover, it can used for future studies related to production of transgenic birds, hybrid avian species, and chimeras etc., Future experimentations should focus on other factors that can affect the viability and survivability of gPGCs in vitro, these factors can be attributed to morphological, cytological and chemical characteristics of the cells.

Keywords: Primordial germ cells, turkey, embryo, purity

Research and Development Project of Monkey's Head Mushroom (*Hericium erinaceus*) Cultivation in East of Thailand

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Monkey's head mushrooms is an edible and medicinal mushroom, native to North America, Europe and Asia. The objective of this project was selection monkey's head mushrooms strains which had properties suitable for growing and gave high yield in east of Thailand, 6 different strains of monkey's head mushrooms from mushroom farms which located around of Thailand were selected, 1. strain from Anonbiotec Farm (AF), 2. strain from Department Of Agriculture #1 (DA1), 3. strain from Department Of Agriculture #2 (DA2), 4. strain from Aranyik Mushroom Center

(AMC), 5. strain from Doi Pui Research Station (DPRS), 6. strain from Kasetsart University, Kampaeng Saen campus (KKU). The experiments were conducted at the faculty of agricultural technology, Rambhai Barni Rajabhat University, Chanthaburi Province, during September 2015 to February 2017, average temperature was 28 ℃, relative humidity was 85 % . The trials were laid out in a Completely Randomized Design (CRD). The results revealed that all of monkey's head mushrooms strains in this research could give fruit bodies if temperature during mycelium grown (incubation time) and induced fruiting time were 26 – 30 ℃, obtained higher temperature affect mycelium grown slowly and did not gave fruit bodies and growing media was highly contaminated. Strains from AF, DA1 and DA2 could give fruit bodies 4 time, 80 – 100 % of bag number gave 2 time, 50 % and 10 % gave 3 and 4 time respectively. While strains from AMC and DPRS could give fruit bodies 3 time, 50 – 60 % of bag number gave 2 time, 10 % - 20 % gave 3 time and, could not give fourth fruiting. Strain from KKU could give fruiting only 1 time. Strains from AF and DA2 had adaptability in east of Thailand especially at Chanthaburi higher than the other strains, the yield per bag was 211.42 and 180.6 g respectively. While DA1, DPRS, KKU and AMC had the yield per bag 146.98, 111.94, 95.31 and 84.77 g respectively.

Keywords: monkey's head mushrooms, mushroom cultivation, medicinal mushroom

Morphological Aspects of *Trilocha varians* Walker (Lepidoptera:Bombycidae)

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Morphological studies of *Trilocha varians* was performed under the laboratory and on the *fig* trees. Different stages of this insect from egg to adult was observed and recorded. There are 4 developmental stages: egg, larva, pupa and adult. The eggs are round, with a diameter of 0.60-0.70 mm The larvae undergo for 4 molts. It is the eruciform larva with 3 pairs of thoracic legs and 5 pairs of abdominal prolegs. There is a caudal horn on the dorsal part of the 8th abdominal segment. The caudal horns of the 1st to the 3rd larvae are curved shape but the ones of the 4th and the 5th larvae are short and straight. The body of the second to the fourth of larval instars was covered with a white powdery secretion. Different stages of the larvae can be reared together and they showed no cannibalistic or aggressive behavior toward each other. The pupa is an obtect type with appendages attached to the body and found inside the boat shaped cocoon. The pupa has a large compound eyes, a black head and pale color of abdomen and a light yellow of thoracic part. Sex of the pupa is to determine by the suture on a ventral side of the ninth abdominal segment: the presence (female) or absence (male). An adult is a small moth including bipectinate antenna. Ocelli, proboscis and maxillary palpus are not developed. It does not has tibial spur on 3 pairs of legs and without tympanum organs observed on the thoracic and abdominal segments.

Keywords: Banyan tussock moth, host plants, *fig* tree, life history

Analysis of Energy Inputs in Rice Production at Varying Yield Levels among Selected Towns of Laguna, Philippines

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Increasing crop yields did not happen by increasing photosynthetic efficiency but mainly done by using greater amount of oil-based energy inputs. Most of these energy input comes directly or indirectly from non-renewable fossil fuel .Concerns have been raised on the excessive use and dependence on fossil fuels in crop productions in view of the fuel's related depletion and the implications of their continued use on the environment and human health. On the one hand, not using enough oil- energy based inputs such as chemical fertilizers will directly affect crop yield. Energy-related studies in rice production in the Philippines have been done. But the energy use of rice produced at different yield levels has not yet been investigated. This study was conducted to determine the energy usage of rice production in the three selected towns (Pagsanjan, Sta. Cruz and Pila) of Laguna Province in the Philippines.Using a pre-tested structured questionnaire, 176 farmers were interviewed in May 2016 for the dry cropping season. The farmers were classified based on 3 yield levels: (a) Low Yield Group (LYG): 3.0-4.0 ton ha^{-1} (b) Average Yield Group (AYG): 4.5-5.5 ton ha^{-1} and (c) High Yield Group (HYG): 6.0-7.5 ton ha^{-1}. Of the total energy inputs, LYG used 9871.00 MJ ha^{-1}, AYG 13940.00 MJ ha^{-1} and HYG 17627.10 MJ ha^{-1}. Of the major energy based inputs , fertilizers contributed the highest energy input at about 53-67%, with nitrogen as the highest contributor. Pesticides (insecticides and herbicides) were the second highest contributors at 10.12%. High energy input was correlated with high yield and negatively correlated with energy use efficiency (EuE). By location, the rice production in Pila had the highest EuE at 6.69, followed by Pagsanjan at 5.64 and Sta. Cruz at 5.79. Cruz. Three major approaches in reducing the fertilizer energy input are discussed, namely: (1) using chemical fertilizers efficiently, (2) using little or no chemical fertilizers at all, and (c) using other sources like organic fertilizers, including integrated pest management to reduce pesticides application.

Effect of Pole Types and NPK Fertilizer Rates on the Early Growth of Black Pepper (*Piper nigrum* Linn.)

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Black pepper (*Piper nigrum* Linn.) requires a reliable support, which usually called standard or pole, for proper growth and yield. In Thailand, cement pole as a support, has been widely used whereas living and non-living tree have been rarely taken. The aim of the study was to examine effect of pole types and NPK fertilizers rates on the early growth of black pepper. A field experiment was conducted with 3x4 factorials in RCBD with 3 replications where the factorial treatments were 3 types of pole (cement-, wooden- and living tree-pole) and 4 rates of NPK fertilizer (24-24-34, 48-48-68, 72-72-102 and 96-96-136 g $N\text{-}P_2O_5\text{-}K_2O$ $tree^{-1}$ yr^{-1} as F_{200}, F_{400}, F_{600} and F_{800}, respectively). Soil chemical property was analysed prior to the experiment. The bush width, internode length, leaf width and aerial root amount of black pepper were collected at 6 and 12 months after planting (MAP) whereas the cling strength of black pepper was collected at 12 MAP.

The results showed that black pepper on both living tree pole and wooden pole had internode length and aerial root amount more than cement pole did, at 6 MAP, additionally; black pepper on both of them resulted of stronger adhesive cling than cement pole did, at 12 MAP. Moreover, black pepper on living tree pole had a wider leaf than wooden- and cement pole did, at 6 MAP. However, black pepper on cement pole had aerial root amount more than wooden- and living tree pole did, at 12 MAP. At 6 MAP, application of NPK fertilizer at the highest rate (96-96-136 g $N\text{-}P_2O_5\text{-}K_2O$ $tree^{-1}$ yr^{-1}) resulted of wider leaf blade than the other rates did, whereas, application of 72-72-102 $N\text{-}P_2O_5\text{-}K_2O$ $tree^{-1}$ yr^{-1} resulted of less aerial root amount compared to the other NPK fertilizer rates did. However, the effect of NPK fertilizer rates did not show significant difference on the other parameters. Further research is required to investigate the effect of pole types and NPK fertilizer for successive years until harvest.

Keywords: black pepper, cement pole, living tree pole, NPK fertilizer, wooden pole

Prevalence of Subclinical Mastitis in Goats from Commercial Farms in The Philippines

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Subclinical mastitis (SCM) in dairy goats is considered one of the main constraints that Filipino dairy farmers encounter in pursuit of a sustainable milk production in the country. SCM poses challenge on how to diagnose this condition since the animal and the milk may appear normal but otherwise. SCM causes high economic losses owing to poor milk quality and yield and may impend serious threat in food safety. This study will further investigate and describe the epidemiology of the subclinical mastitis in dairy goats, the milking practices and the udder health management of the commercial dairy goat farms in the country which are necessary information in conceptualizing approaches to control SCM in dairy goats.

The prevalence of subclinical mastitis in goats was determined using California Mastitis Test (CMT) in n= 180 milk samples collected from commercial dairy goat farms in Nueva Ecija, Batangas, Tarlac, and Misamis Oriental, Philippines. Around 30ml milk samples were collected in goats aged 2-4 years old, apparently healthy animal without any clinical symptoms of mastitis like swelling, reddish/ bluish color udder and hot and painful to touch), on its 1st to 4th parity, processed and interpreted farm-site using the CMT scoring guide. Using a questionnaire guide, the milking practices and udder health management of 38 commercial dairy goat farms in the country were also documented.

The prevalence of subclinical mastitis in dairy goats is recorded as high as 51.11% (92/180) using California Mastitis Test (CMT) in visual score of >1. To prevent the occurrence of mastitis, 10.52% (4/38) of the commercial farms practice daily disinfection of milking area using dip or spray antiseptics, 23.68% (9/38) clean the goat's udder using lukewarm water before milk collection, 15.79% (6/38) and 23.68% (9/38) of farms do the fore-strip milking in random and in all dairy goats, respectively, majority of these farms use CMT (31.58%) as a test of choice in diagnosing subclinical mastitis, and 26.31% (10/38) of the commercial dairy farms utilize automatic milking equipment. 44.44% (8/18) of the responded farms documented that mastitis usually occurs in the 3rd trimester of lactation and at 3rd to 4th parity.

Keywords: Subclinical Mastitis (SCM), Dairy Goats, California Mastitis Test (CMT)

Effect of Plant Extracts, Bio-insecticides , Petroleum Oil and Insecticides for Controlling Rose beetle (*Adoretus compressus*, Rutelidae : Coleoptera) in Immature Oil Palm

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Rose beetles destroy immature oil palm by eating the leaves that cause decreasing of oil palm growth rate, the outbreak is more common found in new area planting. It is necessary for farmers to use chemicals for controlling. To study the effect of pesticides for controlling rose beetle in 2-year-old oil palm plantation was conducted on Thungsong district, Nakhon Si Thammarat province, Thailand from June 1, 2016 to July 31, 2016. The study divided into 2 experiments, the 1 st experiment was studied on the effectiveness of pesticides to control rose beetle in oil palm plantation, with the experimental design was RCBD with 5 replications 7 treatment : 1) tobacco 3% 2)Thai neem extract (aza. 0.05%), 3) bactospeine FC 120 ml/ 20 L. of water 4) petroleum oil 83.9% EC 40 ml/ 20 L.of water 5) carbosulfan 20 % EC 10 ml/ 20 L. of water 6) carbaryl 85% WP 60 g./ 20 L. of water and 7) control (non treated). Sprayed once a week for 3 times, after the last spraying, the effectiveness of treatment was carbaryl 85% WP followed by carbosulfan 20 % EC, petroleum oil 83.9% EC, bactospeine FC, tobacco 3% (3%), Thai neem extract (aza. 0.05%), at 85.93 80.71 79.97 63.86 60.00 and 56.37 %,respectively, compared with control (non treated). The 2nd experiment was used on integrated pest management (IPM) program for controlling rose beetle, planning process was RCBD with 5 replications 8 methods(M): 1. (M1) tobacco 3%, 2) (M2) petroleum oil 83.9% EC 40 ml/20 L.of water, 3) (M3) carbaryl 85% WP 60 g./ 20 L.of water, 4) (M4) tobacco 3% (3%)+ carbosulfan 5 % G 200 g./ tree, 5) (M5) petroleum oil 83.9% EC 40 ml/ 20 L. of water+carbosulfan 5 % G 200 g./ tree, 6) (M6) carbaryl 85% WP 60 g./ 20 L. of water+carbosulfan 5 % G 200 g./ tree, 7) (M7) carbosulfan 5 % G 200 g./ tree and 8) (M8) control (non treated). The highest effectiveness methods were M6 (100 %) followed by M3, M7, M4, M5, M2 and M1 at 86.62 74.98 73.86 70.59 66.54 and 62.82 %, respectively, compared with (M8) control (non treated).

Keywords: immature oil palm, Thai neem extract , bactospeine (Bt), petroleum oil, rose beetle

Antibiotic Sensitivity of Bacteria Isolated in Clinically Mastitic Goats

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Mastitis remains one of the most common diseases that limit profitable milk production in dairy goats. Aside from clinical signs and increase in somatic cell count, mastitis can be diagnosed through the identification of bacteria present in milk. In this study, the bacteria present in milk of goats with mastitis were identified based on morphological characteristics, biochemical tests and molecular assay. In the second part of the study, tigecycline, erythromycin, amoxicillin, imipenem, clindamycin, cefepime, kanamycin, and gentamicin were used to test the identified bacteria.

Milk was collected from the left and right udder halves of four does with clinical mastitis at the Small Ruminant Center, Central Luzon State University. Samples were subjected to California Mastitis Test (CMT) to determine the scores that correspond to the extent of mastitis infection in each case.

For bacterial profiling, milk samples were initially cultured in Blood Agar (BA) with 5% sheep blood and MacConkey Agar (MCA). For Antibiotic Sensitivity Testing (AST), milk samples were inoculated in blood agar for bacterial culture and identification.

Each colony growth from these plates was transferred to differential and selective media and pure cultures of bacteria were also subjected to biochemical tests. To confirm the identity of these bacteria, the DNA of two of the nine isolates were extracted then subjected to polymerase chain reaction (PCR) assay. Generated amplicons were sent to the Philippine Genome Center for capillary sequencing.

A total of nine bacteria, six gram positive and three gram negative, were isolated from six samples collected from six udder halves of four does with clinical mastitis. Analysis of the morphological and biochemical characteristics suggests six types of bacteria: Coagulase negative *Staphylococcus* (CNS), *Enterococcus* sp., *Bacillus* sp., *Corynebacterium* sp., *Pseudomonas* sp., and a member of the Family Enterobacteriaceae. Two of these bacteria were confirmed through PCR assay and gene sequencing as *Bacillus cereus* and *Staphylococcus haemolyticus*. Results suggest that the bacteria identified from milk of goats were considered as minor pathogens of mastitis in goats, although the emergence of Coagulase-negative *Staphylococcus* as a pathogen of mastitis should not be neglected.

Coagulase-negative Staphylococci (CNS) were identified in milk of goats with mastitis namely, *Staphylococcus capitis, Staphylococcus caprae, Staphylococcus simulans, Staphylococcus arlettae,* and *Staphylococcus haemolyticus.* These bacteria were subjected to antibiotic sensitivity testing using disc diffusion method.

Based on the results, it has shown that the bacteria identified are sensitive to gentamicin, imipenem, tigecycline and kanamycin. All bacteria tested in the study were still susceptible to clindamycin except for *Staphylococcus haemolyticus* and *Staphylococcus arlettae* that had an intermediate sensitivity. *Staphylococcus haemolyticus* is resistant to amoxicillin and cefepime. In addition, *Staphylococcus arlettae* was found to be resistant to erythromycin. Thus, antibiotics where these bacteria are sensitive to, can be used for the treatment of mastitis.

Keywords: Mastitis, Coagulase-negative Staphylococcus, polymerase chain reaction, Antibiotic sensitivity testing

Evaluation of Epididymal Sperm from Post-Mortem Derived Cauda Epididymides of Ram (*Ovies aries*)

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Effectiveness of Nano Turmeric Essential Oil against the African Red Mite (*Eutetranychus africanus* (Tucker))

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The study aimed to proof the efficiency in terms of toxicity and repellent properties of nano essential oil of turmeric (*Curcuma longa* Linn.) against the African red mite (*Eutetranychus africanus* (Tucker)) by using leaf dipping method. The mulberry leaf was cut into circle, 2.7 cm in diameter and dipped in various concentrations of nano essential oil at 0.0 (water), 0.2, 0.4, 0.6, 0.8 and 1.0% for 1 min. Then mite mortality was observed at 24 h and compared to the treatments of various concentrations of surfactant, Tween80 and ethylene glycol 400 (PEG400). As for repellent test, the choice test was performed by dipping an half cut leaf into the nano essential oil at 0.02, 0.06 and 0.1% concentrations, whereas the other half leaf was dipped in surfactant. The repellent rate was checked at 24 h. The result showed that nano turmeric essential oil at concentration 1% had a high toxic property, showed 95.5% mortality and showed LC_{50} and LC_{90} at 0.39 and 0.74%, respectively, whereas different concentrations of surfactant also showed high toxic effect to the mite with LC_{50} and LC_{90} at 0.49 and 0.98%, respectively. Anyhow, there was no significant difference among them. In addition, nano turmeric essential oil at 0.1% showed extremely the repellent property to the African red mite, presented 90%RI at 24 h.

Keywords: nano turmeric essential oil, African red mite, *Eutetranychus africanus*, toxicity, repellent

All Natural Alternative AntiExternal Parasite Treatment to Farm Animals at USLS Granada Farm, Brgy. Granada, Bacolod City

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Mange is a contagious skin disease of animals caused by several species of mites. Once infection is established, animals may suffer from intense pruritus and hypersensitivity which can lead to debilitation and possibly death. External parasitism is one main concern of farm animals. Gliricidia sepium know as madre de cacao or kakawate in the Philippines is effective in treating external parasites including mange infection in dogs and other animals. This study was conducted to make All Natural Alternative to Exterminate External and render the medicinal plant more convenient to use, storable and readily available to farm animals throughout the year, even in the urban areas where kakawate tree is seldom seen. Carabao, swine and goat were used as animal units in this study. This kakawate solution is not limited to mange but also other external parasites as well. Based on the results gathered, the oil-based mixture is highly effective in exterminating external parasites as opposed to the water-based mixture (traditional method) and it has a long shelf life which means that it can be used sparingly and it can be stored for a long period of time. This research can be used as a basis for future research in other species of animals or it can be improved to create a more effective product that can benefit not only the animals at the farm but also the animals outside the farm.

Microbial Control on Common Cutworms (Lepidopetera: Noctuidae)

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Agricultural production currently target to reduce the use of synthetic insecticides and at the same time to improve ecosystem health. Here, we investigate the use of *Bacillus thruingiensis* and nuclear polyhedrosis virus to control common cutworms which are a very destructive pest for several economic crops.

The efficacy of Bt 60 and 80 ml in 20 litres of water, NPV 40 and 50 ml/20 litres of water and mixture of Bt:NPV(3:1 and 1:3 v/v) 40 ml in 20 litres of water against different larval instar of common cutworms(*Spodopter litura*) was carried out under the laboratory condition. . The studies showed that NPV 50 ml in the 20 litres of water was the most effective on the 1st and 2nd instar larvae, mixture of the Bt and NPV ratio 3:1 had the highest percentage mortality on the 3rd instar larvae. Whereas, NPV 50ml was the most effective for the 4th and 5th instar larvae. However, these microbial control application would be more effective on early larval stage of common cutworms.

Utilizing Beneficial Microorganisms in Suppressing Bacterial Leaf Blight (BLB) Disease in Rice

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Biological control is an effective and powerful alternative to synthetic chemicals in controlling rice diseases. The rich diversity of the microbial world provides a seemingly endless resource for this purpose. Generally, the study aimed to control major rice pests and diseases using the benefits of plant-microbial interactions. This is through the identification and isolation of beneficial microorganisms, evaluating and determining the antagonistic effect of these microorganisms to major rice diseases, likewise identify their benefits to the growth and yield of the rice plant.

The study was conducted in the screenhouse and laboratory at PhilRice Isabela station with four three fungal treatments arranged in a Randomized Complete Block Design (RCBD) with (3) replications. The fungal treatments identified included *Vesicular Arbuscular Mycorrhiza* (VAM), *Trichoderma harzianum*, and *Metarhizium anisopliae* with BLB stopper as positive control. Varieties used in the study included Mestizo 1, NSIC Rc222, IR24 (susceptible Check), and IRBB21 (resistant check).

In in-vitro test, the growth of inhibition zones in the positive control and in the three (3) fungal treatments was not observed due to the incompatibility of the culture media. Thus, the result was considered inconclusive. Likewise, in-vivo test was also conducted. Statistical analysis of the disease severity (DS) and disease incidence (DI) of the plants treated separately with the spore suspensions of *T. harzianum*, *M. anisopliae*, and VAM were determined to be significantly different to the DS and DI obtained for the negative control. Results imply that the effectiveness of the three fungal treatments is relatively similar to the effect of the commercial BLB stopper when it comes to the inhibition and antagonism of BLB in rice. Furthermore, calculation of percent reduction of DS showed that there is a 5.34% reduction of BLB disease in plants treated with *T. harzianum*, 1.06% in plants treated with *M. anisopliae*, and 0.293% in plants treated with VAM. Therefore, the fungi used were confirmed to be effective biocontrol agents against BLB in rice. They are environment-friendly and cheaper substitutes for chemically-based bactericides against BLB, thus limiting the use of harmful chemicals.

Keywords: Biological control, antagonistic, *Trichoderma harzianum, Metarhizium anisopliae, Vesicular Arbuscular Mycorrhiza* (VAM)

Effectiveness of Nano Plant Essential Oils against Brown Planthopper, *Nilaparvata lugens* (Stål)

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Brown planthopper (BPH), *Nilaparvata lugens* (Stål) is an economically important insect pest of rice. This research study aimed to compare the efficiency of essential oil (EO) and nano essential oils (nEO) of star anise, (*Illicium vercum* (Hook.f.)) and lemon glass, (*Cymbopogon citratus* (Dc.exNees)) against BPH and compared to essential oil mixed with tween used as surfactant at doubling concentration (EO2T). Contact toxicity was performed by applying the EOs at 0.0, 0.02, 0.04, 0.06, 0.08 and 0.1% concentrations into the plate which released 20 BPH adult. Then the insect mortality was observed at 12 and 24 hours. As for repellent activity, choice test was used when EOs at 0.02, 0.06 and 0.1% concentrations were applied to 20 BPH released in rice cage and compared with control surfactant. The results revealed that at 12 hours, both EO2T and nEO of plants were highly effective in killing BPH adult. EO2T of star anise showed the highest effective caused 100% mortality at 0.1% concentration with LC50 at 0.028%, followed by nEO of star anise, EO2T of lemon glass and nEO of lemon glass, which gave LC_{50} at 0.032, 0.042 and 0.044%, respectively. For the repellent efficiency test, 0.02% nEO of lemon glass showed the most repellent effect to adult, with 43.83 %RI. As for the toxicity at 24 hours, all EOs and nEOs had extremely effective in killing BPH adults. Those EO2T and nEO of star anise presented LC50 values at 0.025 and 0.031%, respectively. The nEO of lemon glass with 0.02% concentration, showed the most repellent effect to BPH adults, gave their %RI at 32.27%.

Keywords: brown planthopper, nano essential oil, residual exposure method, repellent efficiency test

Bioactivity test of *Chaetomium cochliodes* against *Phytophthora* sp causing Durian Rot

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Chaetomium cochliodes was tested ability to control durian disease cause by *Phytophthora* sp in vitro. The experiment was designed as two factor factorial experiment in Completely Randomized Design (CRD) with four replications. Factor A represented crude extracts of *Chaetomium cochliodes* and factor B represented different concentrations of 0, 10, 50, 100, 500 and 1000 ppm. Result showed that hexane crude extract, methanol crude extract and EtoAC crude extract gave significantly inhibited sporulation of pathogen when comparaed to the non-treated control. It was also showed that methanol crude extract and EtoAC crude extract were significantly highest inhibition the colony growth of *Phytophthora* sp and followed by hexane crude extract. Further research finding is to evaluate *Chaetomium cochliodes* to control durian disease in pot experiment and so on.

Keywords: bioactive test, *Chaetomium cochliodes*, *Phytophthora* sp.

Fungal metabolites of *Chaetomium lucknowense* for inhibition of a rice blast pathogen, *Pyricularia oryzae*

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Pyricularia oryzae was isolated from rice blast and proved for pathogenicity in rice var. Koe-Ko 9. Bi-culture antagonistic test showed efficacy of *Chaetomium lucknowense* significanltly inhibited *P. oryzae* that can be seen clear zone between the pathogen and antagonist. Whenever, the bi-culture plates were incubated for over month, the colony of *Chaetomium* grown over the pathogen colony. The methanol crude extract and ethyl acetate crude extract of *C. lucknowense* were shown to be the most effective inhibition the growth of *Pyricularia oryzae* which significantly differed from the methanol crude extract when compared to the control. The effective of metabolites to control blast pathogen is being investigated.

Keywords: fungal metabolites, *Chaetomium lucknowense*, *Pyricularia oryzae*

Session 7: SOCIO ECONOMIC, COMMUNITY DEVELOPMENT AND AGRICULTURAL DEVELOPMENT I

Local Government Engagement in Solid Waste Management Cum Organic Fertilizer Production in Support to High Value Vegetable Production

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Waste accumulation and disposal in rural and urban setting continues to be a major problem in the country. The project aimed to showcase local government engagement in solid waste management and the use of solid waste in organic fertilizer production that can supplement inorganic fertilizer in high value vegetable production.

Progression of implementing strategies were effected starting from consultation with stakeholders; expression of commitment; capability building and assistance in the development and implementation of the local government unit's (LGU) Ecological Solid Waste Management (ESWM) Plan and the attendant intervention to improve organic fertilizer production process and product thereof.

A workable ESWM Plan was implemented by the concerned LGU. Segregated household/market wastes were mixed with quail or chicken manure, carbonized rice hull at 3:1:0.5 ratio. The *Trichoderma sp.* isolated from carabao manure was added at the rate of 2 kg per ton of pile to hasten the decomposition process.

Positive results were generated in the recommended technical intervention in organic fertilizer production with an improved total NPK of 6.72% and with shorter decomposition period. Efficacy testing on bitter gourd, tomato and cauliflower showed improvement in crop yield brought about by the addition of the organic fertilizer produced with intervention to half the recommended rate of inorganic fertilizer.

Keywords: Solid waste management, local government engagement, organic fertilizer, efficacy

Problems and Encountered in Sufficiency Economy Philosophy (SEP) Application of People in Thonnalab Community, Thonnalab Sub-district, Bandung District, Udon Thani Province, Thailand

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This study aimed to investigate problems encountered in sufficiency economy philosophy (SEP) application of people in Thonnalab community sub-district, Bandung district, Udon Thani province by using mixed method approach: qualitative and quantitative research design. Questionnaire (IOC = 0.92) and in-depth interview were used for data collection. The sample group in this study consisted 190 Thonnalab community members obtained by simple random sampling content analysis was used for obtained data and frequency, percentage, mean, standard deviation were used for the statistical treatment. Results of the study were as follows:

1. About one-half of the informants were male (51.05%), 39.96 years old on average, elementary school graduates, and farmers/fishermen. Their average monthly income was 10,000 baht and below (91.58%) and about one-half of the informants (52.63%) had debts (loans of the Bank for Agriculture and Agricultural Cooperatives). They perceived information through the television most (48.42%). Besides, sub-district agricultural workers extended knowledge to them most (44.21%).

2. Most of the informants (95.79%) were Phu Thai ethnic and they were proud of it most (53.68%). They claimed that culture of Phu Thai community was different from external cultures (96.84%). The Phu Thai community was encouraged to have unity and transfer Phu Thai arts and culture to their new generations (66.84%). They perceived that it was consistent with the principle of sufficiency economy most (71.58%). Roles of the wife toward her family and children teaching were found at a high level ($\overline{X}$ = 3.95).

3. The informants had problems in the adoption of the sufficiency economy at a high level in terms of technology, politics, community's resources, natural resources, and arts/culture/tradition. However, the following were found at a moderate level: knowledge, society, and local wisdoms, respectively. The informants stated that the community adopted two aspects of the sufficiency economy philosophy at a highest level: codes of conduct in accordance with Buddhist principles/sufficiency and community members willing to adopt the sufficiency economy philosophy.

Keywords: problems encountered, adoption, sufficiency economy philosophy, Phu Thai ethnic group, Phu Thai community

Mango Production Cost Under Tailor-Made Fertilizer Technology in Bangkha District, Chachoengsao Province, Thailand

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This research aimed to analyse the cost of fertilizer application in the process of growing mango by comparing the fertilizer cost per tree between before and after using the Tailor-Made Fertilizer (T-M-F) technology. The study was conducted on mangoes aged 3-5 years in Bang Khla district, Chachoengsao province. The data were collected by structure interviews from 30 all mango gardeners who adopted the T-M-F technology and analysed by pair t- test. The result showed that the cost of fertilizer application with the T-M-F technology (μ=30.27) was highly significant ($p<0.01$) lower than the cost before using this technology (μ=68.27). In addition, the mango production increased slightly from 26 to 27 kg. per tree .

Keywords: Tailor-Made Fertilizer technology, mango, Cost

Profitability of Rice Production under Large Agricultural Plot Scheme in Khlong Khuean District, Chachoengsao Province Thailand

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Large Agricultural Plot Scheme (LAPS) is one of Thai government agricultural strategies that was launched in 2015, in order to help farmers throughout the supply chain and enhances the competitiveness of small-scale farmers. This study aimed to describe the characteristics of participating farmers in LAPS and profitability by investigating the effect of some socio-economic factors. The samples used in this study were 50 rice farmers who participated in a LAPS in Khlong Khuean District, Chachoengsao Province by using questionnaire collected from rice farmers during June to August 2017. Data were analyzed by using descriptive analysis, profitability analysis, and linear regression model. The results revealed that the majority of sample farmers were male (60%) with average ages between 51-60 years old (42%). Most participants graduated from Grade 1-4 (54%). The majority of participants had rice farming experience between 36-40 years (24%) and had average land size during 10-20 rai (44%). The number of family labor used was two persons (50%). Moreover, farmers averagely participated in training sessions 10-20 times per year (54%), and most of them (92%) were members of farmers' organization. An average profit was 135,267.40 THB per years. The result from regression analysis revealed that the factors affecting the profitability of rice production in LAPS were only land size which statistically significant at 1%. The results obtained from this study provide useful information for relevant authorities and rice farmers in order to increase profitability.

Keywords: profitability, Large Agricultural Plot Scheme, small-scale rice farmer, Chachoengsao, Khlong Khuean

Comparative of Costs and Returns on Oil Palm Production of Member and Non-member Farmers Under Large Agricultural Plot Scheme in Bang Saphan Noi District, Prachuap Khiri Khan Province

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The objective of this research wasto compare costs and returns on oil palm production of member and non-member farmers under the large agricultural plot scheme (LAPS) in Bang Saphan Noi district, Prachuap Khiri Khan Province. The data were collected during January to June 2017 from 30 farmers participating in LAPS and 30 farmers who did not participate in the scheme. The data were analyzed by using frequency, percentage, mean, standard deviation, cost benefit analysis, and t-test for comparing costs and returns between the two groups. Theresults showed that the total production cost of LAPS's member farmers was 4,028 Thai Baht (THB) per rai, including 1) the fixed cost was 500 THB per rai, which land use wasa majority cost accounting for 99%; 2) the variable cost was 3,528.48 THB per rai which materials and wage were majority costs accounting for 64.72% and 35.28% respectively; and 3) the return over cash cost was 22,716.78 THB per rai. Meanwhile, the total cost of production of LAPS's non-member farmers was 3,304.77 THB per rai, including 1) the fixed cost was 500 THB per rai, which land use wasa majority cost accounting for 99%; 2) the variable cost was 2,805.17 THB per rai which materials and wage were majority costsaccounting for 53.81% and 46.19% respectively; and 3) the return over cash cost was 18,152.01 THB per rai. The oil palm production cost of member and that of non-member farmers under LAPS were different in the cost of planting materials namely organic fertilizer with statistical significance at the .05 level (P-value = .047), whereas the others costs were not statisticallydifferent. Regarding production returns, the product prices were different with statistical significance at the .05 level (P-value = .000).

Keywords: oil palm production, cost analysis, large agricultural plot scheme, Prachuap Khiri Khan

Profitability Analysis of Banana (*Musa balbisiana*) Industry in Bato, Leyte, Philippines: A Value Chain Approach

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Banana is one of the top crops in terms of production and value-adding potential in Bato, Leyte, Philippines. Unfortunately, the farmers are constrained by various factors that in effect reduce the income they receive from their produce. Thus, this study aimed to look for effective pathways and linkages for upgrading the industry, transforming it to a highly competitive and profitable system for the banana farmers of Bato, Leyte. Examination of the value-creating flow of the industry, from the input supply sector, production, trading until the finished goods are delivered to the end consumers was done. Key informant survey data were analyzed and used to examine the profitability and efficiency of an existing value chain, identify problems and areas for improvement for banana industry in Bato, Leyte, Philippines. Detailed value chain mapping revealed that fresh bananas from other neighboring municipalities converged in Bato market and brought by traders to buyers in Cebu and other areas in Leyte. Closer look at the data showed that an excess demand of about 54% of the current supply traded across the chain is chiefly due to bugtok disease infestation and poor condition of farm-to-market roads, accounting to about 40% of the in-transit losses. In addition, chain performance analysis revealed that medium traders and processors are the most benefited along the chain due to high economies of scale and value added. Moreover, identified logistics issues along the value chain showed among others that upgrading strategies at the farmers' node, call for strengthening extension support through trainings and expanding banana plantations. Also, there is a need to strengthen rural-based organizations of banana farmers to provide an enabling mechanism of governance for an improved value chain. Moreover, provision of common service facilities is necessary to expand the local processing activity into products with higher value-adding and longer shelf life. All these are recommended as the optimal upgrading strategies to bring the entire value chain to a higher plain of competitiveness and profitability.

Keywords: Value chain analysis, banana, upgrading strategies, key informant survey

Economic Aspects of Urban Vegetable Gardening in Bangkok Metropolitan, Thailand

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The purposes of this research were to investigate characteristics of urban vegetable growers in Bangkok Metropolitan and estimate the economic value of urban vegetable gardening. The structural questionnaire was applied as a research instrument for data collection from 60 urban vegetable growers in Bangkok and Metropolitan in the year 2016-2017. Snowball sampling was used in order to select participants. Descriptive statistics namely frequencies, percentage, mean, standard deviation were employed to analyse the data. Additionally, the estimation of direct and indirect values of urban vegetable gardening was applied to measure economic aspects. The result showed that the majority of urban vegetable growers had monthly income at 30,000 Thai Baht, worked as company officers, were middle-aged female during 31-40 years, graduated with university degrees, and were single. This finding supported the characteristics of city residents' lifestyle. Regarding economic value estimation obtained from urban vegetable production, the result revealed that, on average, this practice could reduce household food expenditure at 3,994.42 Thai Baht per month, and generate income at 20,308.69 Thai Baht per month. Commercial gardens could generate more household income from urban vegetable gardening than home consumption about 10 times and reduce more household expenditure than home consumption around 2 times. The results from this study encouraged related organizations to promote urban vegetable growing with economic respects.

Keywords: Economic Aspects, Urban Vegetable Gardening, Urban Vegetable Growers, Urban Agriculture, Urban Vegetable, Bangkok Metropolitan

A Quality Improvement of Manufacturing Process for Jasmine Rice 105 by Applying the Design of Experiment

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The objective of this research is to determine the optimum factors for rice production in the jasmine rice 105 cultivating process, which is beneficial to rice farmers in Chachoengsao and other provinces with the same soil series. By using Generals Full Factorial Design of Experiment with controlled factors, the expected variables were soil (Chachoengsao and Don Rai soil series), Fertilizer (compost, manure, bio-compost, chemical fertilizer, compost with chemical fertilizer, manure with chemical fertilizer and bio-compost with chemical fertilizer) and planting period (season and off season). The experiments were repeated to carry out under the same conditions of 3 replications. The response was the production of jasmine rice 105. The analysis showed that the soil, fertilizer and planting period gave P-Value equal to 0.000 that is less than the significance level ($\alpha = 0.05$). It means all 3 factors influenced the quantity of rice production. For the test of appropriateness of the main factors and contributing factors in rice production, it was found that the optimum factor to achieve the highest average production was cropping in the seasons with manure and Don Rai soil series factors.

Keywords: Design of Experiment, Jasmine rice 105, Fertilizers, Soil, Planting season

Enhancing Profitability and Productivity of Upland Rice Areas through Crop Diversification

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Insect pest infestation is proved to be prevented through intercropping. Intercropping is a crop management system which involves two or more divergent crops in distinct row combinations simultaneously on the same land area.

This study was conducted in two consecutive years (2013-2014) in upland areas of Cagayan Valley particularly in Lasam Cagayan and Ilagan Isabela to determine the effect of the different intercropping farming systems on the abundance and species diversity of insect pests and natural enemies, soil fertility status and profitability in comparison to rice monoculture. The different intercropping systems used were rice monoculture, rice-peanut, rice-mungbean, rice-bush sitao, and rice-corn. The plots were established in a Randomized Complete Block Design (RCBD) with strip intercropping spatial arrangement. Based from the data gathered in 2013-2014, results showed that in Lasam Cagayan, the number of insect pests in the rice monoculture had exceedingly higher diversity compared with the rice based intercropping systems While the rice-based intercropping systems had higher diversity of natural enemies and migrants compared with the rice monoculture. In Ilagan Isabela, results revealed that all rice based intercropping systems especially in rice-mungbean intercropping system increased the diversity of the natural enemies compared with rice monoculture. There was a considerable effect of even short term intercropping in rice on the residual soil fertility. All the intercrops had a positive effect on residual soil organic matter while for the residual phosphorous and potassium varied from location to location. All the intercropping treatments resulted in substantially higher total rice grain yield equivalent (TRGYE) than sole crop of rice except in Ilagan wherein only the rice-peanut intercropping system has a little advantage in terms of marginal benefit income with 8,874.88 with MBCR of 0.66.

Keywords: pests, profitability, diversification, intercropping, rice monoculture

A Feasibility Study for Investment in Para Rubber Latex Foam Production for Combat Sport Mats in Thailand

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The purpose of this study was to investigate the feasibility for investment in Para rubber latex foam production for combat sport mats. The feasibility was evaluated in terms of the technique used and the production. The samples of this study were Para rubber latex foam processing factories, with different sizes, i.e., small, medium and large. Interviews with factories' executives and staff were conducted to gather information concerning the production processes. Study

revealed that all three factories use Dunlop process to produce the Para rubber latex foam; however, the ratio between concentrated latex and chemicals were different, with 97% concentrated latex and 3% chemicals for large- and medium-sized factories, and 90% concentrated latex and 10% chemicals for small-sized factory. All three factories use steaming process to heat up the concentrated latex. From the production point of view, large-sized factory can readily produce combat sport mats because of the availability of larger moulds and steamers, whereas an assembly of smaller Para rubber latex foams was required to produce a combat sport mats for medium- and small-sized factories. Combat sport mats produced from latex foam in this study can be made in accordance with the standard issued by the Privileges and Standardization Division, Sports Authority of Thailand, which specified the characteristic of the mat as 1-meter wide, 2-meter long and 50-millimeter thick, with an ability to absorb shocks.

Keywords: Feasibility study, Para Rubber Latex Foam, Combat Sport Mat

Concentrated Plant Growth Stimulator, Immunomodulator, Fungicide

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Bioactive soil is non-toxic, biologically active organosilicon compound possessing growth-stimulating, adaptogenic, antifungal properties (against root rot). The active substance was developed with the participation of leading Russian scientists on the basis of years of practical experience. The use of bioactive soil provides the crop yields even under unfavorable and stressful conditions, guaranteeing the quality of the final product. Concentrated product with the function of plant growth stimulator, immunomodulator, fungicide are demonstrated as follows:- (1) the drug provides a stable yield increase under conditions of biotic and abiotic stresses, and high and prolonged protective fungicidal effect (late blight, Fusarium, Alternaria) for solanaceous crops, (2) high concentration of active substances in the preparation is a balanced composition of micro - and macro-elements, in this case, the drug is not toxic (4th class), (3) pronounced stimulating effect (from tomatoes increased root system min. 25%, the period of fruiting of tomatoes is increased, the average yield of potatoes and tomatoes above control 30% or more), (4) low price, (5) consumption of the drug does not exceed 0,3-0,5 litres per 10, 000 m^2, (6) the product is compatible with most pesticides used for plants and crops and (7) the use of the drug allows to reduce the use of mineral fertilizers by 25%.

Keywords: Growth Stimulator, fungicide

The Campaign for Effective Reduction of Sugarcane Burning Before Transporting Them to the Factory Aimed Specifically at Khok Klang Community, Nong No Sub-district, Kranuan District, Khon Kean Province.

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The purposes of this research were to 1) study and compare knowledge about reduction of sugarcane field burning before and after the campaign, 2) study and compare attitude towards reduction of sugarcane field burning before and after the campaign, and 3) study participation in the sugarcane Burning Reduction Campaign. The samples were 30 residents in Khok Klang Community, Nong No Sub-district, Kranuan District, Khon Kean Province. They all volunteered to join the campaign. The research tools consisted of a manual, a knowledge test, an attitude test and a participation evaluation form. The statistics used included frequency, percentage, mean and standard deviation, and paired t-test was employed for hypothesis testing. The results showed that 1) The villagers' knowledge before joining the campaign was at the "low" level, but after participating in the campaign their knowledge was found to be at the "high" level, 2) The attitude of the villagers before joining the campaign was at the "not sure" level. However, their attitude changed to the "agree" level after they had joined the campaign, and 3) After the campaign, their participation was found to be at the "high" level. When comparing the mean scores in terms of both knowledge and attitude, it was found that their gain scores were higher than those gained before they participated in the campaign. This was consistent with the research hypotheses which stated that both knowledge and attitude after the campaign were higher than those before the campaign and they would be at the "high" level based on the significance level of .05

Keywords: campaign, sugarcane burning reduction, knowledge, attitude, participation

Strengths, Weaknesses, Opportunities, and Threats (SWOT) Analysis for Okra Production: Case of Okra Growers for Export in Nakhon Pathom Province, Thailand

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The purpose of this paper is to 1) investigate the current situation of the okra production for export, and 2) study the strategies of the okra production for export in Nakhon Pathom Province, Thailand by using SWOT analysis, which is a technique to analyze the strengths, weaknesses, opportunities, and threats of businesses. The study selected okra growers who are the member of exporting company in Mueang Nakhon Pathom and Kamphaeng Saen District of Nakhon Pathom Province. Okra growing areas in the study area approximately 738 Rai with 166 okra households as okra network members. Data were collected from survey, in-depth interview, and focus group discussion was conducted to identify the strengths, weaknesses, opportunities, and threats related to okra production activities. Based on the results of SWOT strategies and TOWS Matrix of okra production for export were prioritized and they include: enhancement the production capability to meet market demands in case of some okra productions are processed to increase the value, motivation the non-member growers to be a members of exporting company, development of governmental supports, preparing strategic plans for development okra production for solving the problem of the decrease of yields, and development of extension programs based on farmers' needs.

Keywords: Okra, okra production, positive list, SWOT, f okra production, okra network.

Factors Affecting the Decision to Raise Beef Cattle of Farmers in Thailand

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Currently, the trend of beef cattle raising in Thailand is decreasing dramatically, resulting from the insufficiency of supply for demand in meat markets. This study aimed to examine some characteristics of beef cattle raising farmers and investigate key factors affecting the decision of farmers to raise beef cattle in Thailand. A purposive sample was applied to gathering data from 325 farmers who raised five or more beef cows within 25 provinces of Thailand. Questionnaires, comprising of two parts: 1) farmers characteristics, and 2) factors affecting to decision-making by four factors: physical, economic, social culture, and promotion, were used to gather data in the study. Data then were analysed by using descriptive statistics. Moreover, an independent t-test was applied to investigate the factors affecting farmers making a decision. The results revealed that, on average, the farmers were 52 years old, graduated from grade six, had 21 years of cattle raising experience, and owned 112 rai of land size. In terms of factors, the result demonstrated that farmers paid less attention to physical factors. In contrast, they focused on economic factors, and promotion factors in moderate levels, and high level in socio-cultural factor. Regarding the investigation on factors affecting the decision of beef cattle farmers in Thailand, the result exposed that education, economic, and social-cultural factors significantly affected farmers' decision on beef cattle raising in Thailand. This study provides information to support that the government should implement a policy to encourage farmers, particularly, factors concerning with age, education, economic and social culture of beef cattle raising farmers in order to raise beef cattle in order to meet market demand.

Keywords: factors affecting, farmers' decision, beef cattle, Thailand

Developing Reading and Writing Abilities of Prathomsuksa2 Students at Schools in MuangMahasarakham Municipality Through Brain-based Learning

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The purposes of this research were: 1 (to study problems and needs in improving reading and writing abilities of Prathomsuksa 2 students at schools located in MuangMahasarakham Municipality, (2to develop brain-based learning activities in an attempt to enhance reading and writing abilities of Prathomsuksa 2 students at schools located in MuangMahasarakham Municipality, and (3to find out the effects of brain-based learning activities on reading and

writing abilities of Prathomsuksa 2 students at schools located in MuangMahasarakham Municipality. The target group, selected through the purposive sampling technique, was a total of 215 Prathomsuksa 2 students in ten different classes from seven different schools located in MuangMahasarakham Municipality. The research tools consisted of BBL lesson plans covering twenty-five hours, an achievement test composed of thirty items each with four choices to select, a test measuring students' reading ability containing twenty items each with four choices to select, a test measuring students' writing ability comprising twenty items each with four choices to select, a teacher satisfaction form consisting of twenty questions using a 5-point response scale, and a student satisfaction form composed of ten questions using a 3-point response scale. The statistics employed included percentage, mean and standard deviation.

The study results revealed that:

1. Administrators and Thai language teachers at schools located in MuangMahasarakham Municipality really wanted to develop some kind of learning management to enhance reading and writing abilities of Prathomsuksa 2 students. Overall, the need was at the 'most' level) $\overline{x}$= 4.58).

2. Overall, the created BBL activities was at the 'most appropriate' level)$\overline{x}$= 4.63).

3. The effects of using BBL activities in improving reading and writing abilities of Prathomsuksa 2 students at schools located in MuangMahasarakham Municipality were as follows

3.1 The effectiveness of the BBL lesson plans to increase reading and writing abilities of Prathomsuksa 2 students at schools located in MuangMahasarakham Municipality was 76.76/75.33, thus meeting the standard creation set.

3.2 In terms of reading ability, 82.79% of Mathayomsuksa 2 students passed the 73.73 percent criterion.

3.3 In terms of writing ability, 80% of Mathayomsuksa 2 students passed the 72.08 percent criterion.

3.5 Overall, the teachers were 'most satisfied' with the created BBL learning $\overline{x}$=4.66 out of 5.00).

3.6 Overall, the students were 'highly satisfied' with the created BBL($\overline{x}$= 2.76 out of 3.00).

Keywords: Reading ability, Writing ability, Brain-based learning

The Biological Literacy, Environmental Awareness and Integrated Science Process Skills in the SCiUS Students of Mahasarakham UniversityDemonstration School (Secondary)

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This research aims to compare the biology literacy, environmental awarenessandIntegrated science process skillsin the Science Classrooms in University-Affiliated School Project (*SCiUS*) students of MahasarakhamUniversityDemonstration school (Secondary) The sample consisted students of Science Classrooms in University-Affiliated School Project (*SCiUS*)Grade 11 and 12 the academic year 2015, by the purposive sampling. The research instruments were the biological knowledge test, the integrated science process skillstest, created by Assoc. Prof. Dr. PaitoonSuksrivam is based on the concept of American Association for the Sciences Advancement of Science (AAAS) and awareness questionnaire of environmental conservation. The result found *SCiUS students*in Grade 11 and 12 their had a statistically significant difference in biological literacy at the .05 level and integrated science process skills difference was statistically significant at the .05 The Grade 11student's had a biology literacy was at moderate level while the Grade 12 students had a high level of biology literacy. The environmental awareness *SCiUS students* Grade 11 and 12 are well aware of the environment as a whole in average level is the same. The integrated science process skills Grade 11 students are in the low to moderate level, while the Grade 12 are at moderate to high levels.

Keywords: Biologicalliteracy, Environmental awareness, Integrated science process skills.

The Project Feasibility Study of Solid Waste Transfer Station Pluakdaeng Subdistrict Administration Organization; Pluakdaeng District, Rayong

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Pluakdaeng Sub-district Administration Organization, Pluakdaeng district, Rayong had problems with solid waste due to the increasing population and a very passive population. There were solid waste problems increased as amount of solid waste in the area is about 48-50 tons/day by disposing of private land with a landfill disposal. Pluakdaeng Sub-district Administration Organization was still experiencing a problem, cost issues, system performance issues and lack of knowledgeable personnel. This problem, if not resolved in a timely manner. This will be intensify the problem. Therefore, in the case of the area of responsibility of Pluakdaeng Sub-district Administration Organization, Pluak Daeng district, Rayong province, the waste disposal site is far from the source of waste. A waste dump truck was established in the area to effectively remove waste from the area to the disposal facility. The purpose of this study was to study the project feasibility of solid waste transfer station of Pluakdaeng Sub-district Administration Organization, Pluakdaeng district, Rayong province. The data were collected from primary data by actual recording and secondary data from documents for analysis the feasibility of area and solid waste state in area, technical, economics and management of solid waste transfer station. The findings revealed that there were the feasibility and appropriate in area and solid waste state in area, technical, economics and management of solid waste transfer station.

Keywords: The Project Feasibility Study, Solid waste Transfer Station, Pluakdaeng Sub-district Administration Organization

Value Chain Analyis of Tomato in Bukidnon, Philippines

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The study aimed to establish baseline information on postharvest handling systems of tomato and at the same time determine the postharvest losses of existing supply chain. The study areas are the top producing municipalities of tomato in Bukidnon.

Tomato (*Lycopersicum esculentum*) is an important fruit vegetable planted in many parts of the country. It is fourth important vegetable in the Philippines in terms of volume of production. In 2016, a total of 16,197 hectares were planted with a total production of 210,720 MT. Bukidnon is the top producer of tomato among the provinces in the Philippines which accounts for about 19 percent of the average total volume of production and it has an average annual growth in production of 0.21 percent.

In Bukidnon, regular season of planting starts on March to October and off season planting is from August to December. Tomatoes are harvested about 75 to 85 days after transplanting. In Bukidnon, the famous varieties planted by majority of farmers are Dwarf Puti and Dwarf Green.

Harvesting of tomato is done early morning. Tomatoes are placed in pails, wooden and plastic crates. Sorting is done by classifying tomato according to size and degree of ripeness. Cleaning of tomatoes with water and liquid detergent helps eliminate bacteria that may lead to immediate rotting of tomatoes. Majority of the farmers do not wash tomatoes. All of the farmers in Bukidnon use wooden crates since tomatoes inside can easily be seen through the spaces in between. Buyers are very meticulous in buying tomatoes and they look at the condition of tomato. They only buy mature green tomatoes to lessen losses during transport to Manila. Majority of tomatoes in Bukidnon are brought to Divisoria which is the major trading center of fruits and vegetables in the Philippines.

Cost and net income share analysis was done to determine the contribution of different chain players in the production and marketing of tomato. The major players are farmers, consolidator, wholesaler/retailers and retailer. Farmers received less profit compared to wholesaler and retailers.

High postharvest losses were noted especially during peak season. It is estimated that 25 to 30 percent of tomato production during peak season are retained in the farm and trading post because of low price. In the actual loss assessment conducted, Bukidnon to Divisoria route exhibited the highest losses of around 13 percent. Some factors that may contributed to high losses are: farmer's lack of knowledge on proper postharvest handling, delay in transport due to unavailability of truck to immediately transport the crop from farm to Bulua Trading Post, Cagayan de Oro City and the absence of air condition units in the ship container vans.

Keywords: postharvest handling system, net income share analysis, supply chain system

The Promotion of traditions of Chong Ku Khu Mahathat of community on eco-culture concept

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The purpose of this study was to study and and compare knowledge, attitude about traditions of Chong Ku Khu Mahathat of community before and after promotion. The sample were 30 students in Environmental Education, Faculty of Environment and Resource Studies of Mahasarakham University, by voluntary. The research tools were manuals, brochures, knowledge test and the attitude test. The statistics used for data analysis were frequency, percentage, means, standard deviation, and Paired t-test. The finding were that before promotion, students had knowledge score at moderate level and after promotion, had knowledge score at very good level. When compared mean score between before and after indicated that students had knowledge score after more than before significant at the .05. Before promotion, students had attitude score had at agree level and attitude after promotion, is at agree level. When compared mean score between before and after indicated that students had attitude score after more than before significant at the .05.

Keywords: promotion, traditions of Chong Ku Khu Mahathat, knowledge, attitudes, eco-culture

Factors Affecting Okra Farm Income in Nakhon Pathom Province, Thailand

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The study has been conducted to identify the factors influencing okra farm income by using multiple regression analysis in Nakhon Pathom Province, Thailand, consisting of 738 Rai with 140 okra growers' members. Data were collected from survey by using a semi-structured questionnaire with a sample of 58 okra growers had been taken randomly. The descriptive statistics and multiple regression analysis were employed to analyse the data. The estimated results of the regression models revealed that number of schooling year had a significant negative effect on okra farm income with the adjusted R^2 was 51.80.

Keywords: Okra, okra growers' income, regression model.

Multi-Strata Production of Leguminous Forages for Livestock Production in Northern Philippines

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The performance of four-legume strata composed of *Gliricidia sepium*, *Leucaena leucocephala, Desmodium rensonii* and *Cajanus cajan* was determined in Northern Philippines to address the seasonality of feeds and the availability of quality forages on a year round basis using the RCBD Design.

Results revealed that the germination rates of the four forages during the rainy season were significantly higher those planted during the dry season however, the survival rates were comparable for both seasons. *Cajanus cajan* was significantly taller than the other species of forages for both planting seasons, followed by *Leucaena leucocephala.* The results of the cutting intervals of 30 days during the rainy season and 45 days during the dry season reveals that

Leucaena leucocephala had significantly the highest regrowths while *Cajanus cajan* had significantly the shortest. The leaf:stem ratio of the different forages were comparable during the dry and rainy seasons. The chemical analyses of the four forages were comparable at the different cutting intervals*Gliricidia sepium, Leucaena leucocephala, Desmodium rensonii* performed well if planted in a multi-strata scheme while *Cajanus cajan* was not suited under this forage establishment.

Keywords: *Gliricidia sepium, Leucaena leucocephala, Desmodium rensonii, Cajanus cajan,* multi-strata, herbage yield, nutrient composition

Ability to Increase Values on Agricultural Sector: Mittraphap Road in Northeastern Region of Thailand

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The purpose of this article is to study the ability to increase the value in agricultural sector of 4 provinces (Nakhon Ratchasima, Khon Kaen, Udon Thani, and Nong Khai) on the Mittraphap Road which is regarded as a crucial route for goods transportation to Laos and Vietnam. The research result revealed that the agricultural production sector which could increase values the most included Livestocks, Vegetables and fruits, respectively. However, when comparing the proportion of the agricultural products in such areas, it was found that the production which has been produced is still insufficient and unable to respond the local people's needs. This is because the high values of production did not derive from agricultural sector but the Building Construction, Public Works, other Constructions, and other Food, respectively. The local industries are unable to produce these kinds of products so they are mostly imported from external locality. Hence, this information identified the low level of values on agricultural sector, including bad income distribution from this sector. Therefore, the agricultural sector should be stimulated to improve the agricultural products for increasing their values as well as building good quality of lives to the agriculturalists.

Sensory Analysis of Single Origin Cocoa Liquor and Chocolates: A Systematic Review

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Session 8: SOCIO ECONOMIC, COMMUNITY DEVELOPMENT AND AGRICULTURAL DEVELOPMENT II

Developing of Basic Skills in Agriculture of Students in Agricultural Education Program, Department of Agricultural Education, King Mongkut's Institute of Technology Ladkrabang, Thailand

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This qualitative and quantitative study aimed to investigate the development of basic skills in agriculture of students in Agricultural Education program, Department of Agricultural Equation, King Mongkut's Institute of Technology Ladkrabang (KMITL), Thailand. A set of questionnaires with co-efficient reliability of 0.87 and in-depth interview were used for data collection. The sample group in this study consisted of 47 first year Agricultural Education students, KMITL. Obtained data were analyzed by using frequency, percentage, and mean. Results of the study revealed the following:

1. Most of the informants (68.09%) were female, upper secondary school graduates (85.11%), Plant Production Technology students (46.81%) and their first year grade point average range was 2.00-2.49.
2. The informants gained knowledge about basis agricultural knowledge a highest level in terms of farm machinery ($\overline{X}$ = 4.44) and the other 7 aspects were found at a high level.
3. The informants were developed on the basis of basic skills in agriculture at a highest level in terms of farm machinery ($\overline{X}$ = 4.68) and mushroom production ($\overline{X}$ = 4.25), the rest aspects were found at a high level.

Keywords: skill development, basic skills in agriculture, B.S. students, program in agricultural education

Promoting the use of environmentally friendly packaging materials for municipality school students

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The purposes of the present study were to examine and compare the knowledge, attitude and behaviour of students before and after promoting the use of environmentally friendly packaging materials. The sample were 32 Grade 1 students from Si sawat Wittaya Municipality School, selecfed. by the purposive sampling technique.The research tools included a manual, a knowledge test, an attitude test and a behavior test. The data were analyed by percentage, mean, standard deviation and paired t – test. The findings revealed that before promoting, the students' knowledge was at the "should be improved" level, their attitude was at the "uncertain" level. However, after promoting, their knowledge had improved to the "fair" level, their attitude to the "agree" level, and their behaviour to the "frequent" level. Descriptive statistics also showed that the students' knowledge, attitude after the promotion were significantly higher than before the promotion at the significance level of .05 in all aspects.

Keywords: promotion, packaging material, environmental friendly, attitude, behavior.

Understanding Household Food Security Status of A Rural Community in Nueva Ecija, Philippines

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Food security is a vital element in life both at the household level and the entire population. The study determined the household food security situation and coping mechanisms of a rural community in Nueva Ecija, Philippines. A comprehensive data is necessary to provide empirical evidences on the extent of household food security which is needed in coming up with effective plans and programs for a rural community to attain food security.

A total of 161 randomly selected household heads served as survey respondents. Data were analyzed descriptively and used the World Bank indicators to determine the level of household food security, which was measured using its three components namely; food availability, food accessibility and food utilization. Correlation analysis was also done using Spearman and Pearson Correlation.

Results indicated a low level of household food security in the rural community. Around 47 percent of the households had low level of food security, 31 percent with moderate level of food security, 18 percent had low and only few, 4 percent of the households had high food security. The most common coping mechanisms adopted by households that experienced food insecurity were: to reduce the number of meals per day, skipped the day without meal, borrow money, purchased food on credit and buy less expensive food in order to survive.

Education, assets owned, house structure, income, percentage of income spent on food, affordability of food, dietary diversity, frequency of meals, access to market, access to health services, perception on health status, knowledge on food and nutrition, adequate sanitation and cleanliness were the factors with significant relationship to household food security.

To help alleviate the low level of household food security, it is recommended that vigorous efforts be extended in terms of livelihood generation, greater access to productive resources, capacity building and family planning.

Keywords: household food security, food availability, food accessibility, food utilization

Model for Development of Agricultural Skills under Occupation and Technology Subject (Agriculture) of Grade 3 Students using School Agricultural Learning Center, Praibuengwittayakom School, Srisaket Province

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The objective of this study were to: 1) explore skill development on agricultural work process of third year lower secondary school students and 2) compare learning achievement of the students before and after learning in accordance with skill development on agricultural work. Locale of the study was at Phraibueng Wittayakom School Agricultural Learning Center. The sample group in this study consisted of 40 third year lower secondary school students at Phraibueng Wittayakom School and they were obtained by simple random sampling. The research instruments in this study are assessment form of skills on agricultural work process. It comprised 10 items as follow: 1) a meeting for planning; 2) preparation of equipment and materials; 3) working based on assigned task; 4) provision of work assistance; 5) working step by step; 6) selection of equipment and materials; 7) equipment and material using; 8) cleaning equipment/materials and operational areas; 9) work performance; and 10) improvement and development of work performance. The score was determined as 3 scores per item. The learning achievement test form was multiple choices (40 items). Statistics used for data analysis included frequency, percentage, mean, and standard deviation. Besides, t-test (Dependent) was used for comparing learning achievement before and after learning. Results of the study were as follows:
1. The students passing learning through a model for development of agricultural skills had a high level of skills on agricultural work process (Mean = 24.48) which was in accordance with the hypothesis
2. Learning achievement on occupation and technology (agricultural work) of the students posttest was higher than that of pretest with statistical significance level at 0.05 which was in accordance with the hypothesis.

Keyword: skills on agricultural work process, school agricultural learning center, occupation and technology subject, agricultural work, lower secondary school students

Consumers' Preferenc and Willingness to Pay for Aromatic Rice in Selected Markets in Nueva Ecija, Philipines

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The consumers' preference and willingness to pay for aromatic rice was evaluated among 70 rice consumers from the Central Luzon State University (CLSU), Science City of Munoz, Nueva Ecija, Philippines. The University is the

producer of aromatic rice in Nueva Ecija hence the choice of the consumers from it. Consumers have high preference for aromatic rice and its characteristics such as fragrance/aroma and taste along with other cooking quality, tenderness, color, cohesiveness, smoothness, glossy, off odor, grain size, and being nutritious.

Their willingness to pay for these characteristics was analyzed using the Hedonic Price Model. The model examined the attributes of aromatic rice and the price consumers attached to these attributes. Moreover, the study also determined how much the consumers are willing to pay for a kilo of aromatic rice and this was compared with the existing price.

The price of aromatic rice in CLSU is Php40/kg. Not all of the consumers are willing to pay higher price for aromatic rice. In fact, the average price the respondents are willing to pay for aromatic rice is only Php 39.19. Only10% of the consumers are willing to pay more than the prevailing price of Php 40/kg, with Php80/kg as the highest.

Results of the hedonic price model shows Y = 0.925 + 0.1879 Aroma + 0.0849 Color + 0.1479 Grain size + 0.0734 Glossy + 0.0382 Cooking quality, where Y is the price of aromatic rice. Aroma, grain size and cooking quality were the most significant factors that explain the price. Consumers paid the highest premium of Php15.04 for aroma. Whereas, grain size and cooking quality also received higher premiums while color and glossiness received lower premiums.

Keywords: aromatic rice, hedonic, price premium, consumers, Philippines

Learning Achievement of Thai Language on Poetry Writing by using Learning Together (LT) Collaborative group

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The purposes of this research are 1) to assess the efficiency of lesson plans on poetry writing by grade 8 students using Learning Together (LT) collaborative group that meet the criteria of 80/80 2) to assess the effectiveness index of lesson plans on poetry writing by grade 8 students using Learning Together (LT) collaborative group. The samples consisted of class 2/9 of HuaiThapThanWittayakhom School, HuaiThap Than district, Srisaket Province, office of basic education commission area 28, 1st education year 2017. The samples is obtained by the cluster random sampling. The research instruments were: 1) lesson plans on poetry writing for grade 8 using 4 sets of learning together (LT) collaborative group. The arithmetic mean of 4.86 was the standard that most appropriate. 2) Achievement test of the poetry writing lesson plan by grade 8 students, 2 subjective questions with arithmetic mean of 1.00. The collected data were analyzed were percentage, arithmetic mean, standard deviation and effectiveness index (E.I).The results of this research were that lesson plans on poetry writing by grade 8 using Composed Learning Together (LT) collaborative group has the efficiency of 84.81 /82.96 which was higher than the criteria of 80/80 and has the effectiveness index of 0.7224 or 72.24 percent

Keywords: Poetry verses, LT collaborative group

Socio-economic of Rubber Farmer in Drought area, in Sakwae Province Thailand

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Para rubber is an important economic crop in Thailand. Eastern of Thailand is a major source of rubber and a long-established rubber plantation because in areas with sufficient rainfall. Sa Kaeo is a province in the east. But there are differences that should be studied. Because of the different climate in the same province. Sa Kaeo province is drought areas. Sa Kaeo is a developing province, a special economic zone in the future. And rubber is an important crop to earn revenue in Sa Kaeo.

This study aimed to describe the characteristics of rubber farmer in drought area and attempted to investigate the effect of some economic and social factors which related to the production. The sample used in this study was 100 rubber farmers who are register of Rubber Authority of Thailand branch Sa Kaeo Province, based on data collected form rubber farmers were register of Rubber Authority of Thailand branch Sa Kaeo Province in 2016. Descriptive analysis and linear regression model were applied to analyze the data. The results showed that most of rubber farmers were

female (54.0%). The average age of rubber farmer was 51-60 years old (32.0%). Most rubber farmer had occupation was farmer (91.0%). Most rubber farmer was member status of rubber group (94.0%) and used rubber variety was RRIM600 variety (95.0%). Harvesting of rubber farmer used tapping system was 1/3 2d/3 (one third stem two days a day) (63.0%) and labor tapping by self (55.0%). An average quantity of plot was 1 plot and land size was 20 rai (3.2 hectare.) An average the number of rubber tapping was 1,469 of rubber tapping. Average production was 179.68 kg.per tapping area 1 rai (1 rai = 0.16 hectare.)

The result from regression analysis revealed that the factors affecting rubber farmers under drought area were the size of land and number of rubber tapping which were statistically signification at 1%. The results of this study provide useful information for relevant authorities working in the government official for rubber farmer in order to increase farmer' productivity.

Keywords: Drought area, Rubber Authority of Thailand, Rubber farmer, Sa Kaeo

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Needs for Animal Farm Work Development of Northeastern Vocational Institute of Agriculture, Ministry of Education, Thailand

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This study aimed to explore needs for animal farm work development of 42 teachers responsible for the college farm care-taking 10 Northeastern Vocational Institute of Agriculture. They were obtained by purposive sampling from 86 Animal Science Section teachers. A set of questionnaires was used for data collection and analyzed by using percentage mean, and standard deviation. Besides, F-test and Scheffe test were employed in this study. Results of the study were as follows:

1. Most of the respondents were male (69.05%), more than 50 years old, bachelor's degree holders, Senior Professional Level Teachers, and they had more than 20 years of service. Their teaching load (office hours) was 19.50 hours per week and 9.90 hours per week for non-office hours.

2. Regarding needs for animal farm work development of the respondents, it was found that the reason was to be beneficial to teaching/learning activities at a highest level ($\bar{X}$ = 4.88). Meanwhile, Factors having an effect on farm care-taking ($\bar{X}$ = 4.61); needs for farm work development to be a modern quality farm business ($\bar{X}$ = 4.61); and needs for Animal Science farm development at a high level ($\bar{X}$ = 4.29).

3. For a comparison of needs for Animal Science farm development and various factors, it was found as follows:
3.1 The difference in years of service and teaching experience of the respondents had no effect on needs for Animal Science farm work development with a statistical significance level at .05. Regarding Scheffe test, it was found that the respondents having years of service for less than 11 years had statistically significant difference in needs for farm work development to be beneficial to community services when compared with those having 11-20 years of service.
3.2 The respondents having difference in years of service and teaching experience had an effect on the difference in needs for the development of knowledge and capability in farm work management with a statistically significant difference level at .05. Based on Scheffe test, it was found that the respondents having more than 20 years of service had a statistically significant difference level at .05. When compared with those having 11-20 and less than 11 years of service.

The respondents having difference in years of service and teaching experience had a statistically significant difference level at .05 in terms of needs for farm work development. When it was compared by using Scheffe test, it was found that the respondents having less than 11 years of service had different opinions from those having 11-20 years of service with a statistically significant difference level at .05

Keywords: animal science farm, teacher responsible for farm work, college of agriculture and technology, vocational institute of agriculture, needs for development

Monitoring and Evaluation to Develop Preliminary Rice Cultivation Curriculum of the School of Rice and Farmers, Department of Rice, Ministry of Agriculture and Cooperatives, Thailand

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This study aimed to monitor and evaluate outcomes of the preliminary rice cultivation curriculum of the School of Rice and Farmers, Department of Rice, Ministry of Agriculture and Cooperatives. The sample group in this study included 159 farmers passing the basic training on rice growing curriculum and they were obtained by simple random sampling. A set of 5-scale-rating questionnaires (IOC = 0.86) was used for data collection. Content analysis was conducted with obtained data. Besides, descriptive statistics was employed i.e. percentage, mean, and standard deviation. Also, f-test was used for the comparison of a level of adequacy in lecture/practice hours. Results of the study were as follows:
1) Most of the respondents were male (57.23%), 46-56 years old (30.19%), bachelor's degree holders (54.46%), rice farmers (32.08%), and business owners (30.19%). The respondents perceived that the adequacy in lecture/practice hours were at a moderate level (6 subjects) and could be utilized at a high level. However, rice growing, nutrient analyses, and fertilizer application was found at a moderate level.
2) According to One-way ANOVA analysis, it was found that the difference in a level of adequacy in 5 lecture classes an 1 practice class had no affection a level of utilization except the difference in Accounting for a Sustainable Farm subject based on theory/lecture class had an effect on the a difference in a level of utilization with a statistical significance level at .01. Meanwhile, the difference in a level of adequacy in practice hours of nutrient analyses and fertilizer application had an effect on a level of the difference in utilization with a statistical significance level at .05.

Keywords: monitoring and evaluation, preliminary rice cultivation curriculum, school of rice and farmers, rice farmer

Assessing Knowledge, Attitude, and Experience of White Shrimp Farmers in Chachoengsao Province, Thailand

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Current production for export in fishing sectors in Thailand is growing rapidly due to the demands of international markets by the year 2017. The export value of shrimp products is one-fifth of the whole Thai fishery products. In particular, white shrimp (*Litopenaeus vannamei*) farming accounts for more than 90 percent of the total areas of shrimp. Chachoengsao province is ranked as the highest number of shrimp farming areas with 3,189 farms accounting for 18.24 percent of farm-raised shrimp throughout the country. In the last three years, Thailand had faced the disease outbreak problem as well as economic downturn resulting in the decrease in the number of white shrimp farms, yet white shrimp farming has still been widely prevalent until the present. Consequently, the study aimed to assess knowledge, attitude and experience of white shrimp farmers in Chachoengsao Province, Thailand. A simple random technique was applied in order to select 45 farmers as samples. Descriptive statistics and chi-square test were employed to analyze the data. Pearson's chi square test was used to verify relationships between variables. The results revealed that the majority of white shrimp farmers were male (64.4%), married (57.8%) with the age range during 46-60 years old (51.1%), and graduated from primary school (40%). Regarding experience, most participants had shrimp farming experience during 5-15 years (44.4%). Farmers had a very good level of shrimp farming knowledge, and had the moderate level of attitude toward white shrimp farming. Chi-square test demonstrated that age of a farmer, marital status, education, knowledge, farm area, the sufficiency of water resources, high selling price, certifying and support from the government, farming interest of new generations, and the love of white shrimp farming, were related to the white shrimp farming experience of the farmers. The results from this study could provide insight information for relevant organizations to perform or support white shrimp raising knowledge, including finding appropriate management approach for shrimp farmers, so that they understand and can resolve problems occurred more effectively and sustainably.

Keywords: Knowledge, Attitude, Experience, White Shrimp Farmers, Chachoengsao

Enabling Communities Through Capacity Building and Agro-enterprise Development: the San Juan, Quirino, Isabela, Philippines Experience

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In recent years, a diversified and integrated rice-based farming system was actively promoted in the Philippines to increase income and profitability through purposive integration of cost-reducing and yield-enhancing technologies. This is a poverty and employment generation strategy by spinning-off rural agribusinesses in the rice farming communities.

The project was started in 2015 to 2017 at San Juan Quirino, Isabela – a rural community which major source of income is farming. Poverty incidence is high at 45.7% compared to national average of 37.5% in 2003 (PSA, City and Municipal Poverty Estimates). Rice, corn and tobacco are the major crops which are planted twice a year except for tobacco, grown in 4 months, making wide window for lean months. Farmers also tend to produce-and-sell farm products due to dearth of marketing information.

In reference to the baseline, season-long training on rice production was conducted to improve practices and eventually increase yields. To make it inclusive, capacity enhancements on mushroom, vermicomposting, vegetable, hog fattening and piglet production were conducted in partnership with other agencies, involving out-of-school youth, women and other sectors as well as students. These components were selected owing to their compatibility of integration. The rice straw was used as substrate for vermicomposting and mushroom production. The spent mushroom substrates were also deposited in the vermibins, as well as other crop by-products and animal manures. Vermicompost produced was used as fertilizer for the crops. Start-up capital needed was provided as loan to farmer-participants and later payments was deposited in an account named after their registered organization.

As result, rice farmers have an increased yield at an average of 0.51t/ha or about Php8,160.00/ha during dry season and 0.48t/ha or Php7,680.00/ha during wet. The cost of production was lessen by Php4,500.00/ha owing to an efficient fertilizer and pesticide managements, as well as labor due to mechanization. Frequency of planting was intensified through mungbean-rice relay. Mungbean grown in 45-60 days can give at least Php22,080.00/ha and can generate farm labor of 15-25MD. Hog fattening practices was improved through efficient feeds and feeding and other management interventions provided by a state university partner, resulted in zero mortality and higher carcass yield. Fifty three hybrid piglet loan were granted with a net income of Php2,350.00/hd in 4months. Vermicomposting and mushroom facilities were provided in the community. They are now producing *Pleurotus* and *Volvariella* mushrooms as well as vermicast. The vegetable component was integrated for household consumption and to sustain safe and healthy food source right at their backyards. The farmers' association has now at least Php 320,000.00 as revolving fund to sustain their small agribusiness.

The project did not only provide training in the community, but also small capital to start and sustain their agro-enterprise. Its greater impact in the next years will be the preservation of the environment through a well integrated closed-loop agro-enterprises wherein there is no farm by-products to be wasted, but utilized as input to produce another products.

Transformation of Agroforestry from Invasive Forest to Encourage Food Security to Smallholder Farmers at Maekammee Watershed in Northern Thailand

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The changing area in Yom watershed at Phrae province during 2002 - 2009, half of land using approximately 1.2 million hectare was forest and paddy rice area. On the other hand, a rest of land using approximately 1.1 million hectare was an invasive forest through maize area. The effect of changing land use not only the impact of ecosystem but also impact of socio-economics. Farmers' Maekammee watershed (the sub-basin of Yom River) has had an awareness of a lack of water in agriculture. Because of the annual crop is paddy rice in rainy season and less water crops in dry season such as tobacco, maize, soybean, green bean, and vegetables. Farmers interested in agricultural used water planning by brainstorming in community. As researchers have been an awareness of watershed management with them for making suitable crop choice model. Goal was a transform of agroforestry from invasive forest to encourage food security to smallholder farmers at Maekammee watershed in Northern Thailand. We collected data in 2015 from population 11,016 persons in Phrae province by using stratified random sampling of farmers in up-middle-down stream of Maekammee watershed and then using simple random sampling collected 371 samples. Methodology was cost benefits analysis of

crop production and Ordinary Least Squares (OLS) by multiple linear programming. We have transformed the agroforestry to smallholder farmers and have followed the results since 2015.

The model was maximum net cash income in condition of saving rice for consumption in household. As a result, can get the maximum net cash income 260,189 baht/year. In rain season, the model selected paddy rice: maize which should 0.06: 1.8 hectare from total area 1.86 hectare and own investment 53,048 baht/total area without loan from financial institutes. Family labors had to use 20 manday/month and hired labor in August (planting)-November (harvest) was a few manday. Paddy rice yield was 297.79 kg. (seed 27.96 kg.: consumption in household 255.99 kg.: payment for land rent 13.84 kg.) and maize yield was 14,737.99 kg. On the other hand, the model selected planting tobacco: green bean which should 0.62: 1.25 hectare in dry season during December (planting) 5.97 manday to March (harvest) 127.37 manday can get the maximum net cash income was 311,519 baht. Family labor for doing activities on farm and hired labor. Yield of fresh tobacco: green bean were 2,509 and 5,845 kg. Water using was 41.37 48.82 and 21.69 m^3 respectively in December-February. The net cash income of model was 571,708 baht/year in condition of food security in household. However, agricultural used water management with brainstorming of farmers, we suggested to share some plot to be an agroforestry. The agroforestry model was paddy rice: maize: bamboo: rubber/fruit tree because the fruit trees/rubber was a main tree and the free area among growing trees could plant the vegetables crop. Bamboo will be a fence for protecting animal of plot. Therefore, farmers could get farm income from vegetables arounds 5 years before growth trees in agroforestry and will also have food security in household.

The Farmers Characteristics on The Adoption of Artificial Insemination Technology in Bengkulu, Indonesia

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The purpose of this research was to investigate the personal characteristics of small holder farmer in Bengkulu Province, Indonesia on the adoption of beef cattle Artificial Insemination (AI). Key Informant Information (KII) and questionnaires were used to collect the primary data from the respondents. Secondary data were obtained from literature review and relevant sources. Data was analyzed descriptivelly and correlation-regresion was used to analyze the relation among parameters viz. education and age of respondent, size of family, size of herd, years of farming experience. Eighty respondents were randomly selected from 5 districts in Bengkulu Province. Results revealed that 83.75% respondents were male and 55% education level of respondents were primary education. It was showed that the mean of respondents age was 46.6 year old, the family size was 4.16, the herd size was 7.22, and the average of farming experience was 8.48 years. Although all respondents were practising semi-intensive production system and 88.75% respondents adopted AI services, some barriers in implementing AI were also found, namely lack of inseminator in remote area, repeated failure during insemination, inproper semen handling, and calving difficulties.

Keywords: farmer, adoption, artificial insemination, Bengkulu

A Study and Development of Local Materials to Improve Quality of Oyster Mushroom Culture Materials, Panom Samran Sub-district, Khu Mueang District, Buriram Province

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This study aimed to investigate: 1) growth performance of Oyster Mushroom culture by different specific materials; 2) an amount of yields based on a number of cropping; and 3) to transfer the body of knowledge on oyster mushroom culture to the community. Completely Randomize Design (CRD) was used for the experimental plan. It comprised A treatments and 50 replications each i.e. 100% Para rubber saw dust (T1); Para rubber saw dust plus raw hush, 50:50% (T2); Para rubber saw dust plus sugarcane pulse, 50:50% (T3); and Para rubber sawdust plus rice straw, 50:50% (T4). Data were recorded by fresh weight measuring (gram), dry weight measuring (gram), width (cm.), and a number of flowers. Time span for flower giving was one month or 30 days. At the end of the experiment, analyzed variance and compared and average mean score of the treatments by Duncan's New Multiple Range Test (DMRT) and analyzed by the Statistical Package Program.

Results of the four experiments showed that there was statistically significant difference ($P \leq 0.05$) in terms of fresh weight of treatment 1 (3.29^a grams), followed by treatment 3 (2.31^b grams). A highest value of dry weight was in treatment 1 (0.37^a grams), followed by treatment 3 (0.31^{ab} grams). A highest width of a flower cab was found in treatment 2 (10.85^a cm), followed by treatment 3 (10.47a cm). A highest number of flowers was found in treatment 1 (7.93^a), followed by treatment 3 (7.55^a). This denoted that using a specific material of chopped sugar cane pulse could

well replace a specific material of 100% Para rubber saw dust. This was because sugar cane pulse had a chemical property of cellulose tissue beneficial to mushroom culture (Na Phuket, 2017). Thus, using sugar cane pulse as by-product material tends to be an alternative for interested farmers in sustainable mushroom culture in accordance with the philosophy of sufficiency economy.

Regarding results of the experiment on the basis of fresh weight, dry weight, width, and a number of oyster mushrooms (flowers) within a flower giving period (1 month), it was found that a highest fresh weight was in treatment 1 (3.29^{a} grams), followed by treatment 3 (2.31^{b} grams), treatment 4 (1.92^{bc} grams) and treatment 2 (1.74^{c} grams), respectively. Based on a highest dry weight, it was found in treatment 1 (0.37a gram), followed by treatment 3 (0.31ab gram), treatment 4 (0.07^{b} gram), and treatment 2 (0.26^{b} gram), respectively.

In terms of a highest width of flown cap, it was found in treatment 2 (10.85^{a} cm.), followed by treatment 3 (10.47^{a} cm.), treatment 1 (8.36a cm.), and treatment 4 (7.72b cm.), respectively. On the basis of a highest number of flowers (oyster mushrooms), it was found in treatment 1 (7.93^{a}), followed by treatment 3 97.55^{a}), treatment 2 97.11^{ab}), and treatment 4 (5.88^{b}), respectively.

Keywords: investigation, oyster mushroom, a specific material

Factors Effecting Basic Education School Administration Using School-based Management, Nam Nao District, Phetchabun Province, Thailand

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This qualitative and quantitative study was conducted to explore factors effecting basis education school administration by using school-based management in Nam Nao district, Phetchabun province. Questionnaire and structured in-depth interview schedule were used for data collection. Key informants in this study consisted of 32 stakeholders from 15 schools. The schools was classified into 4 groups depending on topographic condition and one school was the representative of each group. However, the informants were of 6 groups as follows: 1) four presidents of school committee members; 2) four school administrators; 3) eight teachers; 4) 4 school administrative committee members; 5) 4 student council members; and 6) eight guardians. Content analysis was used for qualitative data and descriptive statistics was used for quantitative data analysis. Results of the study as follows:

1) Internal factors had a highest level of an effect on basic education school administration by using school based management. This included the following: organizational structure, organization member, administrator style, shared values. However, strategies, system of organization operation, and organization capability were found at a moderate level.

2) External factors had a highest level of an effect n basic education school administration by using school-based management. This included politics and economy whereas technology and sociology were found at a low level.

3) Finding showed that there was consistency in opinions of the two informants' group (presidents of school committee and school administrators). However, their opinion was different from that of teachers and school administrative committee (Statistical significance level at .05). Meanwhile, opinions of the guardians and the teachers groups were consistent with external factor on economy but inconsistent with opinions of the school administrators group (Statistical significance level at .01). In addition, opinions of the guardians group and the student council group about factors effecting school administration were not different.

Keywords: school management, basic education school, internal factors, external factors, school based management (SBM)

Needs for the Development of teacher Professional Competency of Agricultural Training Teacher Students at Surindra Rajabhat University, Thailand

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This study aimed to explore needs for the development of teacher professional Competency of agricultural training teacher students of Faculty of Agriculture and Agro-Industry, Surindra Rajabhat University. The sample group in this study consisted of 82 agricultural training teacher students, first semester, academic year 2016. A set of questionnaires

(IOC= 0.89) was used for data collection and analyzed by using descriptive statistic i.e. frequency, percentage, mean, and standard deviation. Results of the study revealed the following:

1) Most of the respondents were male (60%) and 23 years old (74.55%). They had 2.85 of an average grade of elementary and secondary school practicum teaching. Most of the respondents (88.64%) taught Agriculture subject (occupation and technology), had other assigned tasks (70.91%), and taught in a big school (60%).

2) As a whole, the respondents had functional competency at a moderate level ($\overline{X}$ = 3.45). Based on its details, they had a high level of the competency in ethics and teacher profession in code of ethics whereas the following were found at a moderate level: self-development, work achievement, and teamwork.

3) As a whole, the respondents gained a moderate level ($\overline{X}$ = 3.25) of functional competency. Based on its details, creating relationships/coordination with the community and classroom management was found at a high level. However, the rest were found at a moderate level.

4) The respondents had added competency aside from the core and functional competencies at a moderate level ($\overline{X}$ = 3.45). Based on its details, technology using and a communication capability were found at a high level whereas thinking skills, life skills, and problems-solving capability were found at a moderate level.

Keywords: teacher profession competency, functional competency, added competency for Agriculture teachers, teacher profession training students, Agriculture teacher

Utilization and Preservation of Agricultural Areas Ban Bang Rong, Phuket Province, Thailand

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This study aimed to: 1) explore agricultural area utilization and preservation of 17 farmers domesticating goats and 55 orchard farmers in Ban Bang Rong, Phuket sub-district, Thailand district, Phuket province and 2) compare land use and preservation of agricultural areas of the farmers. The sample group in this study was obtained by purposive sampling. A set of questionnaires was used for data collection and analyzed by descriptive statistics i.e. frequency, percentage, standard deviation, and t-test (independent sample).

Results of the study revealed that impacts of land use of the farmers was found at a high level i.e. investment was not worth for the occupation ($\overline{X}$ = 2.88); are fertility for the occupation ($\overline{X}$ = 2.85); expansion of residential areas ($\overline{X}$ = 2.85); and water shortage during the dry season ($\overline{X}$ = 2.79). Regarding a guideline for helping the farmers doing agricultural occupation, it included: 1) building consciousness for the youth to love their community and 2) preserving an identity of local culture and tradition. Besides, there was the management of tourist groups to learn ways of their life of people in the community, instillation of new generations to perceive value of agricultural areas, construction distinct points, community coordination, and development of interesting agricultural areas.

Regarding the preservation of agricultural areas as source of local food production and accommodating an agro-tourism source of the community, the farmers gave suggestions which were very beneficial as follows: 1) conservation of nature particularly on plant varieties and an50a3 breeds in agricultural areas of the community; 2) develop the agricultural are to be an agricultural learning center; 3) preservation of agricultural areas for new generations to do agricultural occupations and build a residential area; 4) mixed farming of one stop service on yield production and processing for value added and construction of motivation for the youth to perceive value of agricultural occupation and to prevent ancestors' area selling.

Keywords: utilization, preservation of agricultural area, agro-tourism, agricultural community

Problem Condition in the Agricultural Learning Center Using at Praibuengwittayakom School, Srisaket Province, Thailand

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This study was conducted to: 1) explore problem conditions in the Agricultural Learning Center using at Praibuengwittayakom School, Srisaket province and 2) compare the problem conditions with various variables i.e. parent occupation, educational attainment, age, sex of the respondents. A set of questionnaires was administered with 279 students (154 third year and 125 sixth year secondary school students) who were enrolled in Agriculture subject, academic year 2016. Obtained data were analyzed by using percentage, mean, standard deviation, and t-test was used for the hypothesis testing.
Finding showed that more than one-half of the respondents (65.45%) were females using the Agricultural Learning Center and their average age was 16.28 years. More than one-half of their parents (65.45%) were engaged in agriculture most. There was all 5 aspects of problems in using the Agricultural Learning Center found at a low level. As a whole, there was no using of students whose parents who were engaged in agriculture and those who were not. Based on its details, findings showed that there was statistically significant difference at .05 in learning content compared between the third year and sixth year secondary school students. It was also found that the students having difference sex had no statistically significant difference.

Keywords: the school agricultural learning center, agriculture subject, problems in the facilitation of agriculture subject teaching, secondary school students, teaching/learning activities

Secondary School Agricultural Teachers' Competency in Task Performance, Nakhon Ratchasrima Province, Thailand

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This quantitative aimed to explore secondary school agricultural teachers' competency in task performance, Nakhon Ratchasrima province. Population in this study consisted of 42 school directors, 42 Agriculture teachers, and 42 co-teachers. They under the supervision of Secondary School Office Area 31 and Nakhon Ratchasrima Provincial Office of Administrative Organization (42 schools). A set of 5-rating-scale questionnaires was used for data collection and analyzed by using mean, standard deviation, t-test, and One-way ANOVA. Findings showed the following: 1) the respondents under the difference in affiliation had statistically significant difference in task performance competency at .05; 2) the respondents working in a different school size had statistically significant difference in the achievement of task performance at .05; and 3) the respondents working in a different school size had statistically significant difference in work line competency in analyses at P 0 .05.

Keywords: core competency, work line competency, task performance, secondary school agricultural teacher

Stress in Learning English for Agriculture of Agriculture Student at Maejo University

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The objectives of this qualitative and quantitative study were to explore: 1) general conditions of students and the facilitation of English for Agriculture teaching and learning; 2) perception traits of the students based on personality and management ability; 3) a level of stress in learning English for Agriculture of the students; and 4) guidelines for solving stress problems of the students. Respondents in this study consisted of 109 second year Animal Science Students and 39 second Agronomy students, Maejo University, Chiang Mai province. All of them were obtained by purposive sampling (Second semester, Academic year 2016. Also, there was focus group discussion among English for Agriculture instructors at Maejo University.

Results of the study revealed that more than one-half (58.78) of the respondents were female, 20 years old, second year students (73.65%), and animal Science students (78.38%). Most of the respondents' domiciles (72.30%) were in northern Thailand and they mainly got allowance from their parents. Their late grade point average in English was 3.50-4.00 (29.73%). Regarding perception traits of the respondents based on personality and management ability, it was found at a high and moderate levels, respectively (= 3.68 and 2.93). Besides, the respondents perceived that teaching and learning activities were appropriate at a high level ($\bar{x}$ = 3.62). Besides, it was found that the respondents had moderate level of stress based on relationships with friends ($\bar{x}$ = 3.09). For behavioral and physical disorder of the respondents due to the stress, both were found at lowest level ($\bar{x}$ = 1.77 and 1.64, respectively).

The following were suggestions: 1) the teacher should be broad minded and accept a level of the student ability to learn English for Agriculture, 2) the teacher should not always follow learning content in the learning material but can make use of other reading selections from other printed materials which are interesting, 3) the teacher should not focus on grammar but English Agricultural technical terms, 4) the teacher should employ diverse teaching methods and modern teaching media to interest the students, 5) the teacher should always give a chance for the students to truly participate in the teaching and learning process.

Keywords: Stress, English for Agriculture, Perception traits

Process of Driving the Sufficiency Economy Philosophy of Debsirinromklao School, Thailand

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The objective of research was to study the process of driving sufficiency economy philosophy of Debsirinromklao School. Data was collected from 10 key informants consisting of teachers and the sufficiency economy committee by using a focus group and non-participant observation. This was analyzed by using the innovation adoption process as a framework. The result showed that the process of driving the sufficiency economy philosophy of Debsirinromklao School includes 5 stages, according to innovation adoption process of Rogers. 1) Knowledge stage: publicize the project and educate about sufficiency economy in the morning ceremony. 2) Persuasion stage: advertise for the camp and create interest in sufficiency economy exhibition. 3) Decision stage: enroll students in the camp. 4) Implementation stage: set up camp activities about sufficiency economy were sufficient seedling camp, sufficient youth camp, sufficient leader camp and sufficient fair. 5) Confirmation stage: set up camp activities about sufficiency economy every year, along with promoting the sufficiency economy philosophy to other schools in nearby areas by sufficient travel.

Keywords: Sufficiency economy, Process of Driving Sufficiency economy philosophy

(DRT) Double Row Transplanting: An Innovation in Organic Rice Production

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In search for ways to increase rice yield in an environment friendly, energy efficient and economical ways, high yielding rice genotypes (3 hybrids -Mestizo 19, Bigante & SL-12H, and 3 inbreds -NSIC Rc 358, 222, 352) bred and varieties under high chemical inputs were grown under organic and double row planting method spaced 20 x 10 cm (the double rows) and 40 cm interval between the double rows. The other features included use of bokashi and liquid manure as fertilizer, use of rotary weeder in controlling the weeds and planting one seedling per hill at 20 kg seeds per ha. Hybrid seeds are expensive. The results showed that under Bokong, Labangan , Zamboanga del Sur rice growing conditions, NSIC Rc222 (an inbred) had the highest yield at 6.07 t ha followed by Mestizo 19 (a hybrid) at 5.37 t ha^{-1} (a 0.7 t ha^{-1} difference in yield, rice agronomists consider 0.5 t ha^{-1}as financially significant though not statistically significant).

This innovation in organic rice culture (double row transplanting, applying organic fertilizer and the use of rotary weeder) and using the most adapted inbred variety, rice yield had surpass the yield of conventionally grown rice in the area .The yield of 3 neighboring rice farmers whose rice were grown the conventional way (applied with chemical fertilizer and sprayed with herbicides) was only 3.93 t ha^{-1}. Compared with Rc222 the yield difference was 2.14 t ha^{-1} or 0.77 t ha^{-1} for Rc358, the next highest yielding inbred. Sold at P19/kg, the added income compared with the farmer's yield was P38,122.86 (US$749.64/ha). But organically grown rice are usually bought at 20% higher price from the conventional growing. An added income of PSB Rc 222 compared to farmers growing was P61,188.86 (USS 1203.20, 1US$=50.85PhP).
There was an added labor in transplanting one seedling per hill in the double rows since trans planters are still adjusting to the innovated transplanting technique and in manual rotary weeding (hence, the need to have motorized rotary weeder) and in preparing/applying liquid manure fertilizer (but 110 watt, 1/6 Hp submersible pump is available now in the market). Deducting all the incremental labor, the net income was still higher since no chemical fertilizer and pesticides were applied.

Organic rice is cash- and energy-cost saving, financially rewarding, environment- and health-friendly way of rice farming. It should be adapted by rice farmers in the Philippines and ASEAN countries.

Keywords: double row, transplanting, innovation, organic rice production

The Project Feasibility Study of Solid Waste Transfer Station Of Mahasarakham

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The purpose of research was to study the project feasibility of solid waste transfer station of Mahasarakham; 13 districts by studying and analyzing the feasibility of the area and the situation of waste in the area, the feasibility of technical transfer station, feasibility in economics and the feasibility of management transfer station from the project by using the information collected and used a qualitative method. The study found that: 1) the feasibility of the project area were devided into 5 stations, including Mueang district station (Mueang Mahasarakham district, Kantharawichai district, Kae Dam district), Borabue stations (Borabue district, Na Chueak district, Kud Rang district), Chiang Yuen station (Chiang Yuen district, Chuan Chom district, Khosoompisai district), WapiPathum district station (WapiPathum district and Na Dun districts) and PhayakkhaphumPhisai district station (PhayakkhaphumPhisai district, Yang Sisurat district). They waere suitable areas and equipped on the side of the area enough to project construction solid waste transfer station and the surrounding areas was conducive to project construction and project development. 2) the technical feasibility of project solid waste transfer station, it was found that the type of the station handling the solid waste management of Mahasarakham province were designed according to the size and amount of waste space projects happening in the day. 3) the economic feasibility of the solid waste transfer project was a project that will reduce waste management costs and eliminate residues and it is an investment that aimed to benefit the community based on the valuation of construction and technology within the waste disposal station. It was considered a good investment for the long-term investment. 4) The the feasibility of internal management station and found that the project washigh form of administration and internal management of solid waste transfer station environmental management and the system safety in work and social responsibility of solid waste transfer station, the precautions and fix the initial environmental examination in order to make the management in solid waste transfer station was appropriate and effective. So the solid waste transfer station project of Mahasarakham, there were the feasibility of the area and the situation of waste in the area, the feasibility of technical transfer station, the feasibility in economics and the feasibility of management transfer station.

Keywords: Project Feasibility Study, solid waste transfer station, Mahasarakham province, the feasibility of the area and the situation of waste in the area, the feasibility of technical transfer station, the feasibility in economics, the feasibility of management transfer station

Poster Session 1: Plant Sciences

Ethnomedicinal Plants Utilized by the Ilongot-Eǵongot Community of Bayanihan, Maria Aurora, Aurora, Philippines

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The Philippines hosts 130 distinct and diverse ethnic groups. One ethnic group is the *Ilongots* that inhabit the mountainous region of Maria Aurora, Aurora Province, characterized by a rich culture of traditional medicine. The study conducted a survey on the ethnomedicinal plants utilized by the *Ilongot-Eǵongot* community at Bayanihan, Maria Aurora, Aurora Province. Personal interviews with the tribal chieftains were conducted as well as 22 respondents were asked to answer questionnaires about the plants and their medicinal uses. Sixty-five (65) plants were documented as treatments to various conditions and are categorized into different areas: respiratory, circulatory, gastro-intestinal, obstetrics-gynecology, genitourinary, dermatology, musculo-skeletal, diseases of the eyes, nose, ears and throat; and other categories such as antidiabetes, antioxidant, anticancer, antiviral antifungal/antibacterial/antiinfectants, antiparasitic, fever, immunostimulant/ immunity issues, anti-inflammatory and snake and dog bites. The sixty-five plants represented 27 families including Asteraceae, Euphorbiaceae, Fabaceae, Lamiaceae, Malvaceae, and Poaceae. Plant voucher specimens were preserved. It is recommended that pharmacological screenings be conducted to validate the medicinal uses of this plants.

Keywords: Ethnomedicinal plants, *Ilongot-Eǵongot*, Aurora, Philippines

Effects of Gamma Radiation for Callus Induction of *Stylosanthes hamata* cv. Verano

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Callus induction from seeds of (Hamata) *Stylosanthes hamata* cultivar Verano were cultured on Murashige and Skoog medium (MS) supplemented with concentrations of 0.5 mg/l Indole-3-butyric acid (IBA) and 3 mg/l Thidiazuron (TDZ), and 30 g/l sucrose and 2.6 g/l phytagyl. Callus was acutely irradiated the dose of gamma irradiation at 0, 2, 4, 6, 8 and 10 Krad. Experiments were set up in a completely randomized design and repeated four times, with at 30 explants per treatment. After irradiation, all callus was cultured on MS medium supplemented with 0.5 mg/l IBA and 3 mg/l TDZ, 30 g/l sucrose and 2.6 g/l phytagyl for 4 weeks. The results showed that fifty percent lethal dose (LD50 value was 6.60 Krad.). After 12 weeks, Callus non irradiated was 7 shoots per callus and shoots length average at 0.95 centimeter higher than that of explants irradiated by dose higher. The number of shoots regenerated per explants also decreased with the increase of radiation dose. Mutation inductions by acutely irradiator and selection of mutants have been powerful tools for plant improvement.

Keywords: Callus induction, gamma irradiation, lethal dose (LD_{50}), *Stylosanthes hamata* cv. Verano

Root Response of PSB Rc68 Under Abiotic Stresses

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The three major abiotic stresses, drought, submergence and salinity adversely affect plant growth and development resulting in significant decline in crop productivity. Plants have evolve various adaptive mechanisms to cope with these abiotic stresses. PSB Rc68 (Sacobia), an improved rice variety, was evaluated in this study to generate information on the initial response of its roots at vegetative stage under drought and submergence stress and at seedling stage under salinity stress condition. NSIC Rc222, FR13A and FL478 were used as tolerant check while IR64, IR42 and IR29 were used as susceptible checks under these stresses. PSB Rc68 were subjected to drought and submergence with water logged as controlled condition while for salinity, plants were grown on hydroponic condition with a control and saline solution.

Results in drought condition showed that PSB Rc68 was comparable with NSIC Rc222 based on total nodal root length (TNRL), number of nodal roots, and root dry weight with significant difference to IR64, a susceptible check, having the least total root length. Total lateral root length (TLRL) was correlated to root dry weight and total nodal root length was positively correlated with number of nodal roots. In comparison between waterlogged and drought condition, increased in TLRL (23.54%) and TRL (2.72%) was observed in PSB Rc68.

In submergence stress, there was no significant difference in TLRL, TNRL, TRL, number of nodal roots and root dry weight in three genotypes. Total nodal root length and root dry weight was correlated as well as total lateral root length to specific root length. TLRL, TNRL, TRL and number of nodal roots of the three genotype decreased in submergence condition compared with the waterlogged.

Data on salinity revealed that there was no significant difference in TNRL in all genotype. Total root length and total lateral root length were found significantly different in FL478 and PSB Rc68. Total root length was also correlated with TNRL, TLRL and root dry weight. Root length including nodal and lateral root of the three genotype decreased in treated condition compared with the control, FL478 with the highest mean while the PSB Rc68 displayed intermediate mean between FL478 and IR29.

With this information, we can determine the root response of PSB Rc68 in drought, submergence and salinity stresses.

Keyword: abiotic stress, drought, saline, submergence**,** waterlogged

Characterization of Gum from Durian Seed and Application in Ice Cream

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The objectives of the research were to characterize gum from durian seed and application in icecream. The gum extraction from durian seed was carried out using acetic acid and dried by hot air oven. The yield of durian seed gum extraction was 8.24%. Gum from durian seed contained moisture content of 8.29%, ash 5.86%, water absorption index 1.26% and water solubility index 68.78%. The color value L*(lightness) a*(redness) b*(yellowness) was investigated. The results show that L* a* b* was 54.01, 8.70 and 22.35, respectively. The effect of durian seed gum in sherbet icecream on total soluble solid, overrun and meltdown were studied. The results indicated that the durian seed gum was added the total soluble solid and overrun were increased but meltdown was decreased. Gum from durian seed can be used in food product and value-added utilization of waste.

Keywords: gum, durian seed, ice cream

***Moringa* Extract in Combination with Organic Fertilizer for Organic Vegetables Production**

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In vitro Effect of Gamma Irradiation and Plant Growth Regulators (PGRs) for induction and developing of Stylosanthes hamata cv. Verano

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In the current study for developed Pasture legumes by tissue culture technique with gamma irradiation. Seeds of *Stylosanthes hamata cv*. Verano were receive 7 doses of radiation (5 10 15 20 25 30 and 45 Krad) and control (without irradiation) cultured on MS medium (Murashige and Skoog, 1962) free Plant Growth Regulators (PGRs) and 30 g/l sucrose after 30 days found at 30 Krad make decreased the percentage of shoot and root length 31.7% and 20.51% respectively. While seeds without irradiation were 100% germination. The radiation dose are reduces the growth rate by half in 7 days $GR_{50(30)}$ at 39.82 Krad. 50 percentage of survival rate lethal dose $LD_{50(30)}$ of *Stylosanthes hamata* cv. Verano 26.14 Krad approximately and the higher irradiation level caused increase death rate. Seeds on MS medium with 3 mg/l, *meta*-Topolin (*m*T). The results showed the percentages of survival at 60 days after irradiation were are higher than 50 in all treatments and $GR_{50(30)}$ higher than 50 too. And every doses of gamma rays can produce shoot and root after 60 days. However, in next study of Hamata with all treatment can be the reasons to made new mutations to made Hamata beans such as drought tolerant and salt tolerant.

Keywords: gamma irradiation, lethal dose (LD_{50}), *Stylosanthes hamata* cv. Verano

Callus Induction and Cell Suspension Culture from Leaves of *Kadsura coccinea* (Lem.) A.C.Sm

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Kadsura spp. is a vines glabrous woody of the family Schisandraceae were rare plants found in highland, it in ancient plants group had low adaptation for living. Shape and scent of fruit like sugar apple its can be eat when ripping so it had nutrients value and high antioxidants. Now it had been valuable medicines to prevent the tumor HIV resistant and hepatitis. In presently *Kadsura* spp. had been become extinct. This study was the aim to induced callus from leaves of *Kadsura* spp. (*Kadsura coccinea* (Lem.) A.C.Sm. The leaves were sterilized and cultured on solid synthetic medium, Murashige and Skoog (MS) medium supplement with Plant Growth Regulators (PGRs) used 0.5, 1, 2, 3 and 5 mg/L concentrations of 6-benzylaminopurine (BAP), *meta*-Topolin (*m*T), 2,4-dichlorophenol-xyacetic acid (2,4-D) and 0.5 mg/L of BAP combine with 0.5, 1, 2, 3 and 5 mg/L of 2,4-D. The maximum number of leaves were induced callus (55.55%) and 350.16 mm^3 average area on medium with 0.5 mg/L of BAP with 0.5 mg/L of 2,4-D but 0.5 mg/L of BAP with 2 mg/L of 2,4-D gave the highest average area (1,079.53 mm^3) after 4 weeks. Afterwards studied on growth rate of cell suspension cultured on liquid MS medium supplement with 0.5 mg/l of BAP and 0.5 mg/l of 2,4-D and took results every 3 days for 30 days. The results shown the fresh weight and dry weight of cell suspension with the best growth for 15 days of 1.12 g/10 mL fresh weight and dry weight 0.14 g/10 mL respectively. Cell suspension has grown rapidly during the period of 6-15 days. This work has developed an optimized protocol for plant breeding.

Keywords: Callus induction, Cell suspension, *Kadsura coccinea* (Lem.) A.C.Sm

Characterization of F2-Derived Lines of White Aromatic Rice

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Morphological characterization and evaluation of agronomic traits of breeding lines are very important activities in any breeding program. These help identify useful traits that could be used as indices for selection. The study was carried out during the 2016 dry season (DS) and wet season (WS) which aimed to characterize/evaluate the morpho-agronomic characters of seven F2 derived lines of white aromatic rice (CLH 122, CLH 138, CLH 150, CLH 278, CLH 283-B1, CLH 283-B2-7 and CLH 295) with Burdagol and CL1 as check varieties. Evaluation was done under lowland irrigated condition at Central Luzon State University, Science City of Munoz, Nueva Ecija. The Randomized Complete Block Design (RCBD) with three replications was used.

Leaf blade pubescence (intermediate), leaf blade colon (dark green), ligules shape (cleft), ligule color (white), collar color (light green), auricle color (light green), stigma color (white), culm internode color (light gold), panicle type (intermediate), secondary branching of panicles (heavy), panicle axis (droopy) and sterile lemma color (straw) were observed to be similar among lines. Variations were manifested on the measurable traits. Most of the lines had intermediate flag leaf angle, straw apiculus, awnless and with lemma and palea of gold and gold furrows on straw background. Culm strength (strong); panicle exertion (enclosed to well-exserted); leaf senescence (late); and panicle threshability (easy) were observed

Most of the lines were rated 0 l- less than 10% of the kernel to have white belly, had extra-long grains (more than 7.5 mm) and slender (3.42-4.42 mm). Most of the lines had medium maturity (111-120 days) across seasons and short to intermediate plant height during DS. Productive tillers ranged from 7-13 across season. CLH 278 had the longest panicles and highest percent filled grains (79.74%) during DS. CLH 295 had heavier weight of 1000 seeds than CL1. Likewise, CLH 295 which produced yield of 5.51t/ha was higher than CL1 (0.91 t/ha) and Burdagol (2.94 t/ha) during WS. On the other hand, CLH 150, CLH 138 and CLH 295 out-yielded CL 1 4.83 t/ha) during DS. The lines recorded milling recovery of 57.07-63.98% which were higher than CL1 (40.48%). CLH 122, CLH 283-1 and CLH 138 had head rice recovery (57.8-63.8%) higher than CL 1 (46.5%) and Burdagol (49.3%). Among the lines evaluated, CLH 122, CLH 283-1 and CLH 295 were found aromatic, with good eating quality, had medium maturity and short to intermediate stature.

Keywords: Characterization, F2 -derived lines, white aromatic rice, agronomic traits

Evaluation of Breeding Lines of Sticky Rice Under Irrigated Lowland Condition

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Evaluation of breeding lines helps breeders in the identification of useful traits that could be used as bases in selecting superior genotypes with the potential to become a variety or as source of genetic variability that could be exploited for present and future breeding program. Nine F_2-derived lines (CLH234-1, CLH155, CLH163, CLH83-3, CLH144, CLH296, CLH82 (BC2), CLH298 and CLH234) together with a check (Bonquitan) were characterized/evaluated for morphological, agronomic and quality traits. The experiment was laid out in Randomized Complete Block Design (RCBD) with three replications. Evaluation was done at the Research Experimental Station of Central Luzon State University during wet season (WS) of 2014 and dry season (DS) of 2015. The lines were observed to be similar for leaf blade pubescence (glabrous), basal leaf sheath color (light green), ligule color (white), ligule shape (cleft), collar color (light green), auricle color (light green), stigma color (white), secondary branching of panicles (heavy), panicle type (intermediate), secondary branching of panicles (heavy), panicle axis (droopy), and sterile lemma color (straw). The lines had strong culms and easy threshability. Other characters differed among lines.

Most of the lines produced 9-10 productive tillers per hill during DS and WS which were higher than the check (6) during WS. Six of the lines were short to intermediate (99.17-105.23 cm) during DS. Panicle length was generally shorter among lines during DS than in WS. Percent fertility was higher during DS (78.10-84.72%) than in WS (68.90-75.60%). All the lines except CLH 83-3 had earlier maturity during DS (93-108 days) and WS (93-108 days) than the check (112 days) during WS. All the lines except CLH 83-3, yielded 4.21-4.87 t/ha (DS) and 2.58-3.73 t/ha (WS) which were higher than the check with yields of 2.50 t/ha (DS) and 1.55 t/ha (WS). Most of the lines had high milling recovery (66-68.00%). On the other hand, head rice recovery was also high in CLH 234-, 298, CLH 163 (57.1-64.10%). Brown rice length was long (>7.50 mm) to extra-long (6.60-7.50 mm) and brown rice shape, medium (2.1-3.0) to slender >3.00). Weight of 100-grains ranged from 2.39-2.91g (DS) and 2.18-2.46g (WS); and seed coat color was opaque white. CLH 144 was the best line for stickiness.

Keywords: Breeding lines, irrigated lowland, sticky rice, agronomic performance

Evaluation of Anaerobic Germination and Seedling Vigor of Selected Philippine Traditional Rice Varieties

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Direct wet seeding is a rice crop establishment technique that helps in reducing the cost input in production but exposes the plant to an anaerobic environment. Shift from transplanting to direct seeding leads in reduction of cost and effort on establishment. Breeders are continuously looking for new source of genes that can resist pest and diseases and tolerate environmental stresses. Thus, search for new varieties adaptable in anaerobic environment is important in direct seeding strategies. Traditional rice varieties (TRVs) are known for its vast genetic resources especially its high adaptability in different stresses. This study screened 20 TRVs under anaerobic environment by comparing their germination rate at 7, 10,14 and 21 days. Submerged in a steel box with 5 cm depth water from the tip of the cup, the set up was maintained for 21 days then germination rate among the TRVs were recorded and compared. Three TRVs showed significantly higher germination rate namely Dumudao, Dumalengan, and Speaker with average percent germination among the screened samples with 68.52%, 65.93% and 53.33% respectively, at 7, 10 14, and 21 days' observation after sowing. Furthermore, 13 out of 20 TRVs were identified susceptible while 7 were intermediate against anaerobic stress. Unfortunately, no resistant variety was found among the screened sample which opens to the opportunity of screening more samples in the future. Dumalengan and Speaker with depicting almost the highest among the seedling vigor parameters was also part of the top 3 TRVs with good anaerobic germination despite of the stress. Hence, these two varieties were the top performing varieties for both experiment and can be concluded to be a good source of trait for AG and SV tolerance. Exploration of potential variety suitable for different environment such as anaerobic environment can be done to contribute in the breeding program.

Keywords: Anaerobic, DSWR, Germination, Rice, TRVs

Study of Proper Fertilizer Management on Growth and Yield of Oil Palm (*Eleais guineensis* Jacq.)

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Fertilizer is the most important thing on growth and yield of oil palm (*Eleais guineensis* Jacq.). Therefore, studies of proper fertilizer management on the growth and yield of palm oil were investigated at Chaloem Phra Kiat district, Nakorn Sri Thammarat province during July 2558 - July 2559. The six-year-old plantation with spacing 9x9x9 meter was selected for study. The rate of fertilizer application were as follows; T1 (urea 2,040 gram/plant; ammonium phosphate 1,050 gram/plant; potassium chloride 2,800 gram/plant; kieserite 700 gram/plant and borate 56 gram/plant), T2 (70% of application rate in 1), T3 (130% of application rate in 1), T4 (application from soil and leaf analysis urea 2,040 gram/plant; ammonium phosphate 1,050 gram/plant; potassium chloride 3,792 gram/plant; kieserite 1,500 gram/plant and borate 56 gram/plant), T5 (70% of application rate in 4), T6 (130% of application rate in 4) and T7 (farmer practice). The fertilizer as three times a year. Randomized complete block design (RCBD) was performed and analysis of nutrients in the soil and leaves before the trial. The result revealed that the fertilizer at a rate of 4 from the analysis of nutrients in the soil and in the leaves are a reasonable rate of growth, that gave the highest response on growth (average of Leaf area at 4.37 m2 and leaf dry weight at 3.06 kg) and yield of oil palm (number of branch at 2.65 branch/plant/month, fresh weight of branch at 16.94 kg/branch and fresh weight of branch 23.22 kg/plant/month). So the fertilizer based on the soil and leaves before management can reduce fertilizer costs down and net income of 22,612 baht per rai handles most fertilizers.

Keywords: nutrient management, growth, yield, oil palm

Efficiency of Biogas Effluent from Durian Shells and Seeds Combined with Chicken Manure on Soil Chemical Properties, Growth and Nutrient Concentrations of Chinese Kale (*Brassica oleracea*)

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The objectives of this research were to study on the effect of biogas effluent from durian shells and seeds combined with chicken manure on soil chemical properties, growth and nutrient concentrations of chinese kale. The experiment was carried out in Completely Randomized Design (CRD) with 4 replications. Six treatments were control (no fertilizer, T1); four concentrations (25, 50, 75 and 100%, T2-T5) of biogas effluents and chemical fertilizer (formula16-8-8, T6). Biogas effluemt and chemical fertilizer was applied at 14, 22, 30 and 38 days after planting. The experiment was conducted for 46 days at Agricultural Technology Faculty in Rambhai Barni Rajabhat University. pH, electrical conductivity (EC), nutrient (nitrogen, phosphorus and potassium) concentrations of soil were analyzed at the starting and end of experiment. The data of plant height, leaf number, leaf length, leaf width, branch diameter, stem diameter, chlorophyll content (SPAD value), fresh and dry weights of plants were collected every week. Nitrogen, phosphorus and potassium concentrations in plants were determined at the end of experiments.

The results revealed that 25, 50, 75 and 100% of biogas effluent resulted in height, leaf number, leaf length, leaf width, stem diameter, trunk diameter, chlorophyll content and dry weight as equal as those results with chemical fertilizer. It also found that chinese kale treated with 50% of biogas effluent showed the similar fresh weight as that of chemical fertilizer treatment. All growth parameters of the control (no-fertilizer) were significantly lower than those of biogas effluent and chemical fertilizer treatments ($P \leq 0.01$.). From the analysis of nutrient concentrations in whole plants, it was found that chinese kale received 50% of biogas effluent had nitrogen concentration similar level to that of chemical fertilizer treatment. While the nitrogen concentration of control was significantly lower than that of the biogas effluent and chemical fertilizer treatments ($P \leq 0.01$). The phosphorus and the potassium differences were not

statistically significant. Based on the analysis of the chemical soil properties, soil pH in chemical fertilizer treatment was lowest in comparison to the other treatments. The lowest and highest of soil EC was found in the control and 100% biogas effluent treatment. There was no significant difference in nitrogen concentration of soil among treatments. In ase of phosphorus and potassium concentration, they were statistically significantly different ($P \leq 0.01$).

Keywords: *Brassica oleracea*, biogas effluent, soil chemical properties, growth, nutrient concentrations

Physiological Response of PSB Rc68 under Progressive Drought Stress

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Drought is an abiotic stress that greatly affects the growth and development of plants resulted to tremendous damage to agricultural sector. One of the useful methods is to use drought resistant varieties to mitigate the effect of drought stress. This study aims to generate information the shoot and root development and physiological response of PSB Rc68 at vegetative stage under progressive drought condition. PSB Rc68 (Sacobia) is an improved rice variety and used as tolerant check for drought tolerance evaluation. The pre-germinated seeds from each genotype were grown in a pail filled with 8 kg soil and subjected to well-watered (controlled condition) and in drought stress environment. The imposition of drought stress was started at 14 days after sowing when the soil moisture content (SMC) reached 12% and maintained the progressive drought stress until the test genotypes reached the vegetative stage. Shoot dry weight, number of nodal roots, lateral root length, stomatal conductance, water use, leaf area of PSB Rc68 and IR64 are significantly different in well-watered and drought stress conditions. Shoot dry weight (SDW) is highly correlated to stomatal conductance and leaf area, lateral root length is negatively correlated to total nodal root length. In comparison between PSB Rc68 and IR64 in well-watered and drought stress environment, results showed IR64 has 56.3% reduction in shoot dry weight while PSB Rc68 was found 40.4 % in drought stress. Maintenance and less reduction of shoot dry weight of PSB Rc68 was attributed by increased total root length by 51% compared to IR64 (22.6% reduction). These characteristics maintain PSB Rc68 to be able to manage the integrity of the plant under progressive drought condition.

Keywords: drought, rice, roots, shoots, water use

Induced Mutation of *Dendranthemum grandiflora* through tissue culture by Ethyl Methanesulphonate (EMS)

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The induced mutation by Ethyl methasulphonate (EMS) was used for new cultivar of chrysanthemum. The calli were regenerated from immature petals of chrysanthemum (Dendranthemum grandiflora) 'vivic'. The size of 0.5x.05 cm ray florets were cultured on Murashige and Skoog medium (MS) supplemented with 2 mg/l NAA and 4 mg/l Kinetin for inducing calli. The calli were soaked in 0, 0.5, 1.0, 1.5 and 2% EMS for 60 and 120 minutes to induce mutation. Afterwards, they were cultured in MS medium supplemented with 2 mg/l NAA and 4 mg/l Kinetin to induce shoots for 4 weeks. The LD_{50} were 1.22% EMS for 60 min and 0.72% EMS for 120 min. The shoots were regenerated from callus in control 76.67% but they could not regenerate in the EMS concentration which is higher than 1.5 mg/l. After that they were transferred to the new bottles and cultured with the same medium for every 4 weeks. All shoots regenerated the roots in the MS medium without the plant growth regulator. Rooting plants were transferd to the soil pot plants. The EMS has the efficiency to induce the in vitro mutation. There are 3 different mutations characteristic which were found in this experiment. The first were obtained in 0.5% EMS for 60 min which resulted in white stacked ray florets with 2 layers, green disk florets. The second mutation characteristic were found in 1% EMS for 60 min which the flower turned into yellow petal stacked with 2 layers, green disk florets and also the white and yellow ray florets. The last mutation characteristic of 0.5% EMS for 120 min made the ray florets slender white stacked with 2 layers and green disk florets.

Keywords: Chrysanthemum, callus, mutation, ethyl methanesulphonate

Simultaneous Saccharification and Fermentation of Eastern Prickly Pear Cactus (*Opuntia humifusa*) using Pectolytic Enzyme and Lactic Acid Bacteria

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Simultaneous saccharification and fermentation (SSF) was applied in *Opuntia humifusa* (Oh) cladodes to improve its processing properties and enrich flavonoid aglycone contents using a mixed culture of enzymes and lactic acid bacteria (LAB) with β-glucosidase activity. Samples were Oh control-1 (LAB only, no enzyme), Oh control-2 (no LAB, Viscozyme only), Oh-P (LAB+pectinase), Oh-C (LAB+cellulase), Oh-PC (LAB+P+C), Oh-V (LAB+Viscozyme), Oh-Px (LAB+Pectinex), and Oh-VPx (LAB+V+Px). After 60 h, LAB viable count reached 107 CFU/mL; pH decreased from 4.34 to 3.60Oh control-2~4.23Oh-V while titratable acidity increased from 0.24% to 0.33%Oh control-2~1.11%Oh-V. Viscosity generally decreased and Oh-V (237.9 cP) was least viscous. Juice yield increased by 1.5~2 folds (65.0Oh-C~90.3%Oh-V) compared to Oh control-1 (41.3%). SSF significantly increased isorhamnetin and quercetin, with Oh-V and Oh control-2 as highest, respectively. SSF could significantly enrich flavonoid aglycones, improve yield, and decrease viscosity of *O. humifusa*, with LAB+Viscozyme generally showing superior results compared to LAB or Viscozyme only.

Keywords: simultaneous saccharification and fermentation; flavonoid glycosides; flavonoid aglycones; viscosity; processing yield

Selection in Recombinant Inbred Lines of Rice (*Oryza sativa* L.) by Drought Tolerant Indices

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The development of drought tolerant cultivars is paramount to attain stability of production in the rainfed lowlands. Inefficiencies of screening techniques for drought flagged the use drought index, which is a mathematical association between yield under stress and non-stress conditions. This study aimed to determine the effectiveness of indices in classifying and identifying drought tolerant rice genotypes. An experiment was conducted in the Philippine Rice Research Institute Central Experiment Station on ten recombinant inbred lines developed through single cross of popular local varieties in replicated RCBD. Each population was subjected to two cycles of seasonal selection, under non-stress ($E_{ns-1,}$) and reproductive stage drought (E_{s-1}) on the 1st cycle at severe stress intensity (SI) of 0.94 and during the 2nd cycle (SI = 0.27, moderate stress) under non-stress (E_{ns-2}) and favorable rainfed (E_{s-2}) conditions. Eleven drought tolerance indices viz., relative drought index (RDI), stress tolerance (TOL), mean productivity (MP), yield stability index (YSI), geometric mean productivity (GMP), stress tolerance index (STI), harmonic mean (HAM), drought resistance index (DI), sensitivity drought index (SDI), stress susceptibility index (SSI) and yield index (YI) were calculated. High heritability (h^2) were computed for yield in E_{ns-1} ($h^2 = 0.91$), E_{s-1} ($h^2 = 0.63$) and E_{ns-2}, E_{s-2} ($h^2 = 0.93$). Significantly positive correlation of GMP, STI and HM to yield under E_{s-1}, E_{s-2}, and E_{ns-2} showed that these indices were effective in identifying stable and high yielding genotypes across three environments. Screening genotypes through drought indices, correlation, principal component and genotype x environment analyses delineated, PR39269-B-3-B-1-3 derived from PSB Rc10 and NSIC Rc138 cross as high yielding and stable under reproductive stage drought, favorable rainfed and non-stress environment.

Keywords: selection, drought tolerant index, correlation, genotype x environment analysis, rice

Allelopathic Potential of Essential Oil from Bottle Brush (*Callistemon lanceolatus* DC.) on The Germination and Growth of *Echinochloa crus-gall* L.

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A study was conducted to determine the allelopathic effects of essential oil from bottle brush (*Callisremon lanceolatus* DC.) on seed germination and seedling growth of *Echinochloa crus*-galli (L.) Beauv. The essential oil at concentrations of 10, 15, 20 and 25 µl/plate were loaded on a piece of filter paper attached to the inner side of the cover of the Petri-dish. The distilled water was used as the control. The results showed that the essential oil from bottle brush at concentration of 25 µl/plate had hightly inhibition effect on seed germination and seedling growth of E. crus-gall in continuous experiment, natural product herbicide from C. lanceolatus. Essential oil in emusifiable concentrates formulation (50% active ingredient; ECC). The EEC at concentration of 0.1-0.8 µl/ml were bioassayed on seed germination of *E. crus-galli*. The results showed that ECC at 0.8 µl/ml inhibited seed germination by 36.11%. Additionally, the effect ECC on seed imbibition and α-amylase activities of *E. crus-galli* seed were studied. The result showed that seed imbibition and α-amylase activities of *E. crus-galli* seed increased by prolonging time whereas decresed with increasing concentrations of ECC.

Keywords: Essential oil, *C. lanceolatus*, *E. crus-galli*, α-amylase, Imbibition, Germination

Poster Session 2: Biological Sciences

DNA Barcoding Pteridophytes Collection from Minalungao National Park, General Tinio, Nueva Ecija

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Induced Mutation of Chrysanthemum by Colchicine

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Chrysanthemum (*Dendranthema grandiflora*) cv.crystal white is a potted plant with a shrub and many buds. The bush is about 20-30 cm height. The study on colchicine induced mutation with chrysanthemum. The rooting plants from tissue culture were transferred to soil pot plant for 14 days were used plant material. The shoots were dropped in 0.1 ml colchicine solution with 6 concentration levels (0, 0.20, 0.40, 0.60, 0.80 and 1.00%) on apical bud, three times a day, 9.00, 13.00 and 17.00 the for 6 days to induce mutation. The colchicine has efficiency to induce mutation. One of the shoot that was dropped with 0.80% colchicine has a height of 28.70 cm in which it is higher than the one with control (19.06 cm). There are only 2 branches of lateral bud, while the other plants are splitted with 7-9 branches. It has 6.09 mm stem diameter which were significantly higher than the other plants. The stomata sizes were 56.84 μm larger than the control. The chlorophyll content of 120.2 μg/gFW is higher than the control. However, the results showed no difference in DNA content.

Keywords: Dendranthema, colchicine, mutation

DNA Barcoding of Chiropterans at Minalungao National Park, Nueva Ecija, Philippines

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Chiroptera, or the order of bats, are widespread and considered one of the most diverse group of mammals consisting of about 1200 species. The Philippines, as one of the key biodiversity spots, hosts a great concentration of chiropterans of which 26 are indigenous. Despite this diversity, this group of mammals are the least known fauna in the country. One area that holds a number of bats is the Minalungao National Park located in Central Luzon, Philippines. Minalungao National Park is a conserved Key Biodiversity Area (KBA) that is characterized with dense forests and has not yet been the focus of scientific studies, particularly in systematics and biodiversity conservation. It is a biologically signficant area where several species are not yet identified and recorded. This study reports the identities of the bats present in the caves of Minalungao National Park. The bats were identified molecularly through the sequences of the mitochondrial cytochrome oxidase 1 (mtCOI). Three (3) species were identified, namely: *Hipposideros rotalis*, *Taphozous melanopogon* and *Cynopterus sphinx*, an unreported species in the Philippines.

Keywords: Chiroptera, Key Biodiversity Area, Minalungao National Park, Mitochondrial cytochrome oxidase 1, Molecular identification.

Detection and Quantification of Auxin and Gibberellic Acid in *Caulerpa racemosa*

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This study was conducted to evaluate plant growth regulators (PGRs) present in extract of seaweed, *Caulerpa racemosa* by Spectrophotometry. Spectra were recorded at the m/z peak of 220 nm for Auxin, and at 524 nm m/z peak for GA3 in seaweed extract. Extraction, purification and quantitative determination of free and bound NAA, and GA3, in *C. Racemosa* were done by reducing 250 mL seaweed supernatant to 50 mL by evaporation and acidified to pH 2.8 with 1 N HCl and extracted with double volume of ethyl acetate. GA3, was extracted and purified, 50 mL of cell free supernatant was reduced to 20 mL by evaporation and acidified at pH 2 and extracted with double volume of chloroform. The supernatant was harvested by centrifugation and reduced to 30 mL by evaporation under vacuum. All experiments were repeated three times. Statistical analysis performed using SPSS statistical software (SPSS Inc., USA) for correlation and regression analysis of each value. The extract contained 979.71 mg/l of GA3 and 15.57 mg/l of NAA at 10 ppm concentration respectively. The results confirmed the presence of plant growth regulators (PGRs) (NAA, and GA_3).

Keywords: Seaweed, Plant Growth Regulators, Auxin (NAA), Gibberellic Acid (GA3), Spectrophotometry Technique.

Influence of Different Brining Concentration as Pre-Treatment in Drying Sea Cucumber (*Holothuria Scabra*) using Cabinet Drier

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Effects of NAA and GA3 at Different Concentrations on Growth and Quality of Oil Palm Bunch and Fruit (*Elaeis guineensis* Jacq.)

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Effects of NAA and GA_3 at different concentrations on growth and quality of oil palm bunch and fruit. The experiment was conducted at the Oil palm orchard of Plant Science Department, Faculty of Agriculture, Rajamangala University of Technology Srivijaya, Nakhon Si Thammarat Campus, from September, 2015 to May, 2016. The experimental design was used the 2x6 factorial experiment in completely randomized design (CRD), compose with 2 factors :factor 1 were used two kinds of plant growth regulator are NAA and GA_3, factor 2 were used six concentrations of each plant growth regulator are 0 100 200 300 400 and 500 $mg.kg^{-1}$.The result showed that the effect of GA_3 at concentration 200-300 $mg.kg^{-1}$hadthe highest effect on growth and development of fruit in term of the length of the fruit, weight of fruit, fruit weight and quality of oil palm bunch.The effect GA_3 was started from 30 days after spraying to the 120 days (harvesting time).The result also showed the effect of NAA at concentration 100-300 $mg.kg^{-1}$ hadthe highest effect on growth and development of fruit in term of the length of the fruit, weight of fruit, fruit weight and quality of oil palm bunch. But the both of plant growth regulator NAA and GA_3were not affect to the fruit quality of oil palm in term of percent of fruit set, percent of dry mesocarp per fruit, percent of oil perdry mesocarp and percent of oil per bunch.

Keyword: NAA, GA_3 ,oil palm, fruit growth and development, oil palm bunch

Performance of Pigmented Rice Lines for Quantitative Traits

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Pigmented rice is currently gaining popularity due to its health benefits. It is considered as enriched rice for its taste and health benefits due to the presence of anthocyanins (Ryu et al., 1998). Quantitative traits can be affected by the environment; hence evaluation in wet season (WS) and dry season (DS) of 2016 is done to assess the actual performance of thirteen advanced lines of pigmented rice (CLH143, CLH263, CLH219, CLH278-1, CLH102, CLH98-1, CLH98-2, CLH10-3-4-1, CLH10-3-4-2, CLH10-1-6, CLH10-1-5, CLH98 and CLH10-3-4) in comparison with the check variety (CL 141) in advanced yield trial (AYT). The traits evaluated were maturity, plant height, productive tillers, percent filled grains per panicle, panicle length, 1000 grain weight, and yield per hectare. The field was laid out in Randomized Complete Block Design with three replications. This evaluation aimed to select promising genotypes that can be released in the future as pigmented rice varieties possessing better quantitative characteristics.

In both wet and dry seasons, CLH278-1 matured earlier than the check variety while almost all lines matured later than the check. In WS, CLH10-3-4, CLH10-3-4-1-6, and CLH98 matured earlier. Most entries have shorter plant height (76 cm – 95 cm) than the check (96 cm) during dry season; however, CLH10-1-6 and CLH102 were shorter even in wet season. CLH278-1 had the highest percent filled grains (91.55%) during dry season though all lines had lower percent filled grains than the check variety during wet season. CLH10-3-4 and CLH10-1-6 had higher productive tillers than the check across seasons. CLH143 had the longest panicle length (23 cm - 26 cm) and highest yield of 4.35 t (WS) - 6.16 t (DS), a yield increase of 8.48% (WS) - 28.6% (DS) over the check variety. All the lines have heavier 1000 grain weight than the check except CLH 10-1-5 during wet season and CLH10-3-4 in both seasons. CLH278-1 has the highest milling recovery (premium grade). The different lines had decorticated grain color varying from dark purple, variegated purple, red, and variegated brown.

The most promising lines based on different characters evaluated were: CLH143 (long panicles, high yielding and dark purple grains), CLH10-3-4 (early maturing, high productive tillers, and reddish brown grains), CLH10-1-6 (short, high productive tillers, and red grains), CLH102(short and variegated purple grains), and CLH 278-1 (early maturing, high percent filled grains, high milling recovery, and variegated brown grains).

Keywords: advanced lines, advanced yield trial, quantitative traits, pigmented rice

Fertilization and Subsequent Development of Bovine Embryos Following In-Vitro Fertilization in Commercially-Prepared Medium

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This study was conducted to compare the capability and efficiency of two different media of IVF in prompting subsequent development and quality embryo. Matured oocytes in-vitro were fertilized using frozen semen and co-incubated in two different media (BODM and FHK medium) and followed the subsequent development stage up to *in-vitro* culture with simple modifications. Results showed that oocytes fertilized in BODM medium appeared to have 60 % induced pronuclear formation during 12 h and 100 % during 18 h, whereas oocytes achieved 58.54 % in cleavage formation at 2-cell during 72 to 96 h post culture and a blastocyst formation of 6.66%. Moreover, for the embryo quality assessment through the total cell count, analysis showed a mean value of 189.00 per embryo. Consequently, upon the usage of FHK medium for fertilization, oocytes prompted 80 % during 12 h and 60% during 18h of pronuclear formation. In addition, 60.46 % of the total samples had exhibited cleavage formation of 2-cell stage during 72-96 h post culture and 28.37 % for the blastocyst formation rate. Moreover, embryo quality assessment showed that total cell count had a mean value of 182.22 per embryo. The study concluded that both media are efficient in embryo production *in-vitro*, however FHK medium is considered to be more efficient in the production of blastocyst in bovine species.

Keywords: *in-vitro* embryo production, medium, pronuclear formation, blastocyst, embryo

Using of Chemical Fertilizer and Arbuscular Mycorrhizal Fungi to Promote Growth and Yield of Sweet Corn INSEE 2 Variety

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To study the effects of arbuscular mycorrhizal fungi on growth and yield of sweet corn INSEE-2 under field condition. The experimental design was completely randomized design (CRD) consists of four treatments and three replications namely (1) no fertilizer applied (2) arbuscular mycorrhizal fungi applied (3) 50 kg/rai of 15-15-15 and 25 kg/rai of 46-0-0 applied (4) 50 kg/rai of 15-15-15 and 25 kg/rai of 46-0-0 with arbuscular mycorrhizal fungi applied. The experiments was conducted between June, 24th to September, 13 rd 2015 at 78, Naimuang, Amper Muang Buriram, Buriram Province. ANOVA and mean comparison were analyzed for corn height, number of leaf, fresh weight of yield (per plot) and fresh weight of corn (per plot). Using of chemical fertilizer and arbuscular mycorrhizal fungi showed significantly increase growth and yield of corn ($p<0.01$). The most of growth and yield of sweet corn INSEE-2 was showed when using application of 50 kg/rai of 15-15-15 and 25 kg/rai of 46-0-0 and arbuscular mycorrhizal fungi following by application of 50 kg/rai of 15-15-15 and 25 kg/rai of 46-0-0, application of arbuscular mycorrhizal fungi and no fertilizer application respectively. However, Using of arbuscular mycorrhizal fungi showed non-significant but they trended to increase growth and yield of sweet corn INSEE-2 comparing with no fertilizer application. The result concluded that chemical fertilizer still increasing growth and yield of sweet corn INSEE-2 and arbuscular mycorrhizal fungi might be used with chemical fertilizer to promote growth and yield of sweet corn INSEE-2.

Keywords: Arbuscular mycorrhizal fungi, Sweet corn, Corn yield

Utilization of Bioextract to Accelerate Growth of Cassava Cuttings

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Utilization of bioextract to accelerate growth of cassava cuttings was studied. The experimental design was Randomized Complete Design (RCD) with five treatments and three replications namely 1) water 2) bioextract from cherry snail 3) bioextract from fish 4) bioextract from vegetable and fruit and 5) root growth accelerate substance (30

cc/ per 20 liters). Cassava cuttings were soaked by each treatment for 2 hours before planting. Root length, number of root and height of cassava cutting was measured at 30 and 45 days after cutting. The result showed that (1) using of bioextract had no effect on root length of cassava cutting ($p>0.05$) at 30 and 45 days after cutting and no effect on height of cassava cutting ($p>0.05$) at 45 days after cutting. However (2) using of bioextract showed significant increase in height of cassava cutting ($p<0.05$) at 30 days after cutting and using of bioextract showed significant increase in root number of cassava cutting ($p<0.05$) at 30 and 45 days after cutting. In addition, there was no significant increase ($p>0.05$) in root length, number of root and height of cassava cutting between the use of bioextract and root growth accelerate substance. Using of bioextract from fish showed highest increase in root length, number of root and height of cassava cutting. The result indicated that the use of bioextract from fish could be used in substitution of root growth accelerate substance for cassava cutting.

Keywords: Bioextract, Cassava, Root growth accelerate substance

Relationship of Culm Anatomy and Lodging Resistance in Rice (*Oryza Sativa* L.) Genotypes under Direct-Seeded System

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Lodging is prevalent in rice given its inherent weak culm morphology and is further stress by strong winds and heavy rains brought by typhoons that regularly routes the Philippines. Therefore, improving the screening and selection efficiency for lodging resistance is crucial in elevating and maintaning yield increase. Lodging-tolerant screening on 12 newly developed direct-seeded rice lines, 26 NSIC released varieties and six local lodging checks were conducted to identify rice genotypes with high push resistance through culm strength and anatomy. Anatomy of the 5th internode were assessed through culm sectioning at full heading stage. Measurement of sclerenchyma containing parts and estimation of lignin content (LC) were used to predict lodging resistance while push resistance or culm strength exerted by the stem was measured using handy force gauge meter. High %LC (23-24%) were observed in seven (NSIC Rc396, Rc356, Rc238, PR43425-25-2-1-1-1-B, Rc308, Rc302 and Rc354) out of 44 (16%) genotypes which also outclassed NSIC Rc240 (16.29% LC), resistant check variety. High resistive-force were recorded in fifteen (26%) out of 44 genotypes, whereas PR43426-13-2-3-2-B-B (1.08 kgf), NSIC Rc396 (1.06 kgf), PR39142-10-3-2-1-1-B (1.05 kgf) and PR45299-14-3-2-B (1.01 kgf) were comparable to NSIC Rc240 (1.02 kgf). Low (2-9) number of Median Vascular Bundles (MEVB) were observed in most genotypes and high MEVB were recorded for NSIC Rc396, Rc300, Rc214 (MEVB = 9) and PR40432-17-3-1-2-B-B (MEVB = 8), significantly higher than Rc240 (MEVB = 6). Significant medium correlation (0.58) was computed for %LC to NMEVB which showed that improvement of lodging resistance is a result of increased lignin and MEVB in the stem, thus breeding objectives should be towards the selection of rice genotypes with high culm strength coupled with high lignin and increased number of median vascular bundles.

Keywords: rice lodging, direct-seeded rice, culm strength, lignin, median vascular bundles

Effect of Gamma Irradiation and Salt Stress on Survival Rate and Growth of Hom Thong Banana

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Banana is a tropical fruit used as staple food for low-income populations. However, the productivity is still low as it is grown in salinity area. Strategy undertaken to solve this problem is improvement of new variety through mutagen. In this study, *In vitro* shoots were exposed to gamma rays at doses of 0, 10, 20, 30, 40, and 50 Gy and regenerated on medium containing salt concentration of 0, 6, 8, 10 g/L NaCl. The result showed that severity of salinity was reduced by gamma irradiation. The survival rate of irradiated shoots cultured on 8 mg/L NaCl was higher than non-irradiated shoots. Result was indicative that gamma irradiation can be considered an alternative method to increase salt tolerance of commercial variety.

Keywords: Gamma Irradiation, Salt stress, Hom Thong banana

Use of Pork Belly and Broiler Chicken Meat Parts in Herbs Sai Oua (Spicy Thai Herb Sausage)

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This research aimed to study the effect of using pork belly and different parts of broiler chicken meat on the quality of Herb Sai Oua (Spicy Thai Herb Sausage). The experiment was divided into 5 groups depended on meat material that consisted of pork belly (control), chicken filet, chicken breast, chicken thigh and chicken drumstick to produce Herb Sai Oua. The experimental design used in this experiment was Completely Randomized Design (CRD). After the production, the Herb Sai Oua was analyzed the % cooking loss, the colour as indicated by L*(lightness) a*(redness) b*(yellowness) color system, water activity (a_w), proximate analysis (moisture content, protein, fat, fiber, ash and energy), sensory evaluation [Randomized Completely Block Design (RCBD)] and the production cost. The results showed that % cooking loss after cooking of the Herb Sai Oua using pork belly was the highest and the Herb Sai Oua using chicken filet was the lowest when compared with the other groups ($P<0.05$). The Herb Sai Oua using pork belly had the lowest in L* value but the highest in a* value ($P<0.05$). The Herb Sai Oua using chicken breast had the highest in b* value but the sample from chicken drumstick had the lowest in b* value ($P<0.05$). For the a_w of the Herb Sai Oua in every groups showed the value between 0.954 - 0.986. The highest moisture content and protein were detected from the Herb Sai Oua using chicken filet but the fat percentage was the lowest when compared with the other groups ($P<0.05$). The Herb Sai Oua using pork belly was the highest in fat percentage and energy ($P<0.05$). Every Herb Sai Oua had fiber percentage between 0.75-1.79 ($P<0.05$). The Herb Sai Oua using chicken filet had the highest ash content ($P<0.05$). The sensory evaluation was conducted using the different characteristics consisted of the appearance, color, odor, texture, taste and overall acceptance. The consumers liked the Herb Sai Oua using broiler chicken meat more than the pork belly. The highest overall acceptance was obtained from the Herb Sai Oua using chicken thigh ($P<0.05$). The cost of non-cooking Herb Sai Oua 1 kilogram of meat material, the Herb Sai Oua using pork belly had the highest cost and the Herb Sai Oua using chicken breast had lowest cost.

Keywords: pork belly, parts of broiler chicken meat, quality of Herb Sai Oua

Efficiency of Antioxidant and Absorbent on Browning and The Optimal Factors of Plant Regeneration from Young Seed of *Gluta usitata* (217 Mae Ka) by Tissue Culture

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Gluta usitata (Anacardiaceae) is a lacquer tree and create lacquer varnish can be utilize in many aspects especially art and culture. Recently, its harvest has troublesome and yields of varnish tree have decrease. Consequently, the conservation of plant has reduced and this plant is becoming extinct. The experiment has chosen to use plant tissue culture technique to preserve and increase this plant. In these studies, compared the effect of Woody Plant Medium (WPM) combined with different concentration of antioxidants were 2, 4, 6, 8 g/L Poly Vinyl Pyrrolidone (PVP), 20, 30, 40, 60 mg/L ascorbic acid or citric acid and absorbents were 1, 2, 3 g/L activated charcoal to reduce browning of phenolic compound in the explant. The results show that 2 g/L activated charcoal had the lowest of browning on seed and medium (about 0.9 ± 0.2 points). The addition of 40 mg/L ascorbic acid was generated the highest of shoots (approximately 1.88 ± 0.4 shoots/seed) after culture for 4 weeks. An efficient *in vitro* propagation of seed germination on WPM supplemented with 0.5, 1, 1.5, 2 and 3 mg/L 6-Benzyl amino purine (BAP), Thidiazuron (TDZ) and *meta*-Topolin (*m*T) 3% sucrose and 0.2% phytagel. The result of this studied revealed that 1.5 mg/L BAP, 2 mg/L TDZ and 2 mg/L *m*T had the maximum of seed germination at 1.6 ± 0.2, 1.8 ± 0.2 and 1.6 ± 0.2 shoots/seed, respectively. The best of Plant Growth Regulators for seed germination was 2 mg/L of TDZ after 6 weeks.

Keywords: Absorbent, Antioxidant, Browning, *Gluta usitata* (217 Mae Ka), Plant regeneration

Effects of Different Planting Dates on Growth and Yield of Kalmegh

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A field experiment was conducted at the Farm of Faculty of Agricultural Technology, King Mongkut's Institute of Technology Ladkrabang, Bangkok, Thailand, during, March to November 2016 to assess the performance of different local kalmegh cultivars under different planting dates. Three local kalmegh cultivars (Prachinburi, Nakhon Prathom, and Phitsanulok 5-4) were sown on five different planting dates (such as 1st of March, April, May, June, and July, respectively) in a randomized complete block design with split plot arrangement with three replications. The results were showed that the best Prachinburi local cultivar was the highest for plant growth and dry matter yield. The planting dates shown a significant effect on growth and yield that decreased with early in planting dates and the highest values were obtained when cultivars planted on 1st June. However, Prachinburi local cultivar gave the highest leaf and seed dry weight yield and the most suitable planting period was on 1st June.

Keywords: Planting date, Growth, Yield, Kalmegh

Optimum Concentration Sample of Herbal Fresh Sausage for Antioxidant Analysis

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The purpose of this study was to optimum concentration sample of herbal fresh sausage for antioxidant analysis. Three sausage recipes were applied in this study as following 1) ground pork adding 0.2 g BHT/kg meat (positive lipid peroxidation) 2) herbal fresh sausage recipe 1 (HFS1) and 3) herbal fresh sausage recipe 2 (HFS2). The antioxidant activity of sample was determined using the following assays: 2,2-diphenyl-1-picryhydrazla hydrate (DPPH) radical scavenging activity, 2,2′-Azino-bis (3-ethylbenzothiazoline-6-sulfonic acid) diammonium salt (ABTS) radical cation decolorization and reducing power ability. Herbal fresh sausage sample such as 2.5%, 5%, 10%, 15% and 20% (w/v) of meat supernatant were studied. Analysis revealed that the optimum concentration of raw and cooked herbal sausage sample for DPPH activity was 15% (w/v) ranged between 67.26±0.53% and 84.72±0.27%. $ABTS^{+}$ cation decolorization was 5% (w/v) ranged between 58.50±0.80% and 82.49±1.39%. Reducing power ability was 20% - 10% (w/v) ranged between 0.27±0.00 and 0.59±0.01, respectively.

Keywords: optimum concentration, antioxidant, herbal fresh sausage

Poster Session 3: Microbial Biotechnology and Plant Protection

In vitro Evaluation of the Antagonistic Activity of *Trichoderma* sp. against *Fusarium verticillioides*

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Fusarium verticillioides is an agriculturally important fungus widely distributed throughout the world, infecting a wide range of plant hosts in all stages of development. This study determined the antagonistic effects of *Trichoderma* sp. against *F. verticillioides* under *in vitro* conditions. Mycelial growth inhibition of *F. verticillioides* by *Trichoderma* was determined using bi-culture test. The microscopic interactions between the two fungi were studied using compound light microscope. Results of bi-culture test indicated that *Trichoderma* can inhibit the mycelia growth of *F. verticillioides* having an average inhibition growth rate of 32% over control. Drying up of the pathogen from the point of contact with the antagonist was also observed in the bi-culture experimental plates. This phenomenon is an indication that the pathogen was depleted of nutrients in presence of the antagonist. Using slide-biculture technique, it was revealed that *Trichoderm* sp. can cause damages to *F. verticillioides* including cell lysis and disintegration of the hyphae. Entry of the hyphae of *Trichoderma* sp. into the lumen of *F. verticillioides* and parasitic behavior by coiling round to the hyphae of the pathogen were also observed under compound light microscope. These results suggest that *Trichoderma* sp. uses antibiosis, mycoparasitism, and competition for space and nutrients as suppression mechanisms against *F. verticillioides in vitro*. Therefore, *Trichoderma* sp. has the potential to be a bio-control agent of *F. verticillioides* in certain crops. However, further studies on the effectiveness of *Trichoderma* sp. to control *F. verticillioides* should be conducted under *in vivo* conditions.

Keywords: *Trichoderma* sp., *Fusarium verticillioides*, biocontrol agent

Identification and Antifungal Activity of Oleanane Saponns Isolated from Trevesia Palmata against Phytopathogenic Fungi

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Phytochemicals which produced by higher plants to protect themselves from microbial attacks have long been recognized as an important source of agrochemicals for the control of plant diseases. As part of our search for new antifungal agents from Vietnamese plants, we found that *Trevesia palmate* (Araliaceae) displayed a promising antifungal activity against *Magnaporthe oryzae*. Under the activity-guided fractionation, novel saponin compound TP1 (hederagenin-3-*O*-β-$_D$-glucopyranosyl-(1→3)-α-$_L$-rhamnopyranosyl-(1→2)-α-$_L$-rhamnopyranosyl-(1→2)-α-$_L$-arabinopyranoside) along with two known saponins TP2 (mcranthoside A) and TP3 (α-hederin) were isolated from the methanolic extract of T. palmate. The minimum inhibitory concentrations (MICs) of TP1, TP2, and TP3 were 8 to 16 μg/ml against *M. oryzae*. When compound TP1 (500 μg/ml) was sprayed onto plants, disease control values of 84%, 82%, 88%, and 70% were exhibited against rice blast, tomato gray mold, tomato late blight, and wheat leaf rust, respectively, without an apparent phytotoxicity. Taken together, these results suggest that *T. palmate* and saponin compounds in this study can be a useful source to develop new natural fungicides which possibly may have a better future over synthetic fungicides.

Preliminary Investigation on the Pharmacological Properties of Wood Rotting Mushroom Collected from Isabela State University , Echague, Isabela Philippines

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Three wood-rotting fungi collected and isolated from Isabela State University, Echague, Isabela, Philippines were assessed to determine their mycochemical composition and antibacterial activity. Dried fruiting bodies were subjected to aqueous extraction prior extraction of their mycochemicals. Five (5) mycochemicals were screened including alkaloids, tannins, flavonoids, saponins and cardiac glycosides. Fruiting bodies of *G. lucidum* and *T. hirsuta* had the most number of mycochemicals detected which varied qualitatively from traceable to appreciable amount. Antibacterial property from the aqueous and acetonitrile extracts of the mushrooms was also evaluated following the standard disc diffusion method against *Staphylococcus aureus* and *Escherichia coli*. The antibacterial assay shows that all of the fungi exhibited a good source of antibacterial properties.

Keywords: *Ganoderma lucidum, Auricularia fuscosuccinea, Trametes hirsuta*, mycochemical analysis, antibacterial

Biological Control of Chili Anthracnose by using *Trichoderma harzianum* PC01 *in vivo*

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Chili anthracnose was isolated and identified as *Collectotriclum capsici*. The experiment was done using Randomrized Complete Block Design (RCBD) with four replications. Result showed that the inoculated chilli seedlings with *C. capsici* and spray nano-crude methanol extracted from *T. harzianum* mixed to nano-chitosan and nano-pure compound of Tridrotoxin A50 mixed to nano-chitosan gave significantly better in plant strands (plant height, number of fruits and fruit weight) than nano-chitosan treatment and followed by nano-Trichotoxin A50 and nano-crude methanol when compared to the inoculated control. The research finding will be investigated for plant immunity against anthracnose pathogen through phytoalexin, capsidiol production.

Keywords: Chili anthracnose, *Trichoderma harzianum* PC01, Biological control

Preliminary Detection of Pharmacological Properties of *Polyporous sanguineous* ISU Strain using Different Indigenous Liquid Substraines

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Polyporus sanguineus is colourful mushroom belonging to Family Polyporaceae that acts as a synthesizer of some pigments. It has been reported to have antibacterial properties with good therapeutic potential and pharmacological application. This study was carried out to determine the growth performance of its mycelia on three different indigenous liquid substrates and evaluate its antibacterial activities. Naturally occurring fruiting bodies of *P. sanguineus* were collected inside the university and were immediately isolated using the standard laboratory procedure on tissue culture. Five (5) day old mycelia were inoculated and cultured in flask containing three indigenous liquid media which includes mung bean decoction (mbd), coconut water broth (CWB) and potato dextrose broth (PDB). After seven (7) days of incubation, formed mycelial mats of *P. sanguineus* were strained, air dried and pulverized. Pulverized mycelial mats from different liquid substrates were subjected to ethanolic extraction for antimicrobial assay activities. Results showed that mung bean decoction (MBD) produced the thickest mycelial mats compared to potato dextrose broth (PDB) and

coconut water broth (CWB). On the other hand, antimicrobial assay revealed that *P. sanguineus* aqueous extracts is a potential antibacterial agent against *E. coli* (36.40 mm) and *S. aureus* (33.36 mm).

Keywords: Indigenous, *Polyporous sanguineus*, liquid substrate Pharmacological

Attraction of Fruit Fly Males to Flowering Plants

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The guava fruit fly (GFF), *Bactrocera correcta* (Bezzi); the melon fruit fly (MFF), *B. cucurbitae* (Coquillett); the Oriental fruit fly (OFF), *B. dorsalis* (Hendel); and the Asia melon fly (AMF), *B. tau* (Walker) (Diptera: Tephritidae), are economically important pests to agricultural crops in Thailand. The fresh samples of 24 plant species belonging to 6 families were examined for the male attractant source for these *Bactrocera* speciesWe found that 12 plant species were attractive to male fruit flies as follows:. *B. correcta*: flowers of *Cananga fruticosa*, *Tabernaemontana sananho*, *Colocasia esculenta*, *Spathiphyllum floribundum*, *Spathiphyllum cv. Starlight*, *Spathiphyllum cannaefolium*, *Spathiphyllum* sp., *Spathiphyllum cv. Sensation*, *Bulbophyllum lasiochilum* and *Gardenia augusta*; *B. dorsalis*: flowers of *Cananga odorata* and *Bulbophyllum patens*; *B. cucurbitae*: flowers of *Cananga fruticosa*, *Tabernaemontana sananho*, *Colocasia esculenta*, *Spathiphyllum floribundum*, *Spathiphyllum cv. Starlight*, *Spathiphyllum cannaefolium*, *Spathiphyllum* sp., *Spathiphyllum cv. Sensation*, *Bulbophyllum lasiochilum* and *Gardenia augusta*;*B. ta*u: flowers of *Cananga odorata* and *Bulbophyllum patens*.

Keywords: Male Fruit Fly, Bactrocera, Flowering Plants

Morphological Characterization and Bacteriostatic Activity of Entomopathogenic Fungi Isolated from Short-horned Grasshopper (*Oxya hyla intrica*)

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Entomopathogenic fungi are known to be part of the rich ecosystem in the tropics playing an important role as biocontrol agent. The isolation and morphological identification of fungi from were performed to identify fungal strain present in short-horned grasshopper (*Oxya hyla intrica*) known as large group of insect that causes economic damage to forage and crops. Short-horned grasshoppers were collected in the field and were placed in an insect jar and subjected to standard classification and naming. Collected insects were paralyzed by placing on a sterilized microwavable plastic with ethyl alcohol and were incubated for five (5) days. After the incubation, insects were inoculated in potato-dextrose agar (PDA) medium for detection of fungi present in the short-horned grasshopper. Classification and identification of fungi present on the insects were based on its morphological characterization and taxonomic guidelines. *Fusarium verticillioides* and *Curvularia lunata* were the two fungal strains identified. The bacteriostatic activities of the two (2) fungal strains were performed using the immobilized disc method. Results revealed that immobilized disc of *F. verticilliodes* exuded 43.06mm zone of inhibition against *E.coli* while *C. lunata* exhibited 49.74mm. On the other hand, *F. verticilliodes* produced a mean of 33.56mm zone of inhibition while *C. lunata* exhibited 36.71mm against *S. aureus*

Keyword: Fungi, Grasshopper, Isolation, Morphological

The Allelopathic Effect of Mangifera indica Leaves on Mustard Seeds

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This study was conducted to evaluate the allelopathic activity of Mangiferaindica leaves against seed germination of mustard seed. Specifically, it aimed to: extract the components of *Mangiferaindica* leaves using ethanol; determine the presence of tannins using Ferric chloride; and assess the allelopathic property of *Mangiferaindica* leaves using mustard seed as seed bioassay.*Mangiferaindica leaves* were air dried, ground into powder and extracted using ethanol through. The crude extract was concentrated using water bath. The 48.57 g of air died crude extract was diluted with 143 ml of distilled water to make 10 mg/mL stock solution. Other concentrations 2, 4, 6 and 8 mg/mLwere also prepared using the stock solution. Assessment of the allelopathic effect of *Mangiferaindica L.*on mustard seeds was done. Results showed that the crude extract inhibited the germination and growth of mustard seeds. Tannin was isolated from the crude extract by preparative thin layer chromatography. The tannin was scraped from the TLC plate and was dissolved in hexane. The dried tannin was then diluted to different concentration and tested on the germination and growth of mustard seed. Results show that the semi-purified tannin did not inhibit the germination and growth of mustard seed.

Keywords: allelopathy, mustard seed, *Mangiferaindica*, germination

Validity of Newly Designed Primers in Detecting Specific Diseases Using Molecular Technique

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Newly designed primers were developed in this study to detect particular diseases in *Morus alba* L. The primer was based on the partial rDNA-ITS sequence of isolated fungi and consequently used for identification. The primers that were developed using Primer3 application were NigroF and NigroR, CurvluF and CurvluR, AsperacuF and AsperacuR and LasioF and LasioR. Designed primers were successfully detected the specific fungi purposely intended for them. The results showed significant correlation with the standards with high coefficient values which ranged from 99.4% to 100% identification. Moreover, specificity of the primer AsperacuF and AsperacuR was evaluated confirming its discriminatory power against other fungal organism used in the validity test of the study.

Psuedofungi Associated with Citrus Decline Disease in ChiangMai, Thailand

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Chiang Mai is a major citrus producing area of Thailand, producing high quality oranges for more than 40 years, especially mandarin orange (*Citrus reticulata* Blanco cv. 'Sai Nam Peung'), with 80,000 ha of plantations. Currently, citrus plantations are threatened by several factors including inappropriate management practices, adverse environmental conditions (irregular water regime with prolonged drought periods), and attacks of pathogens and pests. All these adverse factors can interact, causing a complex disease called as "Citrus decline". This severe outbreak of Citrus decline disease has hit more than 80% of that farmland since 2010; the plantation area was reduced to 3,200 ha

before increasing to 6,400 ha presently. Despite the numerous investigations carried out so far, decline continues to be the main pathological problem of the orange industry because of its complex etiology. A survey conducted in several farms in Chai Prakan, Fang and Mae Ai ditricts, indicated that pathogenic pseudofungi; *Phytophthora* spp. and *Pythium* spp., can play a primary role in the etiology of this syndrome. Therefore, the aim of this study is to analyze the ecology of the endemic and emerging pathogens that threaten citrus trees with particular emphasis on the species more directly involved in Citrus decline in order to consider precise decisions for managing orange plantations properly.

Keywords: Citrus decline, Citrus disease, Mandarin orange, *Phytophthora*, *Pythium*

Efficacy Test of Antagonistic Bacteria against Root-Rot Disease of Vinca, Citrus and Durian Caused by *Phytophthora* spp.

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Phytophthora is a genus of plant-damaging Oomycetes (water molds), whose member species are capable of causing enormous economic losses on crops worldwide. In this study, an antagonistic bacteria efficacy test was used to evaluate *Lysobacter* sp. Three isolates of the bacterium, PPCMU-012, PPCMU-039 and PPCMU-125, were obtained from the Department of Entomology and Plant Pathology, Faculty of Agriculture, Chiang Mai University in order to examine the efficacy of this antagonistic bacterium against *Phytophthora* spp. Six isolates of *Phytophthora* sp. isolated from three different kinds of the host plants, vinca (VI-04 and VI-05), citrus (CI-01 and CI-02) and durian (DU-05 and DU-12), were tested with the three isolates of the antagonistic bacterium, *Lysobacter* sp., by using the dual culture technique on PDA. We found that after incubation of the antagonistic bacteria together with *Phytophthora* sp for 3 days, all three bacterial isolates, PPCMU-012, PPCMU- 039 and PPCMU-125, produced the highest mycelial growth inhibitions of 61.11, 61.39 and 62.78 percent respectively, against *Phytophthora* isolate CI-01 which causes citrus root rot. Therefore, these three isolates of *Lysobacter* were selected for control of citrus root rot and durian root and stem rot in the field. The results of these field experiments will be report elsewhere.

Keywords: *Lysobacter* species, *Phytophthora* species, Antagonistic bacteria, Root-Rot disease, Inhibition, Vinca, Citrus, Durian

Methanol Extract and Nanocomposite of *Trichoderma* sp. as a Potential Bio-Control against *Fusarium moniliforme* in Tomato (*Lycopersicon esculentum*)

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Nanotechnology has been cited as the foundation of a new advanced agriculture. It is a rapidly developing domain of research and practice. The potential uses and benefits of nanotechnology are enormous. These include plant disease management through the formulation of nanomaterials-based products. Use of pesticides and fungicides has been found to be effective against different plant pathogens but the large use of these chemicals can lead to serious problems, including environmental pollution and human health hazards. Therefore, alternative strategies are being widely employed.
One potential strategy to counter attack pathogen is the use of bio-control agents. *Trichoderma* sp. is widely studied bio-control agent against plant pathogens because of their ability to reduce the population of soil borne plant pathogens including *Fusarium* sp. that causes wilt in tomato. The study determined the effectiveness of methanol extract and nanocomposite of *Trichoderma* sp. as a potential bio-control against *Fusarium moniliforme* in tomato through *in- vitro* and *in- vivo* conditions. *In-vitro* assays conducted were bi-culture and slide bi-culture while *in-vivo* assay was done using modified leaf assay. *In-vitro* results revealed that *Trichoderma* sp. colonized *F. moniliforme* and suppressed the growth by an average of 2.84 cm which resulted to damaged and deformed hyphae. In-*vivo* results showed that the methanol extract of *Trichoderma* sp. reduced the disease incidence and severity, while the nano*Trichoderma* extract did not. Given the results, it can be concluded that *Trichoderma* sp. had antagonistic property in controlling growth of *Fusarium moniliforme*.

Keywords: *Trichoderma* sp., *Fusarium moniliforme*, Nanotechnology

Antimicrobial Screening of *Ganoderma lucidum* (Isabela strain) as Affected by Different Liquid Substrates

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Ganoderma lucidum (Lingzhi mushroom) is a fungus which has been used through the centuries for the general promotion of health and longevity in Asian Countries that has been known to have numerous pharmacological effects. Thus, this study aimed to assess the growth of mycelia on two different liquid substrates and evaluate its mycopharmacological activities. Fruiting bodies of *G. lucidum* were collected inside the university premises and were isolated using standard microbiological procedures in fungal tissue culture. Identification was done through morphological characterization of the fruiting bodies guided with textbooks and taxonomic keys. Mycelial mats were produced using indigenous liquid substrates including potato dextrose broth (PDB) and coconut water broth (CWB) extracted prior antibacterial assay. Results showed Coconut Water Broth (CWB) produced heavier fresh and dry weight of mycelial mats than Potato Dextrose Broth (PDB). Moreover, CWB was observed to have shorter incubation period than PDB. Ethanolic extract of *G. lucidum* grown on PDB showed larger zone of inhibition (13.81mm) than ethanolic extract grown on CWB (9.62mm) against *S. aureus* and showed non-significant difference against *E. coli*. *G. lucidum* ethanolic extracts both grown on PDB and CWB shows antibacterial potential against human pathogenic bacteria.

Keywords: antibacterial activity, coconut water, Ganoderma lucidum, liquid substrate

Morphological Characterization and Antimicrobial Potential of Endophytic Fungi Isolated from Oregano (*Oreganum vulgare* L.) Leaves

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Endophytic fungi reside internally and asymptomatically in plant tissues. Almost all plants are known to harbor endophytes. Medicinal plants, such as oregano (*Coleus amboinicus*), are valuable sources of important endophytic fungi. Three fungal endophytes were isolated from Mexican Oregano, all of which belong to the genus Aspergillus. The fungal endophytes were morphologically identified as *Aspergillus niger, Aspergillus fumigatus*, and *Aspergillus terreus*. The three isolates were subjected to UV light immobilization for bacteriostatic and antibacterial activity against *Escherichia coli* and *Staphylococcus aureus*. All fungal endophytes exhibited bacteriostatic potential against both *E. coli* and *S. aureus*. This study shows that the endophytic fungi isolated from the medicinal plant *C. amboinicu*s can be potential antimicrobial agents and are possible contributors to the medicinal properties of the plant.

Keywords: endophytic fungi, antibacterial, oregano, *Coleus amboinicus*

Allelopathic Ellagitannin from *Annona muricata* L. (Guyabano) Leaf Extract against The Rice Weed *Echinochloa crus-galli*

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Allelopathy is a biological phenomenon where one plant inhibits the growth of another. The application of the allelopathic properties of some plants is a natural and environment-friendly approach which increases crop yield, decreased dependence on synthetic herbicides, and conservation of the ecological environment. This study extracted the tannins from *Annona muricata* L. leaves and determined the allelopathic effect on the germination and seedling growth of the rice weed, *Echinochloa crus-galli*. The dried powdered leaves of *Annona muricata L.* were extracted using 80% ethanol. Tannins were isolated through column chromatography. The total tannin content was determined and the

isolate characterized by UV-Vis and IR spectrophotometry. The allelopathic effect of tannin on the seed germination and seedling growth of *Echinochloa crus-galli* rice weed was also obtained. The total tannin content of the isolate was 25.33±00 mg GAE g^{-1}. The percent germination was 66.67±5.77% in the control and 0 in all the tannin treatments. Highest inhibitory effect on the seedling growth was observed in the 8 and 10 mg/mL tannin. Although 8 and 10 mg/mL exhibited the strongest inhibitory effect on the seedling growth, differences in effect among the tannin concentrations were similar but significantly different from the control. The tannin responsible for the inhibition of seed germination and seedling growth is an ellagitannin based from the UV-Vis and FTIR Spectroscopy. The ellagitannin from guyabano leaves has a strong inhibitory effect on the seed germination and seedling growth of the rice weed, *Echinochloa crus-galli* and has the potential as a weedicide.

Keywords: tannin, *Annona muricata L.*, allelopathy, *Echinochloa crus-galli* rice weed

Screening of Antagonistic Bacteria for Biological Control of Rice Diseases

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Preliminary screening for bacteria was done to be used for biological control of leaf spot of rice RD41 causing by *Curvularia* sp. and brown leaf spot of rice var RD41 causing by *Drechslera* sp. *Serratia marcescens* showed ability to inhibit the growth of *Curvularia* sp. and *Drechslera* sp. on NRA medium. Further study will be done to control mechanism of these biocontrol agents against *Curvularia* sp. in pot and field trial.

Keywords: *Serratia marcescent*, biological control, rice disease

Isolation of Cellulase Producing Microbes and Nitrogen Fixing Bacteria from Bamboo Soils

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In organic agriculture, organic compost is not only an essential source of nutrient for plant but also a substrate for improving soil physical conditions. To make low-cost organic compost produced from agricultural waste or crop residue, effective microorganisms with the capacity to decompose the cellulosic substrates was aim in this study. It has been observed that fallen bamboo leaves have been decomposed very quickly possibly as a result of microbial activity. The area at Huaysatyai, Hua-Hin, *Prachuap* Khiri Khan, Thailand, is a remote and conserved area where the native bamboo is plentiful. The isolation and screening of the beneficial microbes from 25 soil samples taken under the bamboo canopy yielded 72 bacterial and 44 fungal isolates with the capacity to degrade Carboxymethyl cellulose (CMC) on Na-CMC medium. *Bacillus subtilis* subsp. *inaquosorum* (S13-5) and *Penicillium restrictum* (SF24-6) were most effective in cellulase production at 0.210 and 0.436 IU/ml, respectively. From 32 isolates, *Bacillus subtilis* subsp. *inaquosorum* (S5NN1-1) and *B. safensis* (S2NN5-1) were effective in fixing nitrogen based on the test on nitrogen free malate (NM) medium. Thus, bamboo soil is a source of beneficial microbes that they will prepare as microbial seed inoculants to improve crop performance.

Keywords: Compost, Soil, *Bacillus*, *Penicillium.*

Bioefficacy of Mangosteen Peel Extracts in Controlling Seed-Borne Pathogenic Fungi of Maize Seeds and Seed Germination

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This study was aimed to investigate the antifungal efficacy of mangosteen peel extracts against seed-borne fungi of maize. The antifungal efficacy of mangosteen peel extracts with 3 different solvents: hexane, ethyl acetate and water were tested the antifungal activity against seed-borne fungi using seed coating method at the concentrations of 250, 500, 1000 and 2000 ppm compared to the control (coating solutions: ethanol, metalaxyl and non-coating). The results revealed that hexane extract was the highly effective against seed-borne fungi. Furthermore, crude extract was evaluated the effect on seed germination. It was observed that mangosteen extract in all treatments had no negative inhibitory effect on seed germination compared to the control. Furthermore, the mangosteen peel extracts which tested antifungal activity against *Aspergillus flavus* and *A. niger* was further subjected to poisoned food technique at the concentrations of 1000, 2000 and 4000 ppm. The mycelial growth inhibition of *A. flavus* and *A. niger* in crude extract tested, hexane at 4000 ppm was the most effective on inhibition of *A. flavus* and *A. niger* growth by 46.99% and 46.70%, respectively. In addition, microscopic observation of spore germination on both of fungi with treatment of hexane crude extract at 4000 ppm revealed the antifungal activity to inhibit conidial germination. Therefore, antifungal characterization of mangosteen peel extracts in this study suggests that it can be used in biocontrol for the alternative choice to reduce the chemical fungicides.

Keywords: Mangosteen peel, Seed-born pathogen, Antifungus, Maize seed, Seed germination

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Isolation and Characterization of Antibacterial Metabolites from *Bacillus methylotrophicus* DR-08 Showing Strong Antibacterial Activities against Various Phytopathogenic Bacteria

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Because of the occurrence of resistant strains, the use of antibiotics and copper substances for the control of bacterial diseases on crops is not effective in many fields. On the other hand, the need of organic foods is gradually increasing. These have led the development of alternative and ecofriendly measures such as microbial and botanical bacteriocides. In the course of screening of antagonistic bacteria with potent antibacterial activity, we found that DR-08 strain highly reduced the cell growth of various phytopathogenic bacteria. The DR-08 strain was identified as *Bacillus methylotrophicus*. The butanol extract of the fermentation broth of DR-08 completely inhibited the growth of 12 phytopathogenic bacteria among 14 test bacteria with minimum inhibitory concentration (MIC) values of 1.95 – 500 μg/ml. *Xanthomonas oryzae* pv. *oryzae* was most sensitive, and *Agrobacterium tumefaciens, X. arboricola* pv. *pruni* (Xap), *X. axonopodis* pv. *citri*, and *X. euvesicatoria* are relatively sensitive with MIC values of 31.2 μg/ml. But the growth of *Acidoborax kojaci* and *Pectobacterium chrysanthemi* were not completely inhibited even at a concentration of 500 μg/ml. In a detached leach leaf assay, the butanol extract of DR-08 strain effectively suppressed the development of bacterial leaf spot caused by Xap with control values of 54 and 58% at concentrations of 100 and 200 μg/ml, respectively. The fermentation broth of DR-08 strain also strongly reduced the development of bacterial wilt on tomato seedlings by 94% and 90% at 2- and 4-fold dilution treatments, respectively. Through the bioassay-guide fractionation and LC-ESI-MS analysis, two antibacterial metabolites were identified as difficidin and oxydifficidin. This study suggests that *B. methylotrophicus* DR-08 could be a potent candidate for the microbial bacteriocide.

Biologically Synthesized Gold Nanoparticles (Aunp) Using Pine (*Pinus Kesiya*) Pollen Show Antifungal Activity Against *Candida albicans*

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Pollen from pine tree species (*Pinus kesiya*) synthesized with gold nanoparticles (AuNP) was tested for its fungicidal activity against *Candida albicans*, a persistent fungus infecting humans. Overgrowth of *C. albicans* present in the gut are commonly triggered by various factors such as high sugar diet, antibiotics, chronic stress, contraceptive pills and diabetes that may lead to several candidiasis diseases. Three concentrations of 500, 300 and 100 ug/ml of synthesized pine pollen with nano gold particles (AuNP) were subjected to paper disc assay using corn meal agar against *C. albicans*. Synthesized extract of *P. kesiya* pollen at 500 ug/ml concentration showed the highest antifungal activity

against *C. albicans.* The prevalent antifungal activity of the biological synthesized gold nanoparticles using *P. kesiya* can lead to its promising utilization as natural fungicidal agent in the field of nano biotechnology.

Optimization of Mycelial Growth and Mycochemical Screening of *Lentinus sajor-caju* (fr.) from Banaue, Ifugao Province, Philippines

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Lentinus sajor-caju (fr.). locally known as "ulat" in the Ifugao province, is one of the wild mushrooms used as food by the indigenous communities here. In this study, the optimal conditions for the mycelial growth of *L. sajor-caju* was studied to develop a protocol for its mass cultivation. Initially, *L. sajor-caju* was collected from a forest site in Banaue, Ifugao, Northern Philippines. Mycelial growth on different indigenous culture media and culture conditions, i.e. pH, aeration, illumination, and temperature were evaluated. Results showed highest secondary mycelial growth on coconut water gelatin (CWG) medium after 5 days of incubation. Secondary mycelia also grew best at pH 5, at room temperature (28-33 ℃), and in lighted and sealed or unsealed incubation conditions. The study also identified the chemical components and antioxidant activity of *L. sajor-caju*. Mycochemicals were extracted from dried mycelial mat with hot water. Results of the study showed the presence of terpenoids, glycosides, alkaloids, and saponins. Aqueous extracts of *L. sajor-caju* also contained a high amount of phenolics (75.29 mg/1g dried mycelial) but showed low radical scavenging activity (31.03%) as compared to the standard Catechin (97.41%).

Keywords: antioxidants, edible mushroom, functional chemicals, indigenous media

Research and Development of Bioproducts for Agriculture in China

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Research and development of bioproducts for agriculture in China have been studying to improve crop production. Result found some potent microorganism that can be promoted plant growth eg. *Chaetomium cochiliodes*, and *Chaetomium* spp., some photosynthesizing bacteria etc. as well as insect fungi to protect insect to destroy the plants. Other bio-products are also being investigated and evaluated the use of bio-products in many kind of plants in the fields eg. citrus, peach, wax berry and strawberry etc. Our research bioproducts are releaded to the farmers as follows:- Bio-nutrient 1 - Bio-fertilizer and plant immunity agent of effective strain of *Bacillus subtilis* and naturally promote the growth of *Chaeomium cochioides* leading to plant stimulation and disease immunity. Application Rate is 50 g per 20 liters of water mixed with sticker and spreader every 15-20 days. Bio-nutrient 2 : naturally substances plant immunity agent for insect is found. Its active ingredient is *Bacillus subtilis*, naturally chitosan and sulfur solution and insect immunity agent. Application rate is 30-50 cc/ 20 L of water mixed with sticker and spreader and spraying to the plants at every 7-15 days intervals.Target Insect Pests are Aphids, Thrips, Leaf miner. Bio-nutrient 3 (Liquid Biofertilizer) - It is the naturally necessary plant nutrients to promote plant growth and increase yield. Active ingredient: *Bacillus subtilis* and mixture of naturally amino acids, humic acid, nitrogen (N) and potassium oxide (K2O). Properties reveal to stimulate root growth-increasing plant growth; root, stem, leaves, flowers and fruits-improving the efficacy of nutrient absorption and translocation from soil. Application rate is 20-40 cc/ 15 L of water. Nano- KS is a new science of natural elicitor. It is used as a plant growth stimulant, natural plant protection. The natural ability of nano-ks is to let the plant strong, and the plant cells become stronger and stimulate root growth, inducing leaf flush come out. improve stand quality, increase yields, reduce fruit and vegetables decay. Application rate is 25 cc per 20 Litres of water and spray around rhizosphere soil , basal stem and above plants at every 30 days.

Keywords: Bioproducts, *Chaetomium* sp., *Bacillus subtilis***,** Plant growth stimulant

Poster Session 4: Animal, Fishery Science and Entomology

Effect of Dry Giant Mimosa Leaves Pellet on Digestibility Efficiency and Skin Colour in Ornamental Fish

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Estimation of digestibility of in fish feed were investigate in fancy carp and goldfish. The feed were included the basal feed (0 g. of mimosa; T1) and mixed with giant mimosa leaves of 50 g (T2), 100 g (T3), and 150 g (T4). Fancy fish and goldfish with an initial weight of 26.54±6.39 and 20.69±0.26 gram were used for those experiments. Two groups' fish were separated into the 70 litter aquarium glasses with 5 fish/aquaria and triplicate per treatment. Digestibility efficiency (DE) of trial feeds were investigated by indirect method. Skin colour of that fish was measure by the colour reader (Konica Minolta model CR-10). The result show that mimosa feed had not been affect to the digestibility efficiency on both fish ($p>0.05$). It seem to be the digestibility of T2 in fancy fish show higher DE than other feed. Digestibility efficiency of protein, lipid, fiber, ash and NFE were 62.32±7.13, 71.53±0.19, 8.10±3.37, 40.30±1.95, and 26.16±13.13, respectively. In goldfish, DE of protein, lipid, fiber ash and NFE were high in T3 as 63.40±8.42, 68.32±9.19, 5.76±1.55, 17.40±2.59, and 37.13±2.86, respectively. Skin colour of fancy fish fed with T3 had high *L**, *a** and *b** value as 73.65+3.31, 6.44±3.46 and 37.7±0.28, respectively. Similarly, goldfish fed T3 had high *L**, *a** and *b** value as 68.82 ± 3.21, 22.32±1.97, and 50.20 ± 9.47, respectively. These researches concluded that dry giant mimosa leaves can use in fancy fish and goldfish up to 100 g kg^{-1} with not affect to DE. Moreover, the skin colour in term of *L**, *a** and *b** show high value in that fish fed with 100 g kg^{-1} dry giant mimosa leaves.

Keywords: giant mimosa leaves pellet, digestibility efficiency, skin colour, ornamental fish

Assessment of the Inhibitory Effect of Selected Medicinal Plants against *Aeromonas sobria* in Nile Tilapia (*Oreochromis niloticus* L.)

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The study assessed the inhibitory effect of selected medicinal plants against *Aeromonas sobria* in Nile tilapia *Oreochromis niloticus*. *In vitro* experiment was used to examine the inhibitory effect of selected medicinal against *A. sobria*. In the *In vivo* experiment Nile tilapia was exposed at two concentrations of acacia, annatto and mango to evaluate the inhibitory effect against *Aeromonas sobria.*

Results in *in vitro* experiment show that Zone of inhibition in acacia against the bacterium was only recorded in 100% extract concentration only. Extracts of annatto and mango in all concentration levels (25%-100%) showed zone of inhibition against the bacterium having the widest and narrowest diameter in 100% and 25% concentration, respectively. Using the highest bacterial suspension (10-7), extract of annatto and mango showed significant and wider zone of inhibition as compared to mango across extract concentrations.

In vivo experiment showed that disease symptoms such as red spots, haemorrhages and lesions have occurred in the challenged tilapia as early as Day 3. As compared to the initial TWBC, the study found out that there was apparent increase in TWBC count right after the appearance of the symptoms (three days after the challenge test).Significant increase in TWBC was only recorded in Treatment VII After 6 weeks prior to leaf extraction administration, there was decreased in the final TWBC of the experimental fish. Even not statistically significant, T5 (3% annatto) and T7 (3% mango) were effective in reducing the final TWBC count (T5 = reduced by 17.49 /mm3; T7 = reduced by 23.02/mm3) prior to infection.

Four types of WBC were identified namely, monocytes, neutrophils, lymphocytes and basophil. Initial differential count revealed that percent composition of WBC was dominated by neutrophils, followed by lymphocytes and lastly monocytes

Evaluation of Wood Charcoal Supplementation in The Diet of Nile Tilapia (*Oreochromis niloticus* L.) and Ammonia Levels in Concrete Tanks

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This study evaluated the growth response of Nile tilapia (*Oreochromis niloticus L.*) and monitored the changes of ammonia levels of the water in tanks upon the application of wood charcoal supplementation. Wood charcoal was pulverized and added to commercial feed at 1% and 2%.

Based on the evaluation, results on growth parameters revealed that wood charcoal supplementation showed no improvement on the growth of Nile tilapia. T1 (no charcoal) had the highest average weight of 95.08 grams while T2 (1% charcoal) had the lowest with an average weight of 90.14 grams. However, ANOVA showed comparable weights of fish. Correlation analysis revealed a positive effect of receiving charcoal added supplementation on gain in weight of the Nile tilapia. Highest final mean standard length and mean total length were observed in T2 (13.5 cm) and T1 (16.65 cm). While ANOVA showed no significant difference among treatments, correlation analysis revealed that wood charcoal supplementation increased the standard length and total length of Nile tilapia.

Results on computed TAN revealed that wood charcoal supplementation can decrease the ammonia concentrations of the water. T2 frequently obtained the lowest TAN concentration during the 65th, 72nd, 100th, 107th, and 114th day; while T3 (2% charcoal) obtained the lowest during the 56th, 74th and 94th day. Correlation analysis on TAN showed that decrease in TAN was only observed from 11th day until 67th day of culture which can be attributed to the shift on the form of feed from pellet to mash form. In terms of NH_3-N, T2 obtained the lowest level of NH_3-N during the 11th, 65th, 72nd and 86th day of culture; while T3 obtained the lowest level during the 56th, 74th, 94th, 100th, and 107th day of culture. Correlation on NH_3-N revealed that decrease in NH_3-N was only observed from the 58th day until 67th day due to the shift on the form of feed from pellet to mash form.

Dietary Effects of *Quillaja saponaria* and *Yucca schidigera* Extract on Rearing Performance of *Nile tilapia Oreochromis niloticus* L. and its Antioxidant Capacity and metabolic Response Following Hypoxic Stress

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This study evaluated the effects of Quillay *Quillaja saponaria* and/ or Yucca *Yucca schidigera* extract on growth and survival of Nile tilapia *Oreochromis niloticus* L. and their antioxidant capacity and metabolic response to hypoxic challenge. Fish were fed diet supplemented with 150 mg kg^{-1} Quillay (QS), 150 mg kg^{-1} Yucca (YS), combination of 150 mg kg^{-1} Quillay and 150 mg kg^{-1} Yucca (M) or control diet (C) without addition of Quillay or Yucca for six weeks. Growth and survival were monitored periodically. After rearing, fish were subjected to hypoxic challenge and after a week, antioxidant capacity (superoxide dismutase, glutathione peroxidase and glutathione reductase) and metabolic response (glucose, triglycerides and lactate) were analyzed. Final weight, weight gain and specific growth rate of M-fish were significantly higher than that of C-fish. However, no significant difference was found on survival after 6-week rearing. Among antioxidant capacity and metabolic response, significant effects were found only on superoxide dismutase and glucose level. Superoxide dismutase of M-fish was 48% lower than that of C-fish. Furthermore, glucose level of QS-, YS- and M-fed fish was 21, 30 and 37% lower than that of C-fish, respectively. Interestingly, percentage survival of YS- and M-fish was increased by 11 and 22% as compared to that of C-fish after 1-week hypoxic challenge, respectively. Overall, combination of Quillay and Yucca improved growth performance, and demonstrated favorable antioxidant activity (superoxide dismutase), metabolic response (glucose) and resistance of fish to hypoxic environment.

Keywords: Antioxidant capacity; Metabolic response; *Oreochromis niloticus*; Quillay; Yucca

Taxonomic Classification and Identification of Class Actinopterygii found in Baler River, Baler, Aurora, Philippines

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The Philippines has about 330 freshwater fish, including nine endemic genera and more than 65 endemic species, many of which are confined to single lakes. More than 5,600 fish species inhabit Neotropical freshwaters alone, such that Neotropical fishes represent about 10% of all vertebrate species on the Earth. this study aimed to collect and identify the species of fish under Class Actinopterygii found in Baler River, Aurora, Philippines in terms of their morphological characters using a taxonomic key. This study would be beneficial to the student and researchers that will study the diversity of the fresh-water fishes in the Philippines. According to the the taxonomic key of Field Guide to the freshwater fishes of New Guinea, there were four different fishes collected and classified by the researcher using taxonomic keys. They are as follows: *Awaous melanocephalus*, *Glossogobius giurius*, belong under Family Gobiidae within Class Perciformes while *Mugil sp.*, belongs to Family Mugillidae within Class Mugilliformes and *Sillagino macrolepsis* was under the Family Sillaginidae in Class Perciformes.

Keywords: Taxonomic key, Morphological characteristics, fresh-water fishes.

Bactrocera (*Bactrocer*a) tuberculata (Bezzi) Reported as a Pest Attacking Fruit of Tummy-wood, (*Careya sphaerica*) in Thailand

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Bactrocera (Bactrocera) tuberculata (Bezzi), is a member of the *Bactrocera zonata* complex which larvae feed in the fruite of Tummy-wood (*Careya sphaerica*: Lecythidaceae). It is not economically important fruit fly species. The *B. zonata* complex, differ from those of the *B. dorsalis* complex in incomplete costal band and the weak anal streak (along cell cup and vein A_1+CuA_2). Morphological characters of adult *B. tuberculata* is as follows: large facial spots on face; scutum(mesonotum) predominantly black with yellow stripes, with anterior supra-alar setae, prescutellar setae; 2 scutellar setae; wing with a small dark brown spot at wing apex (apex of cell r_{4+5}); legs entirely yellow, male hind tibia with a prominent anterodorsal ridge before apex. The 5th sternum of male is shallow concavity on posterior margin and posteroior lobe of surstyluslobe. The fruit of tummy-wood are found as a larval host of *B. tuberculata* and *B. albistrigata*.

Keywords: *Bactrocera (Bactrocera) tuberculata (Bezzi)*, Larval host, Tummy-wood,

Effectiveness of Plant Growth-Promoting *Streptomyces* sp. on Seedling Growth and Development of Rice (*Oryza sativa* L.)

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Poor crop establishment is a major constraint to rice crop growth in drought-prone rainfed upland areas in the Philippines. Actinomycete (*Streptomyces mutabilis*), a gram-positive filamentous bacterium, was previously proven to improve growth of upland rice variety NSIC Rc192 in response to decreasing soil moisture in Isabela province. We further validated the impact of actinomycete on seedling vigor index of NSIC Rc192 and shoot growth (plant height and tiller number) of NSIC Rc122, NSIC Rc222, NSIC Rc240, and NSIC Rc300 under upland rice system in PhilRice, Nueva Ecija. Results showed that actinomycete inoculant increased seedling vigor index by 38.4%, shoot growth by

62.5% and root growth by 43.4% of NSIC Rc192 under laboratory conditions. Furthermore, significant genotypic differences in response to actinomycete inoculation was observed in the screenhouse. Actinomycete inoculation significantly increased plant height of NSIC Rc122 by 68% and NSIC Rc222 by 52% whereas only 12% increase was observed in NSIC Rc240 and NSIC Rc300. Tiller number was also improved by actinomycete inoculation in all varieties (25 to 67%) except NSIC Rc300. The results implied that actinomycete can be a potential bio-inoculant for rice. However, the significant improvement in seedling growth due to actinomycete inoculant evident in selected rice varieties needs further validation in the field.

Keywords: actinomycete, bioinoculant, germination, PGPB, seedling vigor

Influence of *Theobroma cacao* on the Sexual Aggression of Fighting Fish (*Betta splendens*)

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The study was conducted to determine the influence of exposure to different concentrations of *Theobroma cacao* plant extract on the sexual aggression of *Betta spledens.* Fifteen (15) male Betta fishes were exposed to different concentrations (10%, 20% and 30%) of *T. cacao* and behavioural aggression Betta fishes towards their mirror images were assessed after 12 hours of exposure. Behaviors observed were time it took for each fish to be within 8 cm distance from the mirror, the number of bubbles or surface gulping, number of serpentine movements, duration of shaking movements and the number of times the male *Betta splendens* fishes contact their mirror images.

Results of sexual aggression of male Betta fishes increased in those exposed to 20% concentrations comparable to the positive control (Sildenafil citrate). Courtship behavioural displays such as movement of fishes at 8 cm distance, bubble formation/surface gulping, mirror-contact, and serpentine movements were evidences of sexual receptivity and relative signs of sexual aggressiveness. However, exposure to higher concentrations of *T.cacao* reduced sexual drive.

Keywords: Betta splendens, fighting fish, *T. cacao, sexual aggression*

Phytochemical Analysis, Larvicidal Activity and Cytotoxic Properties of Malvarosa (*Pelargonium Graveolens*) Leaf Extract

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Plants have been utilized as medicines for thousands of years. The pharmacological properties are naturally derived compounds, the isolation and characterization of pharmacologically active compounds from medicinal plants continues today.

Phytochemical analysis, larvicidal activity and cytotoxic properties of malvarosa (*Pelargonium graveolens*) leaf extract was done to determine the secondary metabolites present in *P. graveoleons*. The preliminary phytochemical screening of *Pelargonium graveolens* crude extracts showed the presence of bioactive components like Alkaloids, Essential Oils, Flavonoids, Higher Alcohols, Phenols, Steroids, and Tannins.

The study identified the larvicidal activity of *Pelagonium graveoleus* ethanolic extract against *Aedes aegypti* mosquito. The Linear Regression Probit Analysis was used to identify the concentration (ppm) that will kill certain percentage of mosquito larvae. The lethal concentrations for the *P. graveolens extract* to achieve 50% and 90% mortality or LC50 and LC90 were estimated at 1,355 and 5,443 ppm respectively with linear regression equation of $Y = 2.12x - 1.64$.

The biological activity of different concentrations of *P. graveolens* leaf ethanolic extract was tested for their ability to inhibit the proliferation of human lung cancer cell lines (A549), at 50 μg/mL concentration inhibited the proliferation of 55.51 % cells. The concentration needed to inhibit the proliferation of 50% (IC_{50}) of the A549 cells is 46.72 μg/mL. Different concentration of *P. graveolens* extract exhibit growth inhibitory effect and larvicidal activities.

Keywords: *P. graveolens*, phythochemical, larvicidal, cytotoxic properties, cell line A549, MTT Assay

Development of Intermediate Moisture Goat Skin Salad (Chevon Ceviche)

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Skin from goats and other edible animals are often discarded and considered as waste material. Thus, the objective of this study was to add value to the goat skin by producing an intermediate moisture goat skin salad (kapukan) that satisfies consumer preference. Different processing methods were employed and evaluated in the production of chevon kapukan. Goat skin and meat were autoclaved at 15psi for 15 minutes. Cooked goat skin and meat were oven-grilled for 180 ℃ for 10 minutes. Grilled goat skin and meat were subjected into different treatment. After addition of ingredients to the grilled goat skin salad, the sample was served to the panelist and it serve as the control. In treatment 1(T1), grilled goat meat and skin were dried directly at cabinet dryer at 60 ℃ for 180 min. while in treatment 2 (T2) ingredients were added and simmer before drying at cabinet dryer. Same as in T2, treatment 3 (T3) with added ingredients were fried first before drying. Other flavouring ingredients such as chili (red and green), green bell pepper and onion were dried and added. The physico-chemical, microbial and sensory characteristics of the product were also evaluated.Results showed that chevon kapukan has moisture content that ranged from 6.43 to 11.69% and water activity of 0.48-0.66. Aerobic Plate Count (APC) for yeast and molds to determine microbial load of the chevon kapukan showed that the products are microbiologically stable. Consumer testing using 50 untrained panelists revealed that the control, T2 and T3 were most liked in terms of overall acceptability (7.3, 7.4, 7.6) and texture (6.3, 6.4, 6.7). No significant difference ($p>0.05$) in terms of other attributes such as color, aroma, spiciness, sourness and moistness were seen. Moreover, majority of the respondents (>50%) perceived that the sensory attributes of chevon kapukan were in the just-about-right level. In terms of purchase intention, respondents indicated that they will probably buy the product regardless of the treatment. Since there is a good market potential for this product, processing goat skin into kapukan is an effective way to add value to waste products from chevon processing.

Keywords: *chevon kapukan, goat skin salad, chevon, kapukan, value-adding*

Acaricidal Toxicity of Nano Essential Oil of Black Pepper against African Red Mite [*Eutetranychus africanus* (Tucker)]

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Acaricidal property of nano essential oil of black pepper, *Piper nigrum* Linn against the African red mite, *Eutetranychus africanus* (Tucker) was investigated by using contact methode. Test in terms of mortality and repellency effects was made by dipping the mulberry leaf cut in to circle, 2.7 cm diameter in nano-essential oils at 0 (water), 0.2 0.4 0.6, 0.8 and 1% concentrations for 1 minute. The mite mortality was checked at 24 hrs and compared with various concentrations of surfactant (Tween-60+PEG). As for repellent test, the choice test was performed by dipping an half cut leaf in the nano-essential oil at 0 (surfactant), 0.02, 0.06 and 0.1% concentrations, whereas, the other side of cut leaf was dipped with water. The mite repellency was checked at 24 hrs. The results presented that by contact method, both nano-essential oil of black pepper and surfactants showed high effectiveness against African red mite. Therefore, at 24 hrs, both with the concentration of 1% caused the mite mortalities of 96 and 92% and gave LC_{50} at 0.34 and 0.54%, respectively. Nano-essential oil of black pepper presented moderately repellency effect, with 42.39-51.67 %RI at 24 hrs. However, nano-essential oil of black pepper at all concentrations showed higher mortality and repellency effects when compared to the surfactants.

Keywords: nano, essential oil, black pepper, African red mite

Synergistic larvicidal efficacy of *Rhinacanthus nasutus*, *Andrographis paniculata* and *Vernonia cinerea* extracts and their active compounds against *Aedes aegypti* mosquito

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Phytochemicals have been shown to possess insecticidal activities against insects and mosquitoes. We tested toxicities of different extracts of *Rhinacanthus nasutus*, *Andrographis paniculata* and *Vernonia cinerea* medicinal plants against the dengue mosquito vector *Aedes aegypti*, collected from Nakhon Pathom province, in the central part of Thailand. The mosquitoes were observed tolerant to pyrethroids and had increased activities of detoxification enzymes compared to the susceptible Bora strain, indicating detoxicification system could be responsible for tolerance to pyrethroid insecticides. Highest larvicidal activity was observed for the *R. nasutus* hexane fractionated extract toward *Ae. aegypti* fourth-instar larvae, with LC_{50} value of 68.52 µg/ml, while *A. paniculata* and *V. cinerea* extracts possessed much less toxicity. Synergism in toxicity against *Ae. aegypti* larvae was observed on binary mixtures of *R. nasutus* with *A. paniculata* hexane fractions and of *R. nasutus* hexane with *V. cinerea* ethyl acetate fractions. Synergistic larvicidal activity was found when mosquitoes were treated with mixtures of rhinacanthin-C and luteolin or quercetin flavonoids, the major compounds of *R. nasutus* and *V. cinerea*, respectively. We found that these compounds comprised inhibitory activity against MFOs, β-esterase, and Glutathione-S-transferase enzymes. The results suggested that synergism of larvicidal activity might be attributed to the combination of potent insecticidal property of rhinacanthin-C and inhibition of insecticide detoxification enzymes by the respective compounds. This study should thus have an implication in development of eco-friendly strategy in resistance mosquito vector control.

Keywords: Synergism, Larvicide, Plant compounds, Rhinacanthin-C, Flavonoids, *Aedes aegypti*

Comparison of Fermentation process in Thai fermented pork sausage (I-san sausage) on Quality and Safety

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The comparison of different fermentation process for I-san sausage was demonstrated in 5 conditions as follow 1) hang at room temperature for 3 day 2) incubation 37˚C for 3 day 3) vacuum 37˚C for 3 day 4) incubation 37˚C for 2 day with one day hanging at room temperature and 5) vacuum 37˚C for 2 day with one day hanging at room temperature. The pH value, total acidity percentage, weight loss percentage, lactic acid bacteria, coliform/*Escherichia coli* and yeast/mold were analyzed. The results showed that the pH value declined rapidly from 5.97-5.99 to 4.35-5.16 during fermentation for 3 day in all methods. The pH reduction corresponded to an increase in total acidity from 0.35-0.38% to 0.73-1.17%. The lowest pH value and the highest total acidity found in I-san sausage incubation 37˚C for 3 days. The weight loss of fermenting I-san sausage generally decrease as the fermentation time increased. As the fermentation process, I-san sausage hang at room temperature for 3 day had the greatest weight loss (14.93%) but I-san sausage with fermentation condition at incubation 37˚C for 3 day or vacuum 37˚C for 3 day displayed the lowest weight loss value as 3.94 and 3.22%, respectively. The lactic acid bacteria count at day 3 increased in all methods with value between 7.31-7.81 log cfu/g on day 3. The highest population of lactic acid bacteria was found in fermentation condition with 37˚C incubation for 3 days (7.81 log cfu /g). The count of yeast/mold in all methods had no differences ($P>0.05$) on day 1-3 of fermentation. The coliform decreased on day 1 and displayed low limit of detection. The detection of *E. coli* on day 0-3 of fermentation in all methods was no differences ($P>0.05$) with undetectable level.

Keywords: Thai fermented pork sausage (I-san sausages), fermentation process

Acaricidal Properties of Star Anise (*Illicium verum* Hook.f.) Essential Oil against House Dust Mite [*Dermatophagoides pteronyssinus* (Trouessart)]

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Acaricidal properties of essential oil from star anise (*Illicium verum* Hook.f.) were evaluated by using fumigation, residual contact and fibers coating method against house dust mite (*Dermatophagoides pteronyssinus* (Trouessart)) and compared with standard trans-anethole and essential oils from clove (*Syzygium aromaticum* (L.) Merr. & L.M. Perry). The fumigation method was made within 25 L knockdown chamber. The various concentrations of essential oils at 0 (95% ethanol), 0.15, 0.30, 0.45, 0.60, 0.75, 0.90, 1.05 and 1.2 µl/L air were used. The fumigation period was 1 h and mortality of mite was observed at 24 h after fumigation. The residual contact method was done in a glass tube 0.4 cm in diameter and 3 cm long and covered with filter paper on both ends. The various essential oil concentrations at 0 (95% ethanol), 0.02, 0.04, 0.06 and 0.08 µl/cm^2 were applied and mortalities of mite were observed at 12 and 24 h after treatment. The various essential oil concentrations at 1 and 2% in 95% ethanol with MU and PG as additive agents were used to coat the fiber. The tested synthetic fibers were soaked in all treatments for 30 min, dried in a hot air oven at 50 ℃ for 2 h. The coated fibers were separately kept in cloth bags at 25±2^{o}C. The effectiveness of those coated fibers were evaluated by direct contact method and observed on the beginning day and every week as well as the mortality of mite was observed at 24 h after treatment. The result showed that all fumigation experiments showed low effectiveness to control house dust mite, when clove essential oil had a high residual contact property, showed 100% mortality of exposure period of 12 h at 0.02 µl/cm^2 and showed the LC_{50} and LC_{90} at 0.006 and 0.014 µl/cm^2, respectively. In addition, this essential oil was also highly toxic against the house dust mite, by using fibers coating method. It could control the mite effectively as long as 49 days. The coated fibers with star anise essential oils and standard trans-anethole could kill the mite quite well within 2 weeks but lower than 30% mortality within 28 and 35 days, respectively. Whereas, the essential oil of clove was highly effective to control house dust mite, it could kill the mite more than 30% within 56 days.

Keywords: fumigation, direct contact, coated fibers, house dust mite

Effect of Frozen Zooplankton Feed on Growth and Reproductive Performance of Crayfish (*Procambarus clarkii*)

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The objectives of this study were to compare the effects of frozen zooplankton as feeds on the growth and reproductive performance in crayfish *Procambarus clarkii*. Four trial feeds such as commercial feed (CF), two frozen Fairy shrimps; *Branchinella thailandensis* (FB), *Streptocephalus sirindhornae* (FS), and frozen water flea *Moina macrocopa* (FM) were investigated. Completely Randomized Design (CDR) (with 6 replications was used for the 90 day experiments. Average initial weight of crayfish was 5.80±0.17 g. Fecundity and growth performance of the crayfish were significantly different (P<0.05). Crayfish fed with FS had the highest fecundity and Gonadosomatic Index (GSI) values, followed by FB, CF and FM as feeds (with fecundity values were 696.42±84.77, 568.19±71.45, 372.52±88.60, and 305.06±62.95 eggs/female, respectively). GSI were 21.30±5.30 ,15.97±4.95 ,12.38±4.53, and 10.46±4.64 %, respectively. Growth performance of crayfish fed with FB had the highest specific growth rates followed by CF, FS and FM as feeds (with 0.98±0.17 ,0.93±0.23, 0.93±0.11, and 0.76±0.13 % day^{-1}, respectively). This research suggests that the frozen Fairy shrimp can be used in crayfish culture to improve reproductive and growth performance.

Keywords: Crayfish, fecundity, growth, Gonadosomatic Index (GSI).

Observation on *Trilocha varains* (Lepidoptera: Bombycidae)

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Biological studies of the silkworm larvae in the laboratory revealed that after mating, females laid eggs in consecutive rows, sometimes observed 2-6 layers. These eggs were often found attached to the side of plastic rearing cup or its lid 2-15 eggs/group. Innature, the female usually lay eggs on the dorsal part of the fig leaves, 3-24 eggs/group. The female can lay eggs between 160-270 eggs, whereas the unmated adults can lay 15-183 eggs /insect. These unfertilized eggs would not developed into larvae. Egg incubation period was 3.33-3.62 days. The developmental time for larval instar 1-5 was 1.97 ± 0.09, 2.00 ± 0.06, 2.03 ± 0.05, 2.12 ± 0.04 and 2.62 ± 0.34 days, respectively. The fully grown of the fifth instar will build cocoon up the apex of the fig leaf. The prepupa stage was 1 day. The pupa is developed within the pupal case for 4.00-5.75 days (average 4.85 ± 0.50 days for male pupa and 4.99 ± 0.50 for female pupa. Adults as they emerged from the coccon, both sexes does not eat due to not well established mouth parts. Mated male moths tend to live slightly longer and vise versa for the mated female(mated male and female:5.96 ± 0.93 and 7.20 ± 1.25 days, respectively and for unmated male and female 5.58 ± 1.00 and 8.28± 1.72 days, respectively. The moth would hide among the leaf base of host plants during the day and active at night.

Keywords: fig tree, life history, *Trilocha varians*

Biology of *Pergesa acteus* (Lepidoptera: Sphingidae)

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Green pergesa hawk moth (*Pergesa acteus* (Cramer, 1779)) is a moth belonging to the family Sphingidae, order Lepidoptera. They are considered one of the important insect pest of the genus Caladium in the family Araceae. They feed on and destroy Caladiums and widely distributed in most parts of Thailand. The biological studies of this insect was conducted under the laboratory conditions (34 ^{o}C; 70% RH) using young leaves of *Caladium bicolor* for rearing larval stages. Males and females were fed with 25% of honey solution. The eggs were laid singly on the lower surface of the host plant leaves. Egg incubation period was 3.41±0.07days. The mean of head capsule width of 1st, 2nd, 3rd, 4th and 5th instar larvae were 0.85±0.06, 1.27±0.04, 1.78±0.05, 2.54±0.08 and 3.90±0.09 mm and corresponding dorsal horn lengths 2.85±0.25, 4.80±0.48, 6.76±1.09, 7.32±1.12 and 2.84±0.23 mm, respectively. The total time that it stays in the caterpillar stage is about 18.29 days. The length of pupal stage was 14.34±1.12 days. The lifespan of the female green pergesa hawk moth is slightly longer than that of the male 2.83±0.70 and 2.43±0.50 days, respectively.

Insect Diversity on Different Growth Stages of Upland Rice

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The insect diversity study of upland rice field at Pa La-U village, Prachuap Khiri Khan Province, was conducted. The investigation was carried out in 3 rice growth stages; tillering, anthesis and maturity stage, in order to determine the species diversity and evenness. A total of 4,899 insects which representing 715 species, in 127 families under 9 orders were identified. The highest species number (43.78%) was found in rice anthesis stage, following by maturity stage (34.67%) and tillering stage (21.56%), respectively. However, the highest insect diversity and evenness were observed in rice maturity stage (Shannon's index, H′ = 4.349 and Pielou's index, J′ = 0.757). The rice anthesis stage displayed a small lower diversity and evenness (H ′= 4.320 and J ′= 0.723). While the lowest insect diversity and evenness were found in rice tillering stage (H ′= 2.790 and J ′= 0.530).

Keywords: insect diversity, upland rice, rice growth stage. evenness, Pa La-U village

Effectiveness of Bottle Brush (*Callistemon lanceolatus* DC.) Leaf Extracts to Control the Nymph of Mealybug (*Phenacoccus manihoti* Matile-Ferrero)

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Mealybug (*Phenacoccus manihoti* Matile-Ferrero) poses a threat to cassava-growing regions of the world. A current global interest has focused on the discovery of non-chemical strategies and environmental friendly pest control approaches. The objective of this study was to investigate the efficacy in terms of toxicity and repellent properties of hexane, acetone and ethanol crude extracts from leaf of bottle brush (*Callistemon lanceolatus* DC.) against the nymph of mealybug (*P. manihoti*) by using leaf dipping method. Various concentrations of bottle brush extract, 0 (5% tween-20 water) 1, 2, 3, 4 and 5% (w/v) were applied. Then the insect mortality was observed at 24 and 48 hrs whereas, the repellent index (%RI) was observed at 24 hrs. The results showed that acetone extract from bottle brush was highly effective in killing the nymph of mealybug with the LC_{50} at 24 and 48 hrs as 3.54 and 2.28 %, respectively. Acetone and ethanol extracts of bottle brush at 2-5% concentrations showed very strong effect in repellence when the nymph of mealybug with >75% RI was found within 24 hrs. Therefore, the acetone extract of bottle brush leaf was highly containing insecticidal activity against nymph of mealybug in laboratory, then the next filed condition substance should be developed.

Keywords: plant extract, toxicity, repellent property, leaf dipping method

Research on Efficiency of Using Cassava Chip as Based Energy and Local Legume as Protein Supplement in Concentrate for Feeding Dairy Heifer Replacement

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The samples of this study were 62.50 -75.00 % Holstein Friesian. Those 16 dairy heifers were divided into 4 treatments and 4 replications, each were received different treatment as follows: Treatment 1 (T I) para grass + cassava chip + concentrate (control); Treatment 2 (T II) para grass + cassava chip + concentrate mixed leucaena leaf; Treatment 3 (T III) para grass + cassava chip + concentrate mixed dry soilbean;Treatment 4 (T IV)para grass + cassava chip + concentrate mixed saman leaf. The result revealed that initial weight of heifers were not significant but weight increase T1 was the highest weight increase among all four groups at the growth rate of 94.50 kg. or 0.45 kg./day later were T2 89.75 kg. or 0.43 kg./day T3 84.25 kg. or 0.40 kg/day and the lowest weight increase was T4 82.75 kg. or 0.40 kg./day respectively. Statically there were no significant different between T1 and T2 as same with T3 and T4 but significantly different from T1and T2 with T3 and T4 at the highly significant level of $p<0.01$ because in T2, T3 and T4 increasing local legume as protein feed supplement but in T1 was not increasing local legume so T1 have growth rate more than the others so in T1 can consume more protein (not mixed local legume) than the other groups (mixed local legume) the result showed as same research of Virapol (2011). Total feed consumption T1 was the highest consumer at 4,116.50 kg. or 19.60 kg./day later were T2 3,981.25 kg. or 18.96 kg./day. T3 3,976.25 kg. or 18.94 kg./day and the lowest was T4 3,973.50 kg. or 18.92 kg./day. There were no significantly different among T2, T3 and T4 but significantly different with T1 at the highly significant level of $p < 0.01$. Total Feed cost consumption T1 was the highest cost of feed consumption at 13,065.75 Baht or 62.21 Baht./day later were T2 10,986.38 Baht or 52.32 Baht./day, T3 10,973.13 Baht or 52.26 Baht./day and the lowest was T4 10,961.00 Baht or 52.208 Baht./day. There were no significantly different among T2, T3 and T4 but highly significant different from T1 at $p < 0.01$. Counting the cost of feed conversion rate, it was found that T1 used the highest cost at 138.25 Baht. respectively, T2 was at 132.91 Baht. T4 132.53 Baht. And the lowest was T3 at 130.38 Baht. Statically, T2,T3 and T4 were not different. but significantly different from T1. The experiment revealed that local legume used as protein feed supplement significantly different to feed conversion rate and as same with the cost of feed conversion rate in feeding dairy heifer also. This result mean local legume can be use for feeding animals to replace protein food that more expensive than local legume for save the cost of feeding dairy heifer.

Keywords: Cassava chip, Local legume, Leuceana leaf, Dry soilbean, Saman leaf, Dairy heifer replacement

Glh14 and *tsv1* in Rice Boost Resilience to Tungro

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Tungro causes severe stunting and yellowing in rice resulting in 20-100% crop loss. Nephotettix virescens (green leafhopper, GLH) is the most efficient vector in the semi-persistent transmission of its causal viruses, the rice tungro bacilliform virus (RTBV) and rice tungro spherical virus (RTSV). Philippine rice varieties improved with vector resistance were shown to have successfully controlled the occurrence of tungro, however may not be very effective unless further enhanced with resistance against tungro viruses. In PhilRice, the Indian cultivar ARC11554, has long been used as source of tungro resistance but previous marker-assisted selection (MAS) only focused on introgression of a DNA fragment from chromosome 4. Lately, the positions of Glh14 resistance locus and tsv1 gene in ARC11554 were found in chromosomes 4 and 7, respectively.

In this study, MAS–bred rice lines introgressed with Glh14+tsv1 from ARC11554 were evaluated for reactions to tungro in the field. The evaluation was carried out in PhilRice Visayas Experiment Station in Negros Occidental in 2017 wet season, when the disease was so prevalent. The disease intensity score of each rice line was computed, at 45 and 65 days after transplanting (DAT), based on percent plant height reduction, percent number of leaves with yellow to orange discoloration, and presence of interveinal chlorosis on young leaves. At 45 DAT, the tungro-susceptible TN1 variety

planted around the experimental plot already manifested severe tungro infection thereby validates the efficiency of the field trial. Interestingly, all rice lines carrying Glh14+tsv1 exhibited moderate resistance against tungro. Though some MAS-bred rice plants were observed with either mild stunting or leaf discoloration, ELISA revealed very low RTSV accumulation in these plants - infection, if present, was with RTBV alone. These promising rice breeding lines will be recommended for yield trial in 2018 dry season. Likewise, the rice line with the best agro-morphological traits will be recommended for use in rice breeding as common donors of Glh14 and tsv1.

Results of this study once again had proven the effectiveness of MAS in combining resistance genes into a rice plant, which allowed enhancement of the plant's resistance against rice tungro disease. Since RTSV is necessary for the transmission of RTBV, and eventual expression of tungro symptoms, the potential RTSV-resistant rice is expected to halt the source of tungro virus inoculum in the field.

Keywords: tungro, rice tungro spherical virus (RTSV), rice tungro bacilliform virus (RTBV), green leafhopper (GLH), ARC11554

Poster Session 5: Environment, Toxicology and Agricultural Development

Kaala Natural Farm under the New Agricultural Theory, Chiang Dao District, Chiangmai.

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Kaala Natural Farm is located in Chiang Dao District, Chiangmai Province. The total area was 15 rais. The purposes of this study were to plan and to develop this area to be an agricultural learning center under the new theoretical agriculture and organic farming by using the Khok Nong Naa Model. The methods of this study were as follows; 1) collecting data by surveying the site, interviewing the owner requirements and gathering the relevant documents. 2) analyzing and synthetizing data and 3) designing the site planning. The results of this designing were divided into 3 parts. First, upland (Khok) had 8 rais which approximately for 54 percent of the total area Khok was divided into 2 pasts as follows; 1. buildings structure consisted of 1) the residential area, 2) greenhouse, 3) the building of learning and service center 2. orchard and the forest area. Second, water storage (Nong) had 4 rais which approximately for 26 percent of the total area. Third, paddy field (Naa) had 3 rais which approximately for 20 percent of the total area. However, the method of organic farming was used in the process of farming. Therefore, agricultural process in Kaala Natural Farm was intended to be the agricultural learning center for agriculturists who were interested in learning and using this approach to further develop their own areas.

Keywords: Site planning, The New Agricultural Theory, Khok Nong Naa Model

Qualitative Antibacterial Activity and Genotoxicity of Lanzones (*Lansium domesticum)* Seeds Extract Through *Allium cepa* Assay

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Lansium domesticum Corr. of Meliaceae family locally known as Lanzones was widely cultivated in Southeast Asian countries as well in the Philippines that grows from 40-50 ft. high. Its yellow leathery skin fruits grow in clusters approximately 3 - 5 cm with 1-3 segments of seeds folkloricly used for deworming and ulcer medication but lacks scientific validation of its medicinal uses. *Lansium domesticum* Corr. from Dumaguete City, Negros Oriental, Philippines seed extract were tested for qualitative antibacterial activity against *S. aureus* and *E. coli* and genotoxicity through *Allium cepa* assay. Five concentrations of 1250, 1000, 750, 500 and 250 ug/ml of synthesized *L. domesticum* seed extract were subjected to qualitative antibacterial testing to determine the minimum inhibitory concentration (MIC) and genotoxicity using *Allium cepa* assay. Results showed that extract of *Lansium domesticum* seeds antibacterial activity is recorded at 1250 µg/ml, 1000 µg/ml and the minimum inhibitory concentration (MIC) was 750 µg/ml. Genotoxicity test resulted in significant difference of all the concentrations against the control in which 100% concentration has the highest chromosomal aberrations. Mitotic index under all groups has no significant differences which indicate that the extract does not inhibit cell replication and the use of the *L. domesticum* seed extracts can be continued to give no definitive effect as long as used in a recommended dosage.

Modified Organic Dapog Method Using Different Organic Inputs for Organic Rice Seedling Production

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The research was conducted in four cropping seasons in a certified organic area to determine the performance of modified organic dapog method as an efficient method for organic rice seedling production. The modified organic dapog is a method of organic rice seedling production with advantages of lesser planting space, lesser labor cost in pulling and easier transport of seedlings from seed bed to rice paddy. It also produces less roots and stem damage seedlings because the seedlings do not penetrate deep in the soil. Using a mixture of other forms of organic fertilizers like vermicast, organic liquid supplement and microbials were proven effective in improving soil quality thus enhancing the growth of rice seedlings.

Two studies were conducted namely, wet bed method for organic rice seedling production using NSIC Rc 222 variety; and yield performance trial using the seedlings produced, both for modified organic dapog method and traditional dapog method.

Yield performance showed that modified organic dapog method obtained the highest computed yield with 5.313 t/ha or 18.25% higher than the traditional dapog method (T2) and 22.39% higher from the control (T1).

The utilization of modified organic dapog method in organic rice seedling production produces vigorous and green seedlings resulting to higher yields. Likewise, application of organic fertilizers were proven effective in improving soil quality thus, enhancing the growth of rice seedlings. The field days conducted coupled with IEC materials developed helped in motivating the farmer-cooperator to establish a demo farm using the modified organic dapog method.

Keywords: certified organic area, organic rice seedling production, modified organic dapog method, traditional dapog method, organic inputs

Optimization of Coconut Residue as Flour by D-Optimal Mixture Design

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This study was conducted to utilize the coconut residue as flour in the production of a fiber-enriched cookie-premix, standardize the formulation of the cookie-premix using D-optimal mixture design, evaluate the influence of flour blends and their interactive effects, conduct a physical analysis of the premix formulations, obtain an optimal formulation with desirable characteristics, and assess the acceptability and formulation cost of the optimized product produced. Coconut residue was defatted several times, dried and pulverized to produce coconut flour. Eleven (11) formulations of different concentrations of coconut residue flour, all- purpose flour, and rice flour were used to produce cookie-premix. The varying percentage blend of the three types of flours influenced premix's color, bulk density and hardness which were analyzed using a D-optimal mixture design. Coconut residue flour had positive effects for bulk density but negative on color and hardness. All-purpose flour and rice flour had significant positive effect for both color and hardness, but not on bulk density of the premix. The optimum tablet formulation obtained was 69.251% of coconut flour, 16.961% of all-purpose flour and 13.789% of rice flour with L* value color of 12.397, 0.544 g/ml bulk density and 2.146 N hardness. The least formulation cost of the optimized cookie-premix was PhP 26.00 per 100gram net weight.

Keywords: Coconut "*sapal*", coconut residue, coconut flour, D-optimal mixture design, optimization

Development of Mangifera Liqueur towards Commercialization

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This study aimed to develop and standardize the processing of Mango – Infused Liqueur/Cordial towards commercialization. Nine treatments were assigned which comprises the following: Treatment1 20% alcohol with 10% solids concentration; Treatment2 20% alcohol with 20% solids concentration; Treatment3 20% alcohol with 30% solids concentration; Treatment4 30% alcohol with 10% solids concentration; Treatment5 30% alcohol with 20% solids concentration; Treatment6 30% alcohol with 30% solids concentration; Treatment 7 40% alcohol with 10% solids concentration; Treatment8 40% alcohol with 20% solids concentration; and Treatment9 40% alcohol with 30% solids concentration. All treatments underwent two (2) months of infusion. Physico-chemical properties (total soluble solids, pH determination, color measurement and alcohol content) were determined in each treatment. Sensory characteristics of samples were evaluated using 9-point hedonic scale by 50 untrained panelists, classified as frequent and occasional drinkers to determine consumer acceptability of the product. The results revealed that after two months of infusion, most samples showed an increase in total soluble solids (TSS), except for T3 (20% alcohol with 30% solids concentration), T6 (30% alcohol with 30% solids concentration) and T9 (40% alcohol with 30% solids concentration), from the initial of 30% solids (mixture prior infusion). All treatments decreased in pH from the initial pH of 7.8.In terms of colorimetric properties, T1 (20%:10%) had the darkest color among the treatments while treatment 4 (30%:10%) was observed to be the lightest. For a* value, all the treatments obtained negative values confirming that the product was observed to be green. Moreover, for the b* value, all treatments were detected as yellowish which was influenced by the color of the ripe carabao mango. Significant differences ($p<0.05$) were found on the overall acceptability score of mango cordial at different alcohol and solid contentfor frequent drinkers. Occasional drinkers' overall liking of the different treatments had no statistically significant ($p>0.05$) difference. No significant difference ($p>0.05$) were seen on the purchase intention of the products although T7 (40%:10%) obtained the highest mean purchase intention.It is concluded thatfrequent drinkers prefer the higher percentage of alcohol while occassional drinkers prefer lower percentage of alcohol.

Keywords: mango cordial, alcohol concentration, solid concentration, infusion

Assessment of Teratogenicity, Cytotoxicity and Antifungal Properties of Ethanolic Extract of Rosemary (*Rosmarinus officinalis*)

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This study tested ethanol extract of *Rosmarinus officinalis* against two soil borne pathogens *Lasiodiplodia theobromae* and *Thielaviopsis paradoxa* and its safeness to environment and animals through cytotoxicity and teratogenicity assays. Antifungal property of ethanol extract of *R. officinalis* was observed with increasing percent inhibition against *L. theobromae* in four days of incubation and decreasing inhibition through time against *T. paradoxa*. Test for teratogenicity showed *R. officinalis* ethanol extract became lethal at 500 ppm with 100% mortality due to coagulation as primary cause of death on embryos. Heartbeat rate and hatchability were affected by concentration. Malformation such as head not detached, tail not detached and eye underdeveloped was observed at 100 ppm and 500 ppm both with an average of 1 malformed embryo out of 9 embryos per treatment. Using probit analysis Lethal concentration (Lc50) was estimated 7530 ppm was non-toxic. Thus ethanol extract of *R. officinalis* was safe to use as biocontrol agent.

Keyword: Teratogenicity, cytotoxixity, anti-fungal, *Rosmarinus officinalis* and *L. theobromae*

Hydrologic Input-Output Model of Mt. Isarog Watershed

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Access and Utilization of Rice and Agriculture-Related Information through One-Stop Information (OSIS) in State Universities in Region 02

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The availability of rice and agriculture-related information in state universities can contribute to the knowledge acquisition of agriculture students. Its accessibility through libraries and information centers heightens the quality and relevance of such information. The creation of One-Stop Information Shop (OSIS) in 6 state universities in the Cagayan Valley Region (Region 02) of the Philippines provided agriculture students the access to rice and agriculture-related Knowledge Products (KPs). This study investigates the access and utilization pattern on rice and agriculture-related information by agriculture students. Data was obtained through a structured Literature Search Survey with information provided by students. The OSIS was visited 2, 477 times by students, 97% of them were Bachelor of Science in Agriculture (BSA) students. The study found that the accessibility of the provided KPs affects the number of students' utilization. The nearer the location of the OSIS to agriculture students, the higher the percent utilization. The most frequently searched topic was the management of pests and diseases (36%). It can be linked to the reason that majority of the students who accessed and utilized the KPs were Crop Science major (74%). The use of Information Community Technology (ICT)-based tools and resources was generally low (5%) due to lack of computer and slow internet connection. A need-based library or information center is recommended to increase the utilization of KPs.

Keywords: rice and agriculture-related information, knowledge acquisition, knowledge products

The Analysis on Relationship Between Cost Management Strategy and Return on Kanom La production in Nakhon Si Thammarat Thailand

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Kanom-La is special traditional snack made for a Buddhist ceremony on 10th month of the year for charity relative to whom passed away. It was produced as the commercial product This research was conducted to analysis cost and return; cost management strategy and relationship between cost management strategy and return of Kanom La produced in Nakhon Si Thammarat, the southern part of Thailand. Nine groups of entrepreneur who produced Kanom La were sampled by purposive sampling to collect data by indepth interview. Accounting analysis showed that the cost of production 120 kg was 191.70 USD, including average of variable cost was 188.02 USD and average fixed cost was 3.68 USD. Total income was 254.03 USD, net profit was 62.33 USD, with break event point at 15.29 kg, benefit cost ratio was 32.51 % and net profit to sales ratio was 24.54 %. Cost management strategy analysis indicated that over all of Kanom La entrepreneurs emphasized to cost management strategy both in financial cost and production management at the high level while the cost management strategy on marketing cost and management were the middle level. Analysis of relationship between cost management strategy and return showed that cost management strategy did not relate or no effect to return ($p \geq .05$)

Keyword: strategy, cost, return, Kanom-La

Site Planning of Demonstration Farm under the New Agricultural Theory in Faculty of Agricultural Technology, King Mongkut's Institute of Technology Lardkrabang

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Site Planning of Demonstration Farm in Faculty of Agricultural Technology, King Mongkut's Institute of Technology Ladkrabang had a total area of approximately 18.5 rais. The objective of this study was to focus on site planning for agricultural learning center by using Khok Nong Naa Model under the New Agricultural Theory. The methodology of this research were interviewing the project's representative, surveying the area, analyzing data, synthetizing data, and designing the site planning. The result of this planning and designing were divided into 3 main areas. First, upland (Khok) had 11.5 rais which was about 62.2 percent of the total area. Khok was divided into 2 parts as follows; 1. buildings structure consisted of 1) museum of technology and agricultural research, 2) multipurpose learning center, 3) fishery science and aquatic animal experimental center, 4) mushroom laboratory and nursery, 5) charcoal burner, 6) composting place, 7) waste segregation place, 8) agricultural equipment storage, and 9) threshing floor and 2. orchard and perennial plantation area which were the local plant and useful for daily life. This area also included the integrated farming plot for vegetable, herb, and flower garden. Second, water storage (Nong) had 3.5 rais which was about 18.9 percent of the total area. It had been provided for the benefit of fishery and cultivation. Third, paddy field (Naa) consisted of organic rice field and ridge, had 3.5 rais which was 18.9 percent of the total area. In overall, this site planning was considered to design for the benefit of the personnel research dissemination in order to not only to convey knowledge directly to agriculturists but also to be the guideline and to be a model of site planning by using this principle for other educational institutions.

Keyword: Site planning, New Agricultural Theory, Khok Nong Naa Model

Site Planning of Lertchana Farm under the New Agricultural Theory, Hin Lek Fai District, Prachuap Khiri Khan Province

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Site planning of Lertchana Farm is located in Hin Lek Fai District, Prachuap Khiri Khan Province. Lertchana Farm had a total area of approximately 110 rais. The purpose of this research was to focus on site planning for learning center under the New Agricultural Theory by using Khok Nong Naa Model. The methods of this study were interviewing the owner of Lertchana Farm, surveying the area, gathering the relevant documents, analyzing data, synthetizing data along with the designing of site planning. The results of the site planning were divided into 3 major areas. First, upland (Khok) consisted of 11 areas: 1) the residential area, 2) the building of learning and service center, 3) the crop area, 4) the orchard, 5) the flower garden in front of the entrance, 6) the hydroponic farm and nursery, 7) the forest area, 8) the area of banana field, 9) the vegetable area, 10) the livestock area, and 11) the parking areas including road in total area of 94 rais which was approximately 85 percent of the total area. Second, water storage (Nong) consisted of 3 marsh and rill in total area of 13 rais which was approximately 12 percent of the total area. Third, paddy field (Naa) consisted of organic rice paddy field in total area of 3 rais which was approximately 3 percent of the total area. In this study, all areas were designed to correspond with the New Agricultural Theory and water management which were not only to be a leaning center area for agriculturalists or those who were interested in learning but also to be a model in order to further develop their own areas.

Keywords: Site planning, New Agricultural Theory, Khok Nong Naa Model

The Application of Local Knowledge about Thai Blueberry (Mao) Wine to Develop Community Economy in the Northeast of Thailand

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This research is aimed to 1) study the history of Thai Blueberry wine in the northeast of Thailand, 2) study current issues and problems of the application of the local wisdom to produce the Thai Blueberry wine in the northeast, and 3) study on the application of the local wisdom to produce the Thai Blueberry wine for stimulation the community economic in northeastern. This research has collected information, documents and fielded by defining areas of Kalasin, Nakhon Nakhon, and Nakhon Phanom provinces are the study areas. There are 125 people as the sample groups who give us the information. Data Triangulation is applied as a techniques for data investigation and a descriptive analysis is used for presenting the result. The results shows that the Thai Blueberry wine is the popular product that are processed from the local fruit found in the Phu Phan mountain range and the northeast part of Thailand in general. Isan people have known how to process Mao into other products for few years ago by Ban Sang Koh (Sang Koh Village). This village is the first community who has created Mao into other products by applying the ripen Mao fruit as the main ingredient. The knowledge from their higher educations and learning by doing are included as the important tools for creating Thai Blueberry wine. Subsequently, they spread the knowledge from the result they have found to other villages both in the Phu Phan mountains range and the neighboring communities. Moreover, there are many groups have started to process Mao into other products at the same time. At the beginning, their procedure is illegal, but they have established the cooperative for processing the Mao in their communities that legal later. This cooperative can process the Mao from many provinces such as Sakhon Nakhon, Kalasin, Nakhon Panhom, and Mukdahan. After that, each community have sent their Moa seedlings to other areas such as Nhong Bua Lam Phu and turn their agricultural products back to buy for the cooperative in Sakhon Nakhon.

Since 2002 until now, the government has supported each community to create their products which is called One Thambon (sub-district) One Product and they also have the projects to promote and select the best product of each community. The Thai Blueberry wine is well known that it is the best product from the OTOP project. For this reason, Kon Rak Mao Club or Mao Lover Club is established later. This club has four provinces as the members that is supported and helped within their group in many aspects such as academic cooperation and procurement, especially the packages of the wine. Nowadays, the Thai Blueberry wine production begins with Mao breed selecting, Mao fruit quality selecting, wash, crushing, squeeze, fermentation, and waiting about six months or one years for auction. The local wisdom are found in every stages of procedure such as the villagers always squeeze the maos for checking the concentration of their ripen flesh, the members often pound the maos by their hands, and area selecting for yeast fermentation. In the past, the villagers will keep the mao juice under the ladder of their home or in the pond to preserve the temperature stably. Moreover, the members found that the temperature while ferment the yeast is significant, because yeast can be died if the temperature is too high or low. These are the local wisdom that the members have applied for processing the Thai Blueberry wine or Mao wine which the high technology will be used instead these procedures. In addition, we found that the cooperative should be developed by expansion the relationship in both province and region, the institutes should supported them more, the mao's breed selecting should be more strict for wine production only. For the technical production, the cooperative should be applied the traditional local wisdom such as maintenance and insecticide. For the instrument, the cooperative should develop for the good taste of wine and also saving time, labor, and budget at the same time. For the community economy, the cooperative have to focus on the members as the most important factor of the organization. All members need to have the role in every stage of wine production. This suggestion is not only for the delighted result, but also for encouragement all members in the group. For the salesmanship, the consumers should taste each sort of Thai Blueberry wines for making decision, the public relations should highlight more the media that all consumer can reach easily. For quality check, the Thai Blueberry wine production should be verified by both state agency and individual institute to ensure that whole stages are qualified. For the tendency of permanence, the Thai Blueberry wine should be promoted and supported from both state agency and individual institute in many aspects such as budget, instruments, technology, and package. All are the ways to improve and develop our signature product in the northeast of Thailand that may be get the chance to distribute it abroad in the future. This not only for an economic security and cooperation of the country, but also make the stability for the communities and Isan people too.

Keywords: Local Knowledge, Thai Blueberry (Mao), Wine, Community Economy

Implementation of Good Agricultural Practice among Rice Farmers in Eastern Region of Bangkok, Thailand

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Good Agricultural Practice (GAP) for rice in Thailand is an important measure in order to significantly promote and encourage the quality of rice standards. Recently, the government launched GAP to produce and encourage farmers to implement GAP in their farming. Ladkrabang district located in the eastern region of Bangkok is the third largest rice production area of Bangkok, Thailand. The implementation of GAP in this area accounted for only one-fourth of the total rice farmers. Therefore, the objectives of this study were 1) to investigate farmers' implementation on GAP of rice production in eastern region of Bangkok, and 2) to identify factors influencing farmer's implementation of GAP. The data were collected using semi-structured questionnaires. Purposive sampling was employed to select 230 sample farmers covering five sub-districts of Ladkrabang, Bangkok, Thailand from July to August 2016 for the cropping year 2015-2016. Descriptive statistics, mean and standard deviation were used to analyze farmers' socio-economic characteristics. In addition, binary logistic regression was employed to identify factors influencing GAP implementation. The findings revealed that farmers had the highest GAP implementation (0.98) on the "application of pesticide" and the lowest (0.23) on the "water source". The results of binary logistic analysis indicated that the level of education of the household, farmer-owned farmlands, and membership of farming organizations significantly influenced on GAP implementation for rice production. The results from this study provided information for related organization to encourage farmers to improve their rice farming practices in accordance with the GAP for better quality of rice production.

Keywords: Rice farmer. GAP, Good Agricultural Practice, Ladkrabang, Eastern Region of Bangkok

Philippine Ethnobotanicals Show Antifungal Activity Against *Candida albicans*, The Causative Agent Of Candidiasis

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Ethnobotanicals used by the Igorot community of Imugan, Nueva Vizcaya, Philippines were tested for its antifungal activity against *Candida albicans,* a persistent fungus infecting humans. Candidiasis is a major health issue and is one of the most frequently hospital-acquired infection globally. Three concentrations of 1250, 750 and 250 ug/ml of ethanol extracts of *Ayapana triplinervis* (Vahl.) R. M. King & H. Rob., *Ageratina adenophora* (Spreng.) R. M. King & H. Rob, *Pittosporum pentandrum* (Blanco) Merr., *Bidens pilosa* L., *Sacandra glabra* (Thunb.) Nakai, *Cestrum nocturnum* L., Lipang daga (local name), *Alstonia scholaris* (L.) R. Br., *Oreocnide trinerevis* (Wedd.) Miq. and *Derris Elliptica* Benth were subjected to disc diffusion assay using corn meal agar against *C. albicans*. Results showed that the ethanol extracts of *Ageratina adenophora, Bidens pilosa* and Lipang daga (local name) showed antifungal activity with Lipang daga having the highest fungicidal activity against *C. albicans*. The prevalent antifungal activity of these plants can be tapped for possible elucidation of antifungal agents that may be used for the development of a natural fungicide.

Cost and Return on Investment of Season Cropping and Off-season Cropping of Mangosteen, the Economic Fruit Crop in Nakhon Si Thammarat.

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Mangosteen, economic fruit crop in Nakhon Si Thammarat Thailand can be produced both in season and off- season. Research on cost and return on investment of in season cropping and off-season cropping of mangosteen, economic fruit crop in Nakhon Si Thammarat was done to survey general economic and social aspects; and compare the financial cost and return between season cropping and off-season cropping of mangosteen. The data was collected from 15 sampled farmers of each both population. The result showed that the most farmer was male. The most of them were the older than 60 years. For education level, the major of them were primary school. The most of farmers grow mangosteen "local cultivar" The financial analysis revealed that the cost in season production was 55,415.83 USD/hectare which conducted the fixed cost of 780.23 USD/hectare (1.41%) and the variable cost of 54,635.60 USD/hectare (98.59%). The income was 128,121.38 USD/hectare with net profit 72,705.55 USD/hectare. Net profit to cost ratio was 131.20%, net profit to sales ratio was 56.75%. While the cost of off -season production was higher than on season production of 57,904.22 USD/hectare which the fixed cost of 812.74 USD/hectare (1.40%) and the variable cost of 57,091.47 USD/hectare (98.60%) The income was also higher 244,173.26 USD/hectare with net profit 186,269.04 USD/hectare. Net profit to cost ratio was 321.68%, while net profit to sales ratio was 76.29%.

Keyword: cost and return, income, season cropping, off-season cropping

Diversity and Evenness of Mangrove trees in Thasala, Sichon and Pakpaneang District, Nakhon Si Thammarat Province, Thailand

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Diversity and evenness of mangrove trees in Thasala, Sichon and Pakpaneang district, Nakhon Si Thammarat province, Thailand. The field study of mangrove trees in each district was conducted from December, 2016 to June, 2017. The surveying of this study was used the Line Transect method in the scope of area 50 x 200 meters for each district (station).The analysis of data was used the formula $H = -\sum^{s} (pi) (\log_2 pi)$ and $E = H / H_{max}$ for evaluating the diversity

and evenness of mangrove trees. The result showed that the diversity and evenness of mangrove trees in Thasala, Sichon and Pakpaneang district were found 29 species and 18 families. The most abundance are *Avicennia alba* BL (31.05%), *Bruguiera cylindrical* L. (27.12%) and *Rhizophora apiculata* Blume (9.30%), respectively. The result showed that the diversity and evenness the kind of trees were found 16 species and 6 families, the kind of shrub was founded 8 species and 7 families, the kind of ground cover was founded 4 species and 4 families and the kind of climbing were found 1 species and 1 family. The diversity indices of this study were shown in Thasala, Pakpaneang and Sichon district are 0.76 0.54 and 0.47, respectively. The evenness indices of this study was shown in Thasala, Sichon and Pakpaneang district are 0.14 0.13 and 0.11, respectively.

Keyword: diversity, evenness, mangrove trees, shrub, ground cover, climbing

Toxicological, Phytochemical and Antioxidant Activity Evaluation of *Nemalionopsis shawii* Skuja from Thailand

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The freshwater red alga *Nemalionopsis shawii*, is attached on the rocks in shallow stream located various places in Thailand. However, no pharmacological studies have been carried to investigate the toxic for local people consumer. Therefore, the objectives of the study were to examine acute toxicity, total phenolic, flavonoid contents and antioxidant activity. The crude extracts were tested for 3 models of antioxidant activities, total phenolic content (TPC) and flavonoid contents were investigated by using Folin-Cioealteu and colorimetric aluminum chloride assays, respectively. Acute toxicity was tested with a single oral administration of the extract at a dose of 2 and 5 g kg^{-1} body weight. Mortality, behavior, amount of food intake, body weight, and any abnormalities of the visceral organs, were observed. The extract caused neither mortality, nor abnormalities. The *Nemalionopsis shawii* extracted shown the antioxidant activities in all models. The highest TPC, flavonoid, DPPH were in ethyl acetate (20.967 $\pm$ 0.677 mg GAE g^{-1} extract, 58.326$\pm$0.857 mg QE g^{-1} extract and IC_{50} = 0.408$\pm$0.025 mg mL^{-1}). This results suggest that this algae possess antioxiant potential which could be considered for future applications in dietary supplements or cosmetics industries.

Key words: freshwater red algae, toxicity, antioxidatant activity

Microorganism Degrading Rock Phosphate and Potassium Feldspar to Produce Biofertilizer for Organic Crop Production

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Rock phosphate and potassium feldsopar are degraded by treating the enzymatic fungi eg., *Penicillium* sp., *Asperigullus* sp., and *Chaetomium* sp. Results showed significantly greater in available phosphorous and potassium than the non-treated control over 200 %. It is concluded that bio-fertilizer with hign P and high K can be developed as the agricultural inputs for organic crop cultivation.

Quorum Sensing Inhibition of Ethnobotanical Ethanolic Extracts of Imugan, Nueva Vizcaya in *Pseudomonas aeruginosa* Biotech 1335 and *Staphylococcus aureus* Biotech 1582

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The quorum sensing inhibition (QSI) capability of ethanolic extracts of selected ethnobotanicals against *Pseudomonas aeruginosa* BIOTECH 1335 and *Staphylococcus aureus* BIOTECH 1582 was evaluated using virulence factors:

swarming motility and pyocyanin assay for *P. aeruginosa* BIOTECH 1335; α-hemolysin assay and DNase assay for *S. aureus* BIOTECH 1582. Ethnobotanicals from Imugan, Sta. Fe, Nueva Vizcaya used in the study included *Bidens pilosa* L., *Cestrum nocturnum* L., *Sarcandra glabra* (Thunb.) Nakai, *Oreocnide trinervis* (Wedd.) Miq., *Pittosporum pentandrum* (Blanco) Merr., Lipang-daga, *Derris elliptica* Benth., *Alstonia scholaris* (L.) R. Br., *Ageratina adenophora* (Spreng.) R. M. King and H. Rob and *Ayapana triplinervis* (Vahl) R. M. King and H. Rob. The ethanolic extracts were subjected to antibacterial testing before proceeding to assays on the phenotypic expression of virulence factors for each bacteeria. Only the ethanolic extracts of *P. pentandrum* and *B. pilosa* showed antibacterial activity against *P. aeruginosa* BIOTECH 1335 and *S. aureus* BIOTECH 1582 qualifying the rest for the virulence assays. All extracts had QSI in swarming motility while *O. trinervis, C. nocturnum* and *A. triplinervis* revealed QSI in pyocyanin assay of *P. aeruginosa* BIOTECH 1335. All extracts exhibited QSI in α-hemolysin assay; whereas *C. nocturnum, O. trinervis* and *A. triplinervis* displayed QSI in DNase assay of *S. aureus* BIOTECH 1582.

Keywords: Quorum Sensing Inhibition (QSI), *Pseudomonas aeruginosa*, *Staphylococcus aureus*, Virulence Factors

Webanalytics on Organic Agriculture Websites and Their Online Community

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This study was conducted to evaluate the websites and their online community on organic agriculture to have a better idea on the digital traffic and engagement. The Google search engine was used to search for organic agriculture websites. The top global and Asian organic agriculture website were all based on search results from Google.com. The term used in the search were *organic agriculture website* and Wikipedia, online dictionary, web directories, general online journals, personal blogs, agriculture eco-tourism sites, and e-commerce sites were excluded. Only English sites and those with English versions were included in the search. Free tools were used to gather available data and these were www.google.com, www.alexa.com, www.similarweb.com, and www.semrush.com.

Majority among the top ranked websites were classified as government and organization and the rest were economic institution and education websites. More websites originated from Europe and the rest from Asia and from United States. The domain age ranged from oldest of 24 years to newest of 2 years with mean average of 15.14 years; page authority ranged from 1 to 84. The Domain authority had a wide range of one to 100 but 90 percent had scores above 50. The websites were considered competitively low to medium searches with low popularity. In terms of demographics of the online community, they majority of them were male with graduates school level of education and accessed websites from work and home. Most of the online community came from India, United States and United Kingdom and the rest were from Nigeria, China, Canada, Germany, Japan, Philippines, Netherlands, Australia and Turkey. Unlike the Online Community on Google, the social media, like Facebook, is dominated by accounts from Asia. Results may imply that the websites were functional for information seekers but need to reach out to more stakeholders to be more engaging and popular in the global scenario.

Keywords: Organic Agriculture, web metrics, websites, google, online community

Business Development Support to Agri Drone Group (RF)

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