

## FOREWORD

Association of Agricultural Technology in Southeast Asia (AATSEA) is non profitable organized which the aim to support agricultural societies to meet the sustainable development goals (SDGs) and has been organized International Conference on Integration of Science and Technology for Sustainable Development (ICIST) since 2011 which starting from Thailand to Laos, Vietnam, Myanmar, Philippines, Indonesia, China and this time is being in Thailand.

The ICIST Organizing Committee welcome all participants to the 9<sup>th</sup> International Conference on Integration of Science and Technology for Sustainable Development held at Faculty of Agricultural Technology, King Mongkut's Institute of Technology Ladkrabang, Bangkok, Thailand in 19 November 2021.

AATSEA concerns the recent advanced research and progress development in science and technology with the theme "Soil, water and environmental conservation, biological diversity, food safety, food security, and sustainable agriculture" in this year.

Due to COVID19 situation worldwide has still distributed epidemically. We agree to organize the 9th ICIST 2021 as online presentation through Webinar-zoom. All participants request to present their research through the recorded presentation with MP4. This is to avoid the interrupted internet during presentation time. The full texts must be evaluated by of peer review to publish either in conference proceedings or International Journal of Agricultural Technology (IJAT) indexed in SJR-Scopus, Q4.

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 science and technology in agriculture is needed to build up the sustainable development goals (SDGs) 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 be explored various topics as following oral sessions: Organic Agriculture and Related Fields, Microbial technology, biodiversity and food technology, Animal, Fishery Sciences and related fields, Entomology and related fields, Agricultural Sciences and biology, Environmental science, agricultural education and development, Advanced Research in Agricultural and Biological Sciences for Sustainable development goals (SDGs), Advanced Research in Biological Agriculture, and Advanced Development in Agricultural Sciences.

This year, there will be 10 plenary and keynote speakers, 206 oral presentations from 22 countries. The 9th ICIST 2021 are organized by Association of Agricultural Technology in Southeast Asia (AATSEA), Faculty of Agricultural Technology, King Mongkut's Institute of Technology Ladkrabang, KMUTL (Thailand), Bengkulu University (Indonesia),

General Incorporated Association for the Promotion of Self-reliance in Asia (GIAPSA, Japan), Bio-Agritech Co Ltd (Vietnam), CGC organic coffee (Laos), Shwe Bio Hi-tech (Cambodia), Kant Kaw, SKK (Myanmar), Society for Applied Biotechnology (India), Rajamangala University of Technology Tawan-ok, Chantaburi Campus (Thailand), Rambhai Barni Rajabhat University (Thailand) and CAS Asian Agriculture Bio Engineering (PR China). AATSEA committee would like to give special thanks to all co-organizers who has been constantly supported our activities and be hosted our conference.

Academicians, researchers, policy makers as well as extension experts who contributed their expertise, experiences and research results to this conference. May the book of abstracts and proceedings provide useful information and serve to be references for those who are interested in the specific discipline.

Finally, We would like to thanks to all organizing committee, agencies, speakers, participants and to whom it may concerns in this conference to be successfully managed. Hopefully all of you will continue to support AATSEA activities to build up and sacrifice work to the society in the future.

**Kasem Soyong**

**President, AATSEA**

## **Welcome Address**

**by**

Hiroyuki Konuma (Ph.D.); Executive Director of GIAPSA (and former UN/FAO Regional Representative for Asia and the Pacific and former Professor of Meiji University, Japan). Dr. Kasem Soyong, President of AATSEA and the Organizer of 9th ICST 2021, Dr. Thogchai Putthongsiri, Dean of Faculty of Agricultural Technology, King Mongkut's Institute of Technology, Ladkrabang (KMUTL). Distinguished Guests, Participants, Ladies and Gentlemen, I have the honor to welcome you all to the 9th International Conference on Integration of Science and Technology for Sustainable Development 2021. Despite of various constraints and disadvantages associated with New Coronavirus pandemics, I can see over 200, indeed, so many scientists from 24 countries registered for participation and ready for making presentations during this conference. This is something like a miracle. I never thought such a hug number of participants.

In this connection, I wish to express my sincere gratitude to Dr. Kasem and his able staff for the preparation. My special thanks goes to the Faculty of Agricultural Technology, King Mongkut's Institute of Technology, Ladkrabang which has kindly hosted this conference venue. I wish to acknowledge my deep gratitude to the members of organizing committee for their contributions, all co-organizers and co-sponsors for their valuable support, all participants for their interest, commitments and active participation, and all those who provided valuable support for the successful organization of this event today.

Ladies and gentlemen, As you are aware, when it started 6 years ago, we have committed to achieve Millenium Development Goals (MDGs) by 2030. Now, we have only 9 years left to reach the deadline. Yet, there are little progress in many cases nor in some cases, the situation is actually worthening. SDG goal No. 2 that is to ending hunger, food insecurity and all forms of malnutrition by 2030, is not an exception. We are facing increased number of conflicts and civil wars, negative impacts of climate changes, and worthening the impacts of natural disasters including infectious diseases such as Covid-19.

COP26 held recently reminded us that there would be increased frequency of extreme weather events towards year 2100, if we do not keep average global temperature increase at 1.5 Degrees Celsius or below from pre-industrial levels. Yet, contrary, we may face an increase of 2.4 Degrees Celsius by year 2100, if we continue with present pace of greenhouse gas emission. Can you imagine how many extreme weather events such as droughts, floods, cyclones, etc., might occur and how they would negatively impact our agriculture and food security. UN estimates that nearly 690 million global undernourished (hungry)population existed in early 2020 would have increase by 132 million to 822 million by the end of same year (16 % increase in one year), and acutely food insecure people, or people at a risk of starvation, would have increased from 149 million in early 2020 to 271 million in November 2020 (nearly 50% increase in one year) due to Covid-19 pandemics. Indeed, it affected seriously in food systems such as transport and marketing, high food production cost and food price increase, agricultural labor shortage, etc., while purchasing power of people especially those living in urban

areas declined considerably. It also created widening the gap and inequality between those who lost jobs and negatively affected by COVID19, and those who didn't.

In addition, we should not forget that we have been experiencing various constraints and uncertainties in food production and food security, such as the stagnation of expansion of arable lands, increasing scarcity of water resources, stagnation of crop productivity growth, loss of bio-diversity, high food losses and waste, and negative impacts of natural disasters and climate changes, while as United Nations FAO predicted that global food production needs to be increased by 49% by the year 2050 from the level in 2012 to meet increasing population and food demands at that time. FAO also stated clearly that almost all (nearly 90 %) of food production increase is expected to come from existing arable lands by yield increase through harnessing agricultural research and improved farm management technology. If we are unable to achieve this challenging goal, the world, especially the people in food deficit developing countries would face serious food shortage and starvation, and the world security and stability would be seriously jeopardized. Indeed, it is science and technology which have a solution to solve our future problems. This includes meeting the challenges of Covid-19 and global warming. We all should recognize that "Science and technology" are such an important sector which would play a key role in feeding the future world and ensuring world peace and stability.

In this occasion, I wish to congratulate our researchers and scientists, including young researchers who are present today and who have committed to contribute in research, science and technology as a professional carrier towards achieving sustainable development of the world.

Ladies and Gentlemen, Overall, with the combination of serious impacts caused by Covid-19 pandemics and slow progress in reducing greenhouse gas emissions, it is safe to say that we are facing unprecedented multi-dimensional challenges combine by different factors, It is the time for research, science and technology in harnessing their role. They must be integrated and play an inter-sectoral approach with increased investment, collaborative research and concerted efforts among all actors including those from governments, academic/research institutions and private sectors. This international conference organized every year, brings all actors together, reaffirm the importance of wider-range of collaboration and joint efforts. Thank you Dr. Kasem for your dynamic leadership and tireless efforts.

Before closing, I wish to thank all participants in joining this important gathering, and I will look forward for a successful deliberations and outcomes.

**Thank you.**

**Hiroyuki Konuma**

**Executive Director of GIAPSA**

### **Opening address**

Dear All participants, On behalf of Faculty of Agricultural Technology, King Mongkut's Institute of Technology Ladkrabang (KMITL), Bangkok, Thailand, I wish to welcome all participants for participating the 9<sup>th</sup> International Conference on Integration of Science and Technology for Sustainable Development (ICIST) in 19 November 2021. I know that the ICIST has been organized every year in many countries eg. Laos, Vietnam, Myanmar, Philippines, Indonesia and China.

This year, it is very good opportunity to our faculty to be hosted this conference together with Association of Agricultural Technology in Southeast Asia (AATSEA), Faculty of Agricultural Technology, King Mongkut's Institute of Technology Ladkrabang, KMITL (Thailand), Bengkulu University (Indonesia), General Incorporated Association for the Promotion of Self-reliance in Asia (GIAPSA, Japan), Bio-Agritech Co Ltd (Vietnam), CGC organic coffee (Laos), Shwe Bio Hi-tech (Cambodia), Kant Kaw, SKK (Myanmar), Society for Applied Biotechnology (India), Rajamangala University of Technology Tawan-ok, Chantaburi Campus (Thailand), Rambhai Barni Rajabhat University (Thailand) and CAS Asian Agriculture Bio Engineering (PR China).

The conference organizes thru online presentation in Webinar-zoom with the theme of the conference is "Soil, water and environmental conservation, biological diversity, food safety, food security, and sustainable agriculture".

I welcome all participants from 23 countries with 10 keynote speakers and 206 oral presentation in 11 sessions to be successfully organized. I would like to thanks to all co-organizers, organizing committee, keynote speakers, oral presenters and participants to join 9th ICIST2021.

Finally, I am very much appreciated for further collaboration to develop science and technology in agriculture with our faculty in the future, and hopefully the 9<sup>th</sup> ICIST 2021 will successfully managed. Thank you very much and stay with good health.

**Thogchai Putthongsiri,**  
**Dean of Faculty of Agricultural Technology (FAT),**  
**KMITL**

## 9<sup>th</sup> ICIST 2021

Organized by

Association of Agricultural Technology in Southeast Asia (AATSEA), Faculty of Agricultural Technology, King Mongkut's Institute of Technology Ladkrabang, KMUTL (Thailand), Bengkulu University (Indonesia), General Incorporated Association for the Promotion of Self-reliance in Asia (GIAPSA, Japan), Society for Applied Biotechnology (India), Bio-Agritech Co Ltd (Vietnam), Bio Hi-tech (Cambodia), CGC organic coffee (Laos), Shwe Kant Kaw, KKS (Myanmar), Rajamangala University of Technology Tawan-ok, Chantaburi Campus (Thailand), Rambhai Barni Rajabhat University (Thailand), CAS Asian Agriculture Bio Engineering (PR China),

### International Advisory Committee

Chairman: Prof. Dr. Hiroyuki Konuma (Japan)

Vice Chairman: Prof. Dr. Teodoro C. Mendoza (Philippines) and Prof. Dr. Thanuku Samuel Sampath Kumar Patro (India)

#### Committee

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Prof. Dr. Somdej Kanokmedhakul (Thailand)

Assoc. Prof. Dr. Danesh, Y.R. (Iran)

Prof. Dr. Thangadurai Devarajan (India)

Prof. Dr. John C. Moreki (Botswana)

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Prof. Dr. Wafaa Haggag (Egypt)

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Dr. Samantha Chadranath karunarathna (Sri Lanka)

Thet Lwin Htay (Myanmar)

Jame Kernard Jacob (Philippines)

Dr. Houngh Pham (Vietnam)

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Vice-chairman: Assoc. Prof. Dr. Kasem Soyong (AATSEA), Asst. Prof. Dr. Tongchai Putthongsiri (KMUTL), Asst. Prof. Waigoon Thongaram (RBRU), Dr. Jatuporn Aroonkamonsri (RMUTTO), Prof. Dr. Ridwan Nurazi (University of Bengkulu), Mr. Jun Zhao (CAS, China), Prof. Dr. Thangadurai Devarajan (SAB, India), Mrs. Hai Hoang (BioAgritech, Vietnam), Mr. Thet Lwin Htay (Shwe Kant Kaw, Myanmar), Mr. Young Ah Choi (CGC organic coffee, Laos).

#### Committee

Prof. Dr. Moammar Dayoub (Finland)

Prof. Dr. Robert McGovern (USA)

Prof. Dr. Jin-Cheol Kim (Korea)

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Prof. Dr. John Moreki (Botswana)

Prof. Dr. Somdej Kanokmedhakul (Thailand)

Prof. Dr. Nanik Setyowati (Indonesia)

Prof. Dr. Younes Rezaee Danesh (Iran)

Dr. Huyly Tann (Cambodia)

Prof. Dr. Okigbo, Raphael (Nigeria)

Dr. Md. Asaduzzaman Sarker (Bangladesh)

Dr. Somlit Vilavong (Laos)

Dr. Gopi Krishnan (India)

Dr. Hoang Pham (Vietnam)

Edison Chen (Vietnam)

Dr. Jiaojiao Song (China)

Beletskiy Sergey (Russia)

Vojtech Fojtych (Czech Republic)

Prof. Dr. Vadim Fedorov (Russia)

Chen Yi Sung (Taiwan)

Dr. Nguyen Van Thiep (Vietnam)

Maxim Mitrokhin (Russia)

Prof. Dr. Oksana Belous (Russia)

### Local Organizing Committee

**Chairman:** Assoc. Prof. Dr. Kasem Soyong (Thailand)

**Vice-chairman:** Prof. Dr. Somdej Kanokmedhakul

### Committee

Asst. Prof. Dr. Wattanachai Pongnak (KMUTL)

Assoc. Prof. Dr. Pakkapong Pongnak (KMUTL)

Assoc. Prof. Dr. Wichai Supalucksana (AATSEA)

Asst. Prof. Dr. Phitraporn Soyong (BU)

Assoc. Prof. Dr. Supattra Poeaim (KMUTL)

Asst. Prof. Sampan Promhom (RMUT, Srivijaya)

Assoc. Prof. Dr. Adisak Singseewo (MSU)

Assoc. Prof. Dr. Anurug Poeaim (KMUTL)

Prof. Dr. Kwanjai Kanokmedhakul (KKU)

Assoc. Prof. Dr. Rungtawan Yomla (KMUTL)

Asst. Prof. Dr. Bancha Wiangsamut (RMUTTO, Chantaburi)

Asst. Prof. Dr. Naruemon Mongkontanawat (RMUTTO, Chantaburi)

Asst. Prof. Dr. Preeyanan Sittijinda (RBRU)

Asst. Prof. Dr. Terdsak Puramongkon (RMUTTO, Chantaburi)

Assoc. Prof. Dr. Teerawat Sarutayophat (KMUTL)

Asst. Prof. Dr. Jakrapan Wongpa (RBRU)

Assoc. Prof. Dr. Komkhae Pilasombut (KMUTL)

Asst. Prof. Dr. Nonglak Parinthewong (KMUTL)

Asst. Prof. Dr. Sarayut Phonpho (KMUTL)

Assoc. Prof. Dr. Kamronwit Thipmanee (KMUTL)

**General Secretariat:** Dr. Jiaojiao Song (China), Dr. Rujira Tongon (Thailand)

**Vice-General Secretariat:** Ms. Rungrat Vareeket (Thailand)

**Master of ceremony (MC):** Asst. Prof. Dr. Jakrapan Wongpa, Dr. Wanlada Klangnurak

**Financial management:** Dr. Rujira Tongon (Thailand)

**Food & Coffee break, reception:** Ms. Rungrat Vareeket (Thailand), Mr. Pheaktra Phal (Cambodia)

**Proceedings and souvenirs:** Dr. Rujira Tongon (Thailand)

### Audiovisual, Photographer, IT and Session Convenors:

Mr. Akkharat Jantub

Mr. Sarayos Puangkrasear

Mr. Piyawat Srisawat

Mr. Attasit Wattanakitpisan

Mr. Komgrich Khamsor

Mr. Pisit Vinichchayakul

Ms. Pimpaphada Kerdyoo

Ms. Wanna Sakulnee

Ms. Potchawan Dongyang

Mr. Sathid Duangkaew

Mr. Athipu Mongkolkachit

Mr. Nares Srijad

Mr. Noraset Yimprasert

Mr. Manop Vandee

Mr. Sommart. Yoosukyingsataporn

**Oral Session:** Dr. Jiaojiao Song (China), Dr. Rujira Tongon (Thailand)

## **Session Chair and co-chairpersons**

### **Plenary and Keynote Speakers**

Chair: Dr. Kasem Soyong

#### **Session 1**

Chair: Prof. Nanik Setyowati (Indonesia)

Co- Chair: Dr. TSSK Patro (India), Dr. Bancha Wiangsamut (Thailand), Dr. Lampan Khurpoon (Thailand), Dr. Teerawat Sarutayophat (Thailand)

#### **Session 2**

Chair: Prof. Mohamad Chozin (Indonesia)

Co- Chair: Prof. Lalitha, S. (India), Prof. Tatik Suteky (Indonesia), Dr. Suprattra Poeaim (Thailand), Dr. Nonglak Parinthawong (Thailand)

#### **Session 3**

Chair: Prof. Zainal Mukhtar (Indonesia)

Co- Chair: Dr. Sutisa Chaikul (RBRU), Dr. Duanrung Benjamas (RBRU), Dr. Anurug Poeaim (Thailand), Dr. Rungtawan Yomla (Thailand)

#### **Session 4**

Chair: Prof. Fahrurrozi Fahrurrozi (Indonesia)

Co- Chair: Dr. Ronachai Sitthigripong (KMUTL, Thailand), Dr. Bhutharit Vittayaphattananurak Raksasiri (SU), Dr. Yardrun Suwannarat (RBRU)

#### **Session 5**

Chair: Prof. Dwi Wahyuni Ganefianti (Indonesia)

Co- Chair: Dr. Chongko Saetung (RMUTTO), Dr. Gopi Krishnan (India), Dr. N. Emmanuel (India), Dr. Kamronwit Thipmanee (KMUTL, Thailand)

#### **Session 6**

Chair: Dr. Danilo Josue (Philippines)

Co- Chair: Dr. Teodoro C. Mendoza (Philippines), Prof. Dwatmadji (Indonesia), Dr. Kannikar Charoensuk (RMUTTO, Thailand), Dr. Komkhae Pilasombut (KMUTL, Thailand)

#### **Session 7**

Chair: Dr. Preeyanan Sittijinda (Thailand)

Co- Chair: Dr. Adisak Singsewo (Thailand), Dr. Phattraporn Soyong (Thailand), Joselito Dar (Philippines), Prof. Dr. Pakkpong Pongsuk (Thailand)

#### **Session 8**

Chair: James Kennard Jacob (Philippines)

Co- Chair: Prof. Somdej Kanokmadhakul (KKU, Thailand), Dr. Raphael Okigbo (Nigeria), Dr. Wanlada Klangnurak (KMUTL, Thailand), Rungrat Vareeket



### **Session 9**

Chair: Dr. Wikanya Prathumyot (RBRU)

Co- Chair: Prof. Sridhar Kandikere (India); Dr. Jatuporn Aroonkamonsri (RMUTTO); Dr. Somlit Vilavong (Lao PDR);  
Dr. Jiaojiao Song (China)

### **Session 10**

Chair: Dr. Naruemon Mongkontanawat (RMUTTO)

Co- Chair: Prof. Ivan Tarakanov (Russia); Dr. Nithya Priya (India); Dr. Rujira Tongon (Thailand)

### **Session 11**

Chair: Dr. Hoang ND Pham (Vietnam)

Co- Chair: Dr. Wichai Supalucksana (Thailand), Dr. Virapol Jamsawat, (Thailand), Dr. Pornpan Sukhumpinij (RBRU)

## **AATSEA Outstanding Achievement Awards 2021**

### **AATSEA Outstanding award in Education and Research**

**Assist. Prof. Dr. S. Lalitha (India)**



Department of Botany, Periyar University, Alem, Tamilnadu., India.

She has focused on the development of microbial inoculants for biologically controlling plant diseases and for enhancing crop growth. Her experience in Plant Pathology, Microbiology, Microbial Ecology and Biological Control of Plant Disease spans over 20 years including the advanced technology-supported research on *Bacillus*, *Pseudomonas* and *Trichoderma* spp. as PGPR on vegetables, cereals, fruits and forests, induced systemic resistance, mechanisms of biocontrol, plant-microbial interactions, etc. She have published over 42 papers in peer-reviewed international journals. She was the invited speaker in many countries to deliver keynote presentations. She is now acting as a reviewer for several international journals and local & international advisory committee member in conferences. Experience in modern teaching and good at use of modern technology for teaching and presents materials clearly to diverse audiences. She visited several national and international conferences and presenting important research findings and successful collaborations with other researchers. As microbial-derived products are poised to disrupt the agriculture industry, fundamental challenges remain in understanding the complexity of plant-soil microbial interactions, identifying microbial candidates amenable to fermentation and formulation on a large scale, demonstrating added value of a biologicals in an agrochemical dominated market and delivering a biological products into the hands of growers.

She received many national and international awards includes Smt Goman Devi Award and Best Women Scientist Award by Asian PGPR Society for Sustainable Agriculture. She is an significantly scientist to contribute to research, extension education and teaching missions.

## **AATSEA Outstanding award in Education and Research**

### **Prof. Dr. Pakkapong Pounsuk (Thailand)**



Work Address: Department of Agricultural Education, Faculty of Industrial Education and Technology, King Mongkut's Institute of Technology Ladkrabang (KMUTL), Chalongkrung Road, Ladkrabang, Bangkok, 10520 THAILAND

He has written the textbooks and teaching materials related to agricultural education, community development and environmental studies (Three in English and Five in Thai) (2007-Present). He wrote the English Textbooks named Issues and Problems of Rural Development in Thailand. Bangkok: Mean Service Supply Limited Partnership in 2010. The Selected Rural Development Programs and Projects in Thailand" in Battad, T.T., et al. 2003. Administration of Rural Development Projects. Central Luzon State University, Science City of Muñoz, Philippines. In 2010 he wrote English for Agricultural Extension and Rural Development Students. He has also wrote many Thai textbook in agricultural education. The Sustainable Development on Organic Agriculture in School and community, and a New Way of Agricultural Education for Sustainable Development His Research and academic articles related to agricultural education, environmental studies, environmental conservation, organic farming, food promoting health care, and community development including 70 issues are at the international level and 59 issues are at the national level from 2007 to Present.

His academic services are served as Academic Council Committee, Surindra Rajabhat University (2018-Present), Organic Inspector, Association of Agricultural Technology in Southeast Asia (AATSEA), External Graduate Special Lecturer, Mahasarakham University (MSU), National Institute of Development Administration (NIDA), Maejo University (MJU), Ubon Ratchathani Rajabhat University (URBU), Visiting lecturer at: Maejo University (MJU), Mahasarakham University (MSU), National Institute of Development Administration (NIDA), Nakhon Phanom University (NPU), Surindra Rajabhat University (SRU), Buriram Rajabhat University (BRU), Mahasarakham Rajabhat University (RMU), Ramphaiabarnni Rajabhat University (RBRU), Songkhla Rajabhat University (SKRU), and Rajamangala University of Technology Phitsanulok (RMUTL), Visiting lecturer abroad at: Central Luzon state University, Philippines (CLSU); Northern Agriculture and Forest College, Department of Personnel and Organization, Ministry of Agriculture and Forestry, Laos PDR.; Champasak Technical Vocational College, Laos PDR. He has appointed to be Journal Editorial Boards: International Journal of Agricultural Technology (IJAT), Association of Agricultural Technology in Southeast Asia (AATSEA), Journal for the Agriculture, Biotechnology and Education (JABE), International Journal of Education and Development Studies (CLSU), Journal of Vocational Institute of Agriculture (JVIA), Journal of Industrial Education (JIE), Nakhon Phanom University Journal (NPUJ), Creating an international journal and national journal to provide a

platform for agricultural academics agricultural educators, community and rural developers, agricultural extension workers and related area, External assessment staff at the vocational level (2008-Present), Internal quality education assessment staff at the higher education level (2012-Present), Sufficiency economy school advisor, Huay Hin Lub School, Namnang district, Phetchaboon province, Advisor of School Agricultural Learning Center (SALC) to promote model of organic agriculture in school and community as follows: Living Agricultural Learning Center, Phaibueng Wittayakom School, Phaibueng district, Srisaket province, Ban Huai Suea School, Thong Pha Phum district, Kanchanaburi province, Ban Pom Prachanukul School, Khiri Mat district, Sukhothai province, Ban Dong Salao School, Dan Chang district, Suphan Buri province, Sanamchaikhet School, Sanam Chai Khet district, Chachoengsao province, , Sirirachanusorn School, Mueang district, Sa Kaeo province, Phrae Panyanukul School, Mueang district, Phrae Province. ZHe has also appointed to be Trailblazer and advisor “Development Volunteers and Community Forest Reforestation Camp” (1996-2016), Trailblazer and advisor “Agricultural Teacher Student Trait Development Camp of Agricultural Education Club Volunteer for Development” (2007-Present), Trailblazer on development and advisor of School Agricultural Learning Center based on the learning integration of agricultural education, organic farming, community development, and environment (2007-Present), Advisor of the sufficiency economy school project based on the integration of education for the community (2012-Present).

## AATSEA Outstanding award in Community Development

### Mr. Ruangsak komkhuntod Agricultural Scientist (Breeder) Thailand



The world would never forget him for development of new hybrid varieties of *Annona*, Germplasm Collection and Selection of Sugar apple, Atemoya and *Annona* Hybrids. His special selection techniques is unique for Hand Pollination on Fruit set of Sugar apple and Atemoya for Breeding, Development of Production Technology for Sugar Apple and *Annona* Hybrids, The Propagation of Petch Pakchong cv. (*Annona* Hybrid ) by Grafting, Status of Sugar Apple and *Annona* Hybrids Production in Pakchong District, Nakhon Ratchasima Province, Thailand, Germplasm Surveying Collection and Identification of Sugar Apple and *Annona* Hybrids in Thailand, Selection for Superior Growth, Yield and Fruit Quality of Sugar Apple and *Annona* Hybrid Cultivars in Pakchong Research Station, Production System of *Annona* Hybrid cv. Petch Pakchong in Nakhon Ratchasima and Saraburi Province, Characteristics of Sugar Apple and *Annona* Hybrid cv. A0013, B0003, C0001 and D0005 , Guidelines for Implementing GAP for Sugar Apple and *Annona* Hybrids Production in Pakchong District, Nakhon Ratchasima Province, Fruit Development of *Annona* Hybrid cv. Petch Pakchong , Postharvest Changes of *Annona* Hybrid Fruit cv. Petch Pakchong, Harvesting Indices of *Annona* Hybrid Fruit cv. Petch Pakchong, Propagation Procedure of *Annona* spp. at Pakchong District, Nakhon Ratchasima Province, Grading Evaluation of Sugar Apple Fruits, Tamarind Breeding Program, Germplasm Collection and Selection of Tamarind (*Tamarindus indica* Linn.) Program , Superior Growth and Yield of Tamarind (*Tamarindus indica* Linn.) Cultivars at Pakchong Research Station, Nakhon Ratchasima Province . He has appointed to be Head of Training and Technology Transfer Program (Plant Propagation), Head of Training and Technology Transfer Program of Inseechandrastitya Institute for Crops Research and Development. He has released and contributed the New Cultivars of Sugar Apple as follows:-Petch Pakchong, Nue Thong, Pakchong 46, Pakchong KU 1, Pakchong KU 2, Pakchong KU 3, Fai Khiew Kaset Nong Khiew Kaset 1, and Fai Khiew Kaset 2. Recently he has released the New Cultivars of Tamarind as follows:- G1 Hybrid ( Dok kinghuk X Pakchong 1 ), G2 Hybrid (Dokkinghuk X Pakchong 1), G3 Hybrid (Dokkinghuk X Pakchong 1), G4 Hybrid (Dokkinghuk X Pakchong 1) I1 Hybrid (Dokkinghuk X Fuktrong Ratchaburi) , Hybrid ( Dok kinghuk X Fuktrong Ratchaburi, Hybrid ( Dok kinghuk X Fuktrong Ratchaburi

## **AATSEA Outstanding award in Special Community Service**

**Prof. Dr. Thanuku Samuel Sampath Kumar Patro (India)**



His Field of specification in Plant Pathology. Present Position: Principal Scientist (Plant Pathology) & Head, ICAR-AICRP on Small millets, Agricultural Research Station, ANGRAU, Vizianagaram, A.P., India. He has worked hard to investigate new challenge research works in plant pathology, published 9 Text books on Millets, 25 Technical Bulletins and Folders, 203 Research Papers in NAAS rated International and national Journals, 105 popular articles on Millets. 57 Television Programs in Annadatha, Jaikisan in Etv., 25 radio talks, 17 Invited lectures on millets at Phillipines, USA, China, Indonesia, Srilanka, Thailand, Singapore, Nepal, Myanmar and Maldives, 82 Sessions Chaired as Chairman, Visited 18 Countries for Millets Promotion.

He received many International Awards: Award of excellence in Plant Pathology by SONGYANG Government, P.R. China in promoting organic agriculture for disease management, Outstanding leadership and community development award by Association of Plant Pathologists in SE Asia at 7th International Conference on Integration of Science and Technology for Sustainable Development held at Bali, Indonesia- 2018, EAES International Award for Environmental Agriculture-2018 at Maldives, Outstanding Scientist in Agriculture Award -2017 at 2nd International conference on Innovative approaches in applied sciences and technologies (iCiAsT-2017) during 19-23 june 2017 at Nanyang Executive Centre, Nanyang Technological University, Singapore, Innovative scientist of the year award-2015 at the International conference on Innovative approaches in applied sciences and technologies (iCiAsT-2016). Febraury 1-5, 2016 at Faculty of Science Kasetsart University, Bangkok, Thailand, Best Paper award in oral presentation at the International conference on Innovative approaches in applied sciences and technologies (iCiAsT-2016). Febraury 1-5, 2016 at Faculty of Science Kasetsart University, Bangkok, Thailand, Outstanding Scientist award-2016, at IJTA 3rd International Conference on Agriculture, Horticulture & Plant Sciences, New Delhi, India from 25th to 26th June 2016, Leading Scientist of the World- 2013 by International Biographical Society, Cambridge, England, Best Research Paper Award-2002 in Plant Protection and Taxonomy session at 14th International Annual Congress organized by University of Peradeniya, Sri Lanka, 20th- 21st November, 2002 for Doctoral degree research work in an oral competition, Best Research Paper Award-2000 in Genetic Engineering session at 12th International Annual Congress organized by University of Peradeniya, Sri Lanka, 16-17th November, 2000 for Master's Degree research work in an oral competition, Best Oral Presentation Award-2018 at Second international scientific conference on Environmental research: Issues, Challenges and Strategies for Sustainable Development and Livelihood Security held at the Maldives National university- 2018.

#### Identification of New reports/ diseases:

He has new recorded in sciences such as First time in India identified the “Top rot phase” of red stripe disease caused by *Acinetobacter baumannii* on Sugarcane crop (MTCC No.7618). Published as New Record in *Indian Phytopathology*, 59(4):501-502 (2006), First time in India identified the Banded Sclerotial Disease caused by *Rhizoctonia solani* on Sugarcane crop. Published as New Record in *Indian Phytopathology*, 59(3):373 (2006,) First time in India identified the Red spot of leaf sheath caused by *Mycorellosiella viginae* on Sugarcane crop. Published as New Record in *Journal of Mycology and Plant Pathology*, 37(1):117-118 (2007), First time in India identified the Banded Blight Disease caused by *Rhizoctonia solani* on Finger millet crop. Communicated as New Record in *Indian Phytopathology*, (2013), *HCIO No.46, 916*, First time in India identified the Smut Disease caused by *Melanopsichium eleusinis* on Finger millet crop. Published as New Record in *Indian Phytopathology*, 61 (1): 137 (2008), *HCIO No.46, 914*, First time in India identified the Rust Disease caused by *Uromyces eragrostidis* on Finger millet crop. Published as New Record in *Indian Phytopathology*, 61(1):137(2008), *HCIO No.46,915*.

He has contributed his research works in the Field application as follows:- Developed talc based formulation of *Trichoderma viride*, an endophytic strain for the management of Sugarcane red rot caused by *Colletotrichum falcatum* Went and this has been using as a protective bio agent in red rot prone areas in susceptible varieties like Co C 671. The efficiency of *Pseudomonas fluorescence* as a seed treatment (0.6%) and foliar spray (0.6%) for blast management of finger millet was established. This treatment went as a recommendation to farmers on All India basis during AICRP small millet workshop. Identified the etiology of sugarcane rust Pathogen *Puccinia erianthi* Padwk. and the specimen was deposited at *Herbarium Cryptogamae Indiae Orientalis* (HCIO No. 45,885), IARI, New Delhi and rust scale was developed for scoring Sugarcane rust disease. Published in *Proceedings of Global Conference-II, held at MPUAT, Udaipur, Rajasthan from 25-30 November, 2005* organized by *Indian Society of Mycology and Plant Pathology*. He has contributed in Soil application of *Pseudomonas fluorescens* + *Trichoderma viridi*+ *Bacillus subtilis* for management of banded blight of all the millets (finger millet, foxtail millet, kodo, little, proso and barnyard millet) was established. This treatment went as a recommendation to farmers on All India basis.

## **AATSEA Outstanding award in Special Community Service**

### **Prof. Younes Rezaee Danesh (Iran)**



Address: Soil, Fertilizer and Water Resources Central Research Institute, Ankara, Turkey, Department of Plant Protection, Faculty of Agriculture, Urmia University, Iran

Prof. Younes Rezaee Danesh received his first class BSc degree in 1996 at the Ferdowsi University in Mashhad, Iran, which was followed by successfully obtained first class MSc (1999) and PhD (2007) degrees from the Tarbiat Modares University, Tehran, Iran. His scientific career developed further rapidly at the Department of Plant Protection, Faculty of Agriculture, Urmia University, where he started as Assistant Professor in 2006, which was followed by appointments to Associate Professor (2013) and Professor (2016). He also acted as Research Vice-chancellor. Besides Urmia University, recently he is also affiliated to the Central Research Institute in Ankara, Turkey. The main scientific fields of interest of Prof. Danesh are mycology, plant pathology and biological control. His scientific results already established him in the international forefront of these research areas. He conducts his work with great diligence and came up with new, important results. His research interest focuses on symbiotic (mycorrhiza-, and mycorrhiza-like) as well as plant growth promoting fungi, with special emphasis on their application as eco-friendly agents for biofertilization, biostimulation and bioprotection of crop plants and for inducing plant resistance against different abiotic and biotic stresses. He has been working with various fungi including arbuscular mycorrhizal fungi, the mycorrhiza-like fungus *Piriformospora indica*, as well as potential biocontrol candidates from the genus *Trichoderma*. In Iran he firstly established a culture collection of plant growth promoting fungi. In the above mentioned research fields he has outstanding contribution to the application of science and technology to sustainable development. The work of Prof. Danesh played a key role in the successful and fast achievement of a series of projects. He has been initiating and coordinating a series of fruitful international collaborations with Iranian, Russian, Finnish, US, Chinese, Italian, Indian, Thai, Austrian, Turkish and Hungarian partners.

A long list of highly ranked international scientific publications (full articles in prestigious international journals, edited books and book chapters in high ranked publishers as well as abstracts and full texts of oral lectures and posters presented at international conferences) and nearly 600 citations of Prof. Danesh's work reflect a scientific research achievement of outstanding significance by a very well trained, skilful, perfectly organized and intellectually brilliant person with a successful scientific career. Prof. Danesh is also involved in the activities of scientific societies including



the Association of Agricultural Technology in Southeast Asia, the Asian Mycorrhizal Society, the Iranian Society of Plant Pathology, the International Symbiosis Society, as well as the Iranian Mycological Society where he is the head of the Symbiotic Fungi Research Section. He is acting as member of the Editorial Board in the Journal of Stored Products and Post-harvest Research, the International Journal of Agricultural Technology, the Journal of Soil Science and Environmental Management and the Journal of Agricultural Extension and Rural Development. During his career he received numerous “Best Researcher”, Best Scientist” and „Best Presentation” awards. His very intense education activities are reflected by the supervision of 30 MSc and PhD students.

## **AATSEA Outstanding Award for emerging leader of young generation**

### **Dr. Ramon Lorenzo Luis Rosa Guinto MD (Philippines)**



Doctor of Public Health Class of 2019, Harvard T.H. Chan School of Public Health

Website: <http://scholar.harvard.edu/renzoguinto>

LinkedIn: <https://ph.linkedin.com/in/renzoguinto>

He recently finished medicine at the University of the Philippines, and currently serve as Regional Coordinator for the Asia-Pacific of the International Federation of Medical Students' Associations (IFMSA), a global network of 1.2 million medical students. He was also recently appointed one of the members of the Youth Commission on Global Governance for Health, convened by the Lancet and the University of Oslo in collaboration with the Harvard Global Health Institute.

A Filipino physician with broad interests in global health and sustainable development, Dr. Ramon Lorenzo Luis “Renzo” Rosa Guinto is a third-year Doctor of Public Health (DrPH) candidate at the Harvard T.H. Chan School of Public Health. Currently, Renzo is based in the Philippines, conducting his doctoral thesis (known as Doctoral Engagement in Leadership and Translation for Action or DELTA Project) which focuses on building 'climate-smart' local health systems in the Philippines. For his DELTA Project, he is hosted by the Civika Asian Development Academy as a Planetary Health Innovation Fellow. At present, he is also a "Thought Leader" columnist for Rappler, the Philippines' largest online news organization, and is establishing PH Lab, a "glocal think-and-do tank" for generating innovative solutions for Philippine health, public health, and planetary health.

As a global health generalist in the business of translation, he is finding innovative ways to tackle some of the seemingly intractable health challenges through projects, discourses, and other initiatives – from building climate-smart health systems and cities and developing upstream strategies for combatting noncommunicable diseases, to strengthening regional health governance in Southeast Asia and promoting the health rights of migrants, to creating effective teams in public health settings and preparing countries for the next big epidemic. He has a diverse range of experiences in government, academia, private sector, and civil society at local, national, regional, and international levels.

While in Harvard, Renzo is president and founder of two organizations - the Sustainability & Health Student Forum at the Harvard Chan School, and the Harvard Chan ASEAN Student Organization; member of the university-wide Council of Student Sustainability Leaders; Associate Editor of the Harvard Public Health Review; co-convenor of the Teams for Health Study Group; researcher in the Climate, Energy, and Health Program at the Harvard Center for

Climate, Health and the Global Environment; Graduate Student Associate of the Harvard University Asia Center; Student Fellow of the Voices in Leadership Series at the Harvard Chan School; Teaching Fellow at the Global Health Education and Learning Incubator and the Harvard University Graduate School of Design; Graduate Student Ambassador of the Harvard Global Health Institute; Fellow of the Walker Study Group on Nutrition and Agriculture; core member of the One Harvard Climate Initiative; and member of the steering committee of the annual Planetary Health Meetings in 2017 and 2018. Deeply committed to the advancement of health and wellbeing in his home region, he organized in April 2017 a forum entitled “Future of Health in Southeast Asia” in partnership with the Harvard University Asia Center and in commemoration of ASEAN’s 50<sup>th</sup> anniversary.

Currently, Renzo is the sole student member of the Editorial Advisory Board of The Lancet Planetary Health, and he recently joined an international collaborative of emerging scholars convened by The University of Edinburgh and Georgetown University which examines the nexus of universal health coverage and global health security. Previously, Renzo was a Climate CoLab Fellow at the Massachusetts Institute of Technology; consultant for climate and health at the World Bank; 2016 New Voices Fellow at the Aspen Institute; local convener of the NCDFREE advocacy and innovation bootcamp in Boston; and one of the 'talents' at the inaugural UNLEASH Global Innovation Lab for the Sustainable Development Goals in Denmark.

Renzo also served as Asia coordinator, and later acting Global Coordinator of the Healthy Energy Initiative, Health Care Without Harm's flagship program focusing on the nexus of climate change, energy, and health. He also worked as consultant on cancer care to the Ministry of Health in Chile; co-founder and director of youth ‘think-and-do’ tank #ReimagineGlobalHealth; co-investigator in a national study on reconfiguring primary health care under the Universal Health Care Study Group of the University of the Philippines (UP) Manila; migrant health consultant in the International Organization for Migration and Philippine Department of Health; convener of ASEAN Youth Dialogues, a movement promoting ASEAN awareness among Southeast Asian youth; lecturer on “Futures Thinking” in the Section of History of Medicine in UP Manila; guest lecturer for a Coursera online course entitled “An Introduction to Global Health” offered by the Copenhagen School of Global Health; and intern at the Department of Ethics and Social Determinants of Health (SDH), World Health Organization (WHO) in Geneva.



### The final scientific program

**The 9<sup>th</sup> International Conference on Integration of Science and Technology for Sustainable Development  
2021 (9<sup>th</sup> ICIST 2021) through Webinar-Zoom  
in November 19, 2021 at Faculty of Agricultural Technology, King Mongkut's Institute of Technology  
Ladkrabang (KMUTL), Bangkok, Thailand**

**Conference theme "Soil, water and environmental conservation, biological diversity, food safety, food  
security, and sustainable agriculture"**

Organized by

Association of Agricultural Technology in Southeast Asia (AATSEA), Faculty of Agricultural Technology, King Mongkut's Institute of Technology Ladkrabang, KMUTL (Thailand), Bengkulu University (Indonesia), General Incorporated Association for the Promotion of Self-reliance in Asia (GIAPSA, Japan), Society for Applied Biotechnology (India), Bio-Agritech Co Ltd (Vietnam), Bio Hi-tech (Cambodia), CGC organic coffee (Laos), Shwe Kant Kaw, KKS (Myanmar), Rajamangala University of Technology Tawan-ok, Chantaburi Campus (Thailand), Rambhai Barni Rajabhat University (Thailand), CAS Asian Agriculture Bio Engineering (PR China)

### PROGRAM

19 November 2021

Time

8:00	Master of Ceremony (MC): Asst. Prof. Dr. Jakrapan Wongpa, Dr. Wanlada Klangnarak Thai dance presentation
8:10	Welcome Addresses & opening remarks Prof. Dr. Hiroyuki Konuma (Japan) Dr. Tongchai Putthongsiri Dean Dr. Kasem Soyong, President of AATSEA
8:20	AATSEA Awarding Announcement

AATSEA Outstanding Leader Award 2021

**Education and Research:** Assist. Prof. Dr. S. Lalitha (India), Prof. Dr. Pakkapong Pongsuk (Thailand)

**Community Development:** Mr. Ruangsak Komkhuntod (Thailand)

**Special Community Service:** Prof. Dr. Thanuku Samuel Sampath Kumar Patro (India)  
and Prof. Dr. Younes Rezaee Danesh (Iran)

**Award for emerging leader of young generation:** Dr. Ramon Lorenzo Luis Guinto  
(Philippines)

Special reserved person awards

Recognition awards for organizers

Theme song: IMAGINE (Mr. Sarayos, P.)

### **Plenary and Keynote Speakers (Main conference room)**

	<b>Chairs: Dr. Kasem Soyong (Thailand).</b> 25 minute each
08:30-08:55	<b>Prof. Dr. Hiroyuki Konuma (Japan):</b> Sustainable Development and New Challenges (Covid-19)
08:55-09:20	<b>Dr. Ramon Lorenzo Luis Guinto (Philippines):</b> The Planetary Health Diet: advancing human nutrition and safeguarding the environment in the anthropocene
09:20-9:45	<b>Dr. Teodoro C. Mendoza (Philippines):</b> True, full, and fair costs accounting of rice, the staple food of half the people of the world
09:45-10:10	<b>Prof. Dr. Kampon Sriwatanakul (Thailand):</b> Health Benefits of Organics: Herbal formulations to fight against the Pandemic Sar-Cov-2 corona virus
10:10-10:35	<b>Prof. Dr. Jin-Cheol Kim (Korea):</b> Can we effectively control pine wood nematode by plant resistance inducers ?
10:35-11:00	<b>Prof. T.S.S.K. Patro (India):</b> Investigation on the efficacy of bio-agents and chitosan against finger millet blast disease
11:00-11:25	<b>Prof. Dr. Moammar Dayoub (Finland):</b> Internet of thing (Iot) for smart agriculture in rural areas
11:25-12:50	<b>Prof. Ivan Tarakanov (Russia):</b> Agricultural Technologies of the Future: Intelligent Plant Factory
11:50-12:15	<b>Prof. Rajeev Bhat (Estonia, EU):</b> Circular bio-economy perspectives for sustainable management and effective valorization of food industrial wastes and by-products
12:15-12:40	<b>Kasem Soyong (Thailand):</b> Research investigation and application in organic agriculture for sustainable development goals (SDGs)
12:40-13:00	Questions and Answer

## RESEARCH FORUM

### ORAL PRESENTATIONS

#### Session 1: ORGANIC AGRICULTURE AND RELATED FIELDS

##### Chair persons

**Chair: Prof. Nanik Setyowati (Indonesia)**

**Co-chair: Dr. TSSK Patro (India), Dr. Bancha Wiangsamut (Thailand), Dr. Lampan Khurpoon (Thailand), Dr. Teerawat Sarutayophat (Thailand)**

- |    |             |   |
|----|-------------|---|
| 1  | 13:00-13:20 | <b>IS: Nanik Setyowati:</b> Allelopathic effect of sorghum root extract and its potential use as a bioherbicide   |
| 3  | 13:20-13:40 | <b>IS: Pablito Malabanan Villegas:</b> A paradigm shift in the promoting the adoption of organic agriculture  |
| 4  | 13:40-14:00 | <b>IS: Somlit Vilavong:</b> The organic coffee production in Lao PDR  |
| 5  | 14:00-14:20 | <b>IS: Thet Lwin Htay:</b> Organic agriculture in Myanmar   |
| 6  | 14:20-14:40 | <b>IS: Lalitha Sundaram:</b> Yield enhancement of <i>Lycopersicon esculentum</i> Mill. using microbial consortium   |
| 7  | 14:40-15:00 | <b>IS: Yao Min Hong:</b> Circular economy of oyster shell in Taiwan   |
| 8  | 15:00-15:20 | <b>IS: Oksana Belous:</b> Influence of exogenous growth-regulators on physiological and growth processes of dwarf mandarin cv. 'Miagava-Vase'                 |
| 9  | 15:20-15:40 | <b>IS: Chen Yi-sung:</b> Weed and pest management on paddy rice cultivation based on farmers practices  |
| 10 | 15:40-16:00 | <b>IS: Nithya Priya:</b> Mass production of pseudomonas biofertilizer and its large scale application in arachis hypogaea                                     |
| 11 | 16:00-16:20 | <b>IS: Md. Asaduzzaman Sarker:</b> The art and myth of organic agriculture for nature conservation and sustainable food production: perspective of Bangladesh |
| 12 | 16:20-16:40 | <b>IS: Boun Oum Douangphrachanh:</b> The situation of organic production in Lao PDR   |
| 13 | 16:40-17:00 | <b>IS: Vojtech Nemec:</b> Practical experience in application of bioproducts for crop production in Cambodia and ways how to make them work more effectively. |
| 14 | 17:00-17:20 | <b>IS: Nathala Emmanuel:</b> Organic beekeeping and value addition of bees wax and honey for livelihood of rural women and youth in andhra pradesh, India     |
| 15 | 17:20-17:40 | <b>IS: Younes Rezaee Danesh:</b> Community structure of arbuscular mycorrhizal fungal species in saline soils of Turkey.                                      |
| 17 | 17:40-18:00 | <b>IS: Gopi Krishnan:</b> Exploration of earthwormcast associated actinobacteria for plant growth promoting properties  |
| 18 | 18:00-18:20 | <b>IS: Duong Minh Lam:</b> Biological activities of extracts and beauvericin from <i>Cordyceps cateniannulata</i> CPA14V.                                     |

## Session 2: MICROBIAL TECHNOLOGY, BIODIVERSITY AND FOOD TECHNOLOGY

### Chair persons

**Chair: Prof. Mohamad Chozin (Indonesia),**

**Co-chairs: Prof. Lalitha, S. (India), Prof. Tatik Suteky (Indonesia), Dr. Suprattra Poeaim (Thailand), Dr. Nonglak Parinthawong (Thailand)**

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|----|-------------|---|
| 20 | 13:00-13:20 | <b>IS: Samantha C. Karunarathna:</b> How to be a “fungi” not a dead guy.  |
| 21 | 13:20-13:40 | <b>IS: Lalitha Sundaram:</b> Phytostabilization of glyphosate contaminated soil using Plant Growth Promoting Rhizobacteria  |
| 22 | 13:40-14:00 | <b>Reny Herawati:</b> Field Evaluation of Blast Resistance on Inbred Lines Rice Derived from Crossing Bengkulu Local Varieties  |
| 23 | 14:00-14:20 | <b>Hoàng Nguyễn:</b> The trial of fresh straw mushroom ( <i>Volvariella volvacea</i> ) preservation in 9 days   |
| 24 | 14:20-14:40 | <b>Thitiporn Ditsawanon:</b> Protein hydrolysates from agricultural wastes for plant bacterial disease control  |
| 25 | 14:40-15:00 | <b>Boda Praveen:</b> Evaluation of bacterial bio-agents against <i>Alternaria alternata</i> (Fr.) Keissler causing leaf blight in little millet   |
| 27 | 15:00-15:20 | <b>IS: Raphael Okigbo:</b> Fungal flora of mechanic workshops and its bioremediation  |
| 28 | 15:20-15:40 | <b>Dung T. K. Nguyen:</b> An Assessment of Sustainable Agro-Forestry Livelihood of K'Ho Cil Minority in Da Nhim Commune, Lac Duong District, Lam Dong Province, Vietnam.                                  |
| 29 | 15:40-16:00 | <b>Minh T. Ton:</b> Implementing payment environmental services in Langbiang Biosphere Reserve, Vietnam.  |
| 30 | 16:00-16:20 | <b>Naruemon Mongkontanawat:</b> Development and evaluation the formula of healthy mushroom beverage with high $\beta$ -glucan from <i>Schizophyllum commune</i> Fr. in Thailand                           |
| 31 | 16:20-16:40 | <b>Yupa Pootaeng-On:</b> Antifungal activity and phytochemical analysis of <i>Miliusa sessilis</i> twig extract to control anthracnose disease in mango ( <i>Mangifera indica</i> )                       |
| 32 | 16:40-17:00 | <b>Loc V. Pham:</b> Mycelial growth and yield of different <i>Pleurotus</i> mushroom cultivars in southern Vietnam.   |
| 33 | 17:00-17:20 | <b>Sararat Monkhumg:</b> Antifungal activity of <i>Bacillus subtilis</i> subsp. <i>spizizenii</i> BL-59 to control some important postharvest diseases of mango fruits ( <i>Mangifera indica</i> L.)      |
| 34 | 17:20-17:40 | <b>Nguyen V. Lam:</b> Identification of lovastatin analogs-producing <i>Pleurotus</i> cultivars in southern Vietnam.  |
| 35 | 17:40-18:00 | <b>Kittichon U-Taynapunn:</b> Species diversity, tetracycline resistance and virulence factor gene profile of pathogenic <i>Aeromonas</i> spp. isolated from Nile tilapia seed farms in southern Thailand |
| 36 | 18:00-18:20 | <b>Quyen B. T. Ho:</b> Biological characteristics of the <i>Pleurotus</i> cultivars in southwestern Viet Nam  |
| 37 | 18:20-18:40 | <b>Waritchon Ninlanon:</b> Growth and survival of lactic acid bacteria during the fermentation of durian yogurt   |
| 38 | 18:40-19:00 | <b>Joannalyn Montemayor:</b> Phytochemical analysis and antifungal activities of <i>Passiflora edulis</i> var. <i>flavicarpa</i> on <i>Fusarium verticillioides</i>                                       |
| 39 | 19:00-19:20 | <b>Phraeo Vijitrotai:</b> Proximate analysis, Mineral and germanium of <i>Ganoderma lucidum</i> (Lingzhi) powder by spray dry as affected by different species and maltodextrin                           |



### Session 3: PLANT, WATER AND SOIL SCIENCES

**Chair persons:**

**Chair: Prof. Zainal Mukhtar (Indonesia)**

**Co-chairs: Dr. Sutisa Chaikul (RBRU), Dr. Duanrungs Benjamas (RBRU), Dr. Anurug Poem (Thailand), Dr. Rungtawan Yomla (Thailand)**

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|----|-------------|--|
| 40 | 13:00-13:20 | <b>IS: Zainal Mukhtar:</b> Soil nitrate availability pattern as influenced by the application of vermicompost supplemented with a liquid organic fertilizer  |
| 41 | 13:20-13:40 | <b>Catur Herison:</b> Reliability of seedling stage selection for aluminium stress tolerance in hot pepper ( <i>Capsicum annuum</i> L.)  |
| 42 | 13:40-14:00 | <b>IS: Fahrurrozi Fahrurrozi:</b> Use of <i>Tithonia diversifolia</i> leaves for liquid organic fertilizer   |
| 43 | 14:00-14:20 | <b>IS: Sigit Sudjatmiko:</b> Sweet corn root distribution under different fertilizer applications  |
| 44 | 14:20-14:40 | <b>Sefri Oktaviani:</b> Coffee cherry's pulp variety and pulping delay time leading to cascara tea products  |
| 45 | 14:40-15:00 | <b>Muhammad Farid:</b> Identification of soil porosity using geophysical and geotechnical observation for agricultural application   |
| 46 | 15:00-15:20 | <b>Merakati Handajaningih:</b> Enhancing soil characteristics and yield response of coffee cultivated under reduced chemical fertilizer in ultisols with application of bio-organic fertilizer containing plant growth promoting microbes  |
| 47 | 15:20-15:40 | <b>Rathanon Lohsuwan:</b> Effects of draw solution concentration and operating factors on forward osmosis for lime juice concentration   |
| 48 | 15:40-16:00 | <b>Ramos, J. C. T., Maluping, L. P., Polido, K. P., Mancia, A. F. V., Panganiban, M. J. T. and Reaño, C. E., Mendoza, B. C:</b> Detection of <i>S. aureus</i> and <i>E. coli</i> Strains and Bacterial Count Determination in Selected Agro-ecologically and Conventionally Grown Salad Vegetables in Laguna and Quezon Provinces, Philippines |
| 49 | 16:00-16:20 | <b>IS: Bancha Wiangsamut:</b> Effect of ethephon on fruit ripening and fruit components of durian cv. 'Monthong' after harvest   |
| 50 | 16:20-16:40 | <b>Varee Yoosumran:</b> Micropropagation of young inflorescence Curcuma hybrid <i>In vitro</i>   |
| 51 | 16:40-17:00 | <b>Marwanto Marwanto:</b> Reducing the use of mineral fertilizer and enhancing growth performance of green onion by application of pelletized organomineral fertilizer   |
| 52 | 17:00-17:20 | <b>Angel Deva:</b> Understanding the response of antioxidant mechanisms to abiotic stress in the <i>Arabidopsis</i> Negev desert relative, <i>Anastatica hierochuntica</i>   |
| 53 | 17:20-17:40 | <b>Sandhya Rani:</b> Crop residue management for enhancing the soil health and productivity in red sandy loam soils  |
| 54 | 17:40-18:00 | <b>Chamaiporn Anuwong:</b> The effect of timing and storage temperature on pollen viability and pollen germination in <i>Zephyranthes</i> Hybrid   |
| 55 | 18:00-18:20 | <b>Colenares, R. E., Asis, D. M., Rieza, J. R. S. and Tuazon, B. S.:</b> Metal accumulation of leguminous crops in mine tailings of Camarines Norte, Philippines: basis for soil remediation strategies  |
| 56 | 18:20-18:40 | <b>Charanya Khaeksawad:</b> The effect of water deficit at different growth stage on yield and quality of sweet corn ( <i>Zea mays</i> var <i>saccharata</i> Sturt.)   |
| 57 | 18:40-19:00 | <b>Suwichaya Chantarasaka:</b> Identification of phenolic compounds and evaluation of biological activities of methanolic extracts obtained from two varieties of longan ( <i>Dimocarpus longan</i> ) peels  |



#### Session 4: ANIMAL, FISHERY SCIENCES AND RELATED FIELDS

**Chair persons:**

**Chair: Prof. Fahrurrozi Fahrurrozi (Indonesia)**

**Co-chairs: Dr. Ronachai Sitthigripong (KMUTL, Thailand), Dr. Bhutharit Vittayaphattananurak Raksasiri (SU), Dr. Yardrung Suwannarat (RBRU)**

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|----|-------------|--|
| 59 | 13:00-13:20 | <b>Jinda Glinubon:</b> Effect of dietary supplementation with Vietnamese coriander ( <i>Persicaria odorata</i> ) extract on growth performance, carcass characteristics and meat quality of broilers   |
| 60 | 13:20-13:40 | <b>Kajit Mettamehtar:</b> Effect of genetic groups and age within genetic groups on milk chemical composition of buffaloes   |
| 61 | 13:40-14:00 | <b>Tatik Suteky:</b> The Preference of PE Goats on Poly-herb Supplementation   |
| 62 | 14:00-14:20 | <b>Ruangyote Pilajun:</b> Growth performance and nutrient digestibility of Thai native compared with Lowline Angus crossbred beef cattle fed with regional feedstuffs  |
| 63 | 14:20-14:40 | <b>Kajit Mettamehtar:</b> Milk fatty acid profile in different genetic groups and age of buffaloes   |
| 64 | 14:40-15:00 | <b>Rigos, L., Atabay, E. C., Atabay, E. P., Apolinario, J. P. R.:</b> Determination of pregnancy associated - Glycoproteins (Pags) during and post pregnancy in riverine buffaloes ( <i>Bubalus bubalis</i> Linn.)                               |
| 65 | 15:00-15:20 | <b>Panneepa Sivapirunthep:</b> Yield grading and prediction of combined closely trimmed and semi-boneless lean percentage using carcass traits of fattening culled dairy cattle in Thailand  |
| 66 | 15:20-15:40 | <b>Chittraporn Yeanpet:</b> Effect of <i>Mucuna pruriens</i> leaves in dairy cow feed on gas production, digestibility and rumen fermentation by using <i>in vitro</i> gas production technique  |
| 67 | 15:40-16:00 | <b>Manatsanun Nopparatmaitree:</b> Effect of feeding banana stalk on the physical quality and nutritive value of eggs, fatty acid profile, and lipid quality index in yolk of laying hens under a free-range rearing system in bamboo plantation |
| 68 | 16:00-16:20 | <b>Bhutharit Vittayaphattananurak Raksasiri:</b> Supplementation of synbiotic in diets of Thai native chicken: the effect on its production performance, intestinal histomorphology and carcass quality.   |
| 69 | 16:20-16:40 | <b>Dwatmadji:</b> Short-Term Herbal Supplementation on the Physiological Condition of Bali Cattle under the Oil Palm Integration System  |
| 70 | 16:40-17:00 | <b>Paitoon Kaewhom:</b> Molecular Survey of <i>Theileria spp.</i> of Ruminant in Thailand-Cambodia Border Region   |
| 71 | 17:00-17:20 | <b>Panneepa Sivapirunthep:</b> Ribeye Areas and Sizes of Fattening Culled Dairy Carcasses Determination Using Plastic Grid and Geometric Methods   |
| 72 | 17:20-17:40 | <b>Teerajet Laohasatian:</b> Development of Loop-mediated Isothermal Amplification (LAMP) for rapid detection of Methicillin-resistance <i>Staphylococcus aureus</i> (MRSA) from dairy cattle  |
| 73 | 17:40-18:00 | <b>Manatsanun Nopparatmaitree:</b> Dietary of probiotics and organic acids supplementation on productive performances, intestinal morphology, carcass characteristics, and meat quality of broiler chickens                                      |
| 74 | 18:00-18:20 | <b>Phimook Thiwaratkoon:</b> The influence of fattening periods on chemical composition, fatty acid profile, cholesterol and ribonucleotide content of Charolaise crossbred steers   |
| 75 | 18:20-18:40 | <b>Waritchon Ninlanon:</b> Effect of storage temperature on the quality of live mud crabs  |
| 76 | 18:40-19:00 | <b>Sukanya Jumanee:</b> Influence of age on the incidence of wooden breast and white striping, carcass composition, meat physicochemical property, texture profile, and chemical composition of broiler chickens                                 |
| 77 | 19:00-19:20 | <b>Krittikarn Kamporn:</b> Effect of strain and gender on production performance, carcass characteristics and meat quality of broiler chickens   |
| 78 | 19:20-19:40 | <b>Katatikarn Sahatsanon:</b> Effects of different starch sources in concentrates on meat characteristics, nutrient composition, and collagen solubility of dairy steers   |

## Session 5: ENTOMOLOGY AND RELATED FIELDS

### Chair persons:

**Chair: Prof. Dwi Wahyuni Ganefianti (Indonesia)**

**Co-chairs: Dr. Chongko Saetung (RMUTTO), Dr. Gopi Krishnan (India), Dr. N. Emmanuel (India), Dr. Kamronwit Thipmanee (KMUTL, Thailand)**

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| 79 | 13:00-13:20 | <b>Agustin Zarkani:</b> A First Record of Mealybug, <i>Planococcus bendovi</i> Williams (Hemiptera: Planococcus) in Southeast Asia   |
| 80 | 13:20-13:40 | <b>Sorphia Kummin:</b> Adulticidal toxicity of trans-anethole and geraniol from natural essential oils against house fly, <i>Musca domestica</i> (L.), Muscidae; Diptera   |
| 81 | 13:40-14:00 | <b>Nitchakan Mekha:</b> Larvicidal and pupicidal activities against <i>Musca domestica</i> L. of several combinations of <i>Cinnamomum verum</i> , <i>Cymbopogon citratus</i> (Stapf.), and <i>Illicium verum</i> Hook. f                        |
| 82 | 14:00-14:20 | <b>Khwunjira Chanasongcram:</b> Larvicidal and ovicidal activities against <i>Aedes aegypti</i> (L.) of combinations between plant essential oils and their major constituent  |
| 83 | 14:20-14:40 | <b>Navasero, M. M., Panis, W. N. De, Candano, R. N., Navasero, M. V. and Montecalvo, M. P.:</b> Predatory efficiency of <i>Euborellia</i> species against fall armyworm, <i>Spodoptera frugiperda</i> (J.E.Smith) (Lepidoptera: Noctuidae)       |
| 84 | 14:40-15:00 | <b>Tanapoom Mounghthipmalai:</b> Adulticidal activity against housefly ( <i>Musca domestica</i> L., Muscidae: Diptera) of eucalyptol, limonene, and their combined formulations  |
| 85 | 15:00-15:20 | <b>Cheepchanok Puwanard:</b> Ovicidal and adulticidal activities of <i>Cymbopogon citratus</i> (DC.) Stapf and <i>Illicium verum</i> Hook. f. against <i>Aedes aegypti</i> (Linn.)   |
| 86 | 15:20-15:40 | <b>Watcharaporn Takawirapat:</b> Repellency of six plant essential oils against <i>Periplaneta americana</i> L. and <i>Blattella germanica</i> L.  |
| 88 | 15:40-16:00 | <b>Montecalvo, M. P., Navasero, M. M. and Navasero, M. V.:</b> Lethal Effect of Native <i>Metarhizium rileyi</i> (Farlow) Samson Isolate to Invasive Fall Armyworm, <i>Spodoptera frugiperda</i> (J.E. Smith), Infesting Corn in the Philippines |
| 89 | 16:00-16:20 | <b>Praiyanut Noitubtim:</b> Productivity of Five Entomopathogenic Nematodes in <i>Galleria mellonella</i> L. and Their Persistence in Soil under Laboratory Conditions   |
| 90 | 16:20-16:40 | <b>Donna Ria Josue-Canacan:</b> Adoption of Integrated Pest Management (IPM) Technologies in Southern Philippines: Constraints and Motivations   |
| 92 | 16:40-17:00 | <b>Siraprapa Teangpa:</b> Ovicidal effect against <i>Musca domestica</i> (L.) of several combinations of plant essential oils and their major constituent  |
| 93 | 17:00-17:20 | <b>Sempurna Ginting:</b> Insect diversity in forest and beach ecosystems in pelabuhan ratu, sukabumi, west java  |
| 94 | 17:20-17:40 | <b>Priyatiningsih Priyatiningsih:</b> Identification and Biology of Fruit Fly Attacking Some Citrus Varieties in Bengkulu  |
| 95 | 17:40-18:00 | <b>Kancharika Pilapang:</b> Study on different concentrations and timing of 17 $\alpha$ -methyltestosterone to accumulate in water flea ( <i>Moina</i> spp.) from lab-scale  |
| 96 | 18:00-18:20 | <b>Kalayanee Theeraphapsombut:</b> Carcass quality traits and omega-3 content in different pork cuts from pigs fed a diet supplemented with linseed  |
| 97 | 18:20-18:40 | <b>Pattana Somniyam:</b> The Diversity of Terrestrial Earthworm in Agricultural Land and Adjacent areas, Uttaradit Province, Thailand  |

## Session 6: AGRICULTURAL SCIENCES AND BIOLOGY

**Chair persons:**

**Chair: Dr. Danilo Josue (Philippines)**

**Co-chairs: Dr. Teodoro C. Mendoza (Philippines), Prof. Dwatmadji (Indonesia), Dr. Kannikar Charoensuk (RMUTTO, Thailand), Dr. Komkhae Pilasombut (KMUTL, Thailand)**

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| 98  | 13:00-13:20 | <b>Kasem Soyong:</b> The novel investigation of natural product nano-particles from fungi for plant immunity  |
| 99  | 13:20-13:40 | <b>IS: Mohammad Chozin:</b> Progress in rice breeding for Indonesian swampland areas  |
| 100 | 13:40-14:00 | <b>Phumipat Sangkrabun:</b> Effect of Drying Methods during Priming on Quality and longevity of Rice Seeds  |
| 101 | 14:00-14:20 | <b>Ruangsak Komkhuntod:</b> New hybrid varieties of sugar apple and giant sour tamarind   |
| 102 | 14:20-14:40 | <b>Jisinee Vaiyanikorn:</b> Larvicidal and pupicidal activities against <i>Aedes aegypti</i> L. (Diptera: Culicidae) of several combinations of plant essential oils and their major constituent  |
| 103 | 14:40-15:00 | <b>Dwi Wahyuni Ganefianti:</b> Growth and yield of chili cuttings under different compositions of inorganic fertilizer applications   |
| 104 | 15:00-15:20 | <b>Maluping, L.P., Ramos, J.C.T., Polido, K.P., <u>Mancia, A.F.V.</u>, Panganiban, M.J.T., Reaño, C.E., Mendoza, B.C.:</b> Heterotrophic and Coliform Counts, and <i>S. aureus</i> and <i>E. coli</i> Detection in Soil and Fertilizer Samples Obtained |
| 105 | 15:20-15:40 | <b>Hesti Pujiwati:</b> Effects of N and P dosages on crop growth, yield, and attack of pod borer ( <i>Etiella zinchenella</i> ) of soybean c.v. detam-1 grown at swampy land  |
| 106 | 15:40-16:00 | <b>Edi Susilo:</b> The inhibition of seed germination treated with water extract of sorghum ( <i>Sorghum bicolor</i> , L.) cultivated in histosols  |
| 107 | 16:00-16:20 | <b>Michael Jay Trapse:</b> Functionality of Insulin Plant ( <i>Costus igneus</i> N.E. Br.) Leaf Extracts  |
| 108 | 16:20-16:40 | <b>Wuri Prameswari:</b> Natural plant growth regulator effects on the vegetative growth of long pepper ( <i>Piper retrofractum</i> Vahl.)   |
| 109 | 16:40-17:00 | <b>Rustikawati Rustikawatin:</b> Evaluation on Salinity Tolerance of New Maize Hybrids at Early Growth and Their Performance in Coastal Field   |
| 110 | 17:00-17:20 | <b>Prapasri Theprugs:</b> Research and Development of the Restructured Shrimp Product   |
| 111 | 17:20-17:40 | <b><u>Manigbas, N.L.</u> and <u>Ha, W.G.:</u></b> Enhanced partnerships with farmers' associations, the key in sustaining rice productivity and income.   |
| 112 | 17:40-18:00 | <b>Bunny Soem:</b> Influence of Organic Fertilizer on the growth of Arrowroot   |
| 113 | 18:00-18:20 | <b>Norden Lepcha:</b> Cost and return analysis of organic potato in Gasa District, Bhutan   |
| 114 | 18:20-18:40 | <b>Mimi Sutrawati:</b> Disease Incidence and Molecular Diversity of Tungro Virus on Rice ( <i>Oryza sativa</i> ) in Bengkulu, Indonesia   |
| 115 | 18:40-19:00 | <b>Muhammad Mustava:</b> Biological activity of rhizobacteria isolated from rhizosphere <i>Acacia crassicarpa</i> A. Cunn ex Benth. in timber plantations   |

## Session 7: ENVIRONMENTAL SCIENCE, AGRICULTURAL EDUCATION AND DEVELOPMENT

### Chair persons

**Chair: Dr. Preeyanan Sittijinda (Thailand)**

**Co-chairs: Dr. Adisak Singsewo (Thailand), Dr. Phattraporn Soyong (Thailand), Joselito Dar (Philippines), Prof. Dr. Pakkapong Pongsuk (Thailand)**

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| 116 | 13:00-13:20 | <b>Danilo Josue:</b> Learning Farm Center for Organic Agriculture Education   |
| 117 | 13:20-13:40 | <b>IS: Pakkapong Pongsuk:</b> Agricultural Skills for the Promotion of Future Careers of Special Students at Phrae Panyanukul School, Phrae Province  |
| 118 | 13:40-14:00 | <b><u>Navasero, J. M. M., Angeles, A. A., Adiova, C. D., Merca, F. E.</u></b> Effect of Black Soldier Fly, <i>Hermetia Illucens</i> (Linnaeus), Larvae on Production Performance, Egg Quality, and Nutrient Digestibility in Post-Peak Chicken Layers |
| 119 | 14:00-14:20 | <b>Patticha Kulsuwan:</b> The carbon footprint Assessment from Electricity in Amnatcharoen Province of Northeastern Thailand  |
| 120 | 14:20-14:40 | <b><u>Savuth, S. and Mendoza, T. C.:</u></b> System of Rice Intensification (SRI) vs. Chemical Intensive Rice Production: Which direction shall Cambodian rice agriculture be ?   |
| 121 | 14:40-15:00 | <b>Bhutharit Vittayaphattananurak Raksasiri:</b> Farmers' Economic Status and Acceptability of Goat Farm Management Technology: A Case Study in the Lower Central and Upper Southern Regions of Thailand  |
| 122 | 15:00-15:20 | <b><u>Garan, M.A., Salang, E.D., Galo, E.V. and Tabal, E.P.G:</u></b> Soil erosion rate estimates using USLE of selected corn producing areas in Barangay Vitali, Zamboanga City, Philippines   |
| 123 | 15:20-15:40 | <b>IS: Margie D. Fiesta:</b> Environmental perception of the women in Central Mindanao, Philippines   |
| 124 | 15:40-16:00 | <b>Isaac F. Sulonteh:</b> Improving Production Practices to Increase yield Liberian Rice  |
| 125 | 16:00-16:20 | <b><u>Tabal, E.P., Mendoza, T.C., Paelmo, R.F., Garcia, J.N.M. and Visco, R.G.:</u></b> Energy inputs and carbon emission equivalent of selected agroforestry systems in zamboanga city, Philippines  |
| 126 | 16:20-16:40 | <b>Tawid Rasi:</b> Management for Promoting Agriculture Subject Learning in the Elementary School Level through KLUATOD Model, Num Nao District, Phetchabun Province  |
| 127 | 16:40-17:00 | <b>Wattana Saduak:</b> Promotion of Vegetable Gardening for Household Food Storage during Covid-19 Pandemic of Farmers in Praibueng District, Srisaket Province.  |
| 128 | 17:00-17:20 | <b>Kantika Youngmanee:</b> Composting of boiler-ash and biogas-sludge from the palm oil industry for use as plantlet growing media  |
| 129 | 17:20-17:40 | <b>Nuttanan Direksri:</b> Important of marketing mix factors on consumer purchase decision towards organic rice of a community enterprise   |
| 130 | 17:40-18:00 | <b>Satria Utama:</b> Factors Affecting Farmers' Decision in Using Subsidized and Non-Subsidized Seeds in Hybrid Corn Farming in Seluma Regency, Bengkulu Province   |
| 131 | 18:00-18:20 | <b>Jeeranun Khermkhan:</b> The Comparison of Cost and Return from Raw and Ripe Namdokmai Mango Planting of Large Plots in Bang Phli District, Samutprakarn Province   |
| 132 | 18:20-18:40 | <b>Hery Suhartoyo:</b> Assessment of Socio-economic Aspects of Farmers under Social Forestry Program and its Environment: study case at Tanjung Alam Village, Kepahiang, Bengkulu, Indonesia  |
| 133 | 18:40-19:00 | <b>Thammanat Posiripong:</b> Management of organic sweet potato from production top markets   |

## Session 8: ADVANCED RESEARCH IN AGRICULTURAL AND BIOLOGICAL SCIENCES FOR SUSTAINABLE DEVELOPMENT GOALS (SDGs)

**Chair persons:**

**Chair: James Kennard Jacob (Philippines)**

**Co-chairs: Prof. Somdej Kanokmadhakul (KKU, Thailand),**

**Dr. Raphael Okigbo (Nigeria), Dr. Wanlada Klangnarak (KMIL, Thailand),  
Rungrat Vareeket (Thailand)**

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| 134 | 13:00-13:20 | <b>IS: James Kennard Jacob:</b> Exploring Medicinal Plant Associated Mycoendophytes: Phytochemistry and Bioactivity   |
| 135 | 13:20-13:40 | <b>Suteera Vatthanakul:</b> Effect of Carboxymethylcellulose and Xanthan Gum on the Physicochemical and Sensory Properties of Passion Fruit Topping Sauce         |
| 136 | 13:40-14:00 | <b>Pramote Pornsuriya:</b> Yield stability of new elite lines of yardlong bean ( <i>Vigna unguiculata</i> (L.) Walp. ssp. <i>sesquipedalis</i> Verdc.)            |
| 137 | 14:00-14:20 | <b>IS: Nanik Setyowati:</b> Allelopathy for Sustainable Weeds Management  |
| 138 | 14:20-14:40 | <b>Rungrat Vareeket:</b> Nanoparticles from <i>Neosartorya hiratsukae</i> against brown leaf spot of rice caused by <i>Drechslera oryzae</i> .                    |
| 140 | 14:40-15:00 | <b>IS: Rujira Tongon:</b> Natural product nano-particles from Chaetomium for resistant of Durian Phytophthora rot   |
| 141 | 15:00-15:20 | <b>IS: Jiaojiao Song:</b> Agricultural nanotechnology for plant immunity  |
| 142 | 15:20-15:40 | <b>G. Bharathi:</b> Molecular Divergence Analysis for Pre-Harvest Sprouting Resistance in Rice ( <i>Oryza Sativa</i> L.) genotypes                                |
| 143 | 15:40-16:00 | <b>Janejira Phakawan:</b> Antimicrobial Enhancement of Red Onion Crude Extract using Epsilon-polylysine   |
| 144 | 16:00-16:20 | <b>Suriya Kosinwattana:</b> Effect of Different Planting Materials Ratios on the Growth of Foliage Plants   |
| 145 | 16:20-16:40 | <b>Naruebet Meelua:</b> Technical Efficiency of Rice Production in Klong Suan Sub-District, Bang Bo District, Samut Prakan Province, Thailand                     |
| 146 | 16:40-17:00 | <b>Raphael Okigbo:</b> Neglected useful crops of africa   |
| 147 | 17:00-17:20 | <b>Krittiya Khuenpet:</b> Development of Inulin Beads from Jerusalem Artichoke by spherification and reverse spherification techniques                            |
| 148 | 17:20-17:40 | <b>Suriyasit Somnuek:</b> In vitro effect of <i>Callistemon viminalis</i> and <i>Melaleuca cajuputi</i> ethanolic extracts as botanical fungicide and insecticide |
| 149 | 17:40-18:00 | <b>Narumon Tangthirasunun:</b> Application of organic soybean tempeh in raisin purple sweet potato cookie   |
| 150 | 18:00-18:20 | <b>Christopher Llonas:</b> Influence of perceived risks in farmer's decision towards sustainable farm practices. Evidence from Northern Thailand.                 |
| 151 | 18:20-18:40 | <b>Nagia Ali:</b> Improvement of wool dyeing quality and antimicrobial activity using nano forms of silver  |



## Session 9: ADVANCED RESEARCH IN BIOLOGICAL AGRICULTURE

**Chair persons:**

**Chair: Dr. Wikanya Prathumyot (RBRU)**

**Prof. Sridhar Kandikere (India); Dr. Jatuporn Aroonkamonsri (RMUTTO); Dr. Somlit Vilavong (Lao PDR); Dr. Jiaojiao Song (China)**

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| 152 | 13:00-13:20 | <b>IS: Sridhar Kandikere:</b> Diversity of fungal spores in barkflow, throughfall and tree holes of two mangrove tree species of southwest India  |
| 153 | 13:20-13:40 | <b>Norden Lepcha:</b> Macronutrients (NPK) and other soil properties influenced by long term organic and conventional potato farming in West-Central Bhutan                                 |
| 154 | 13:40-14:00 | <b>Anuwat Lakyat:</b> Ectoparasite species attacking chicken in eastern area of Bangkok, Thailand   |
| 155 | 14:00-14:20 | <b>Harry Jay Cavite:</b> Supply chain structure and constraints of a rice production community enterprise: Evidence from rural Thailand   |
| 156 | 14:20-14:40 | <b>Karinporn Yodsene:</b> <i>In vitro</i> Study of Antioxidant and Antimicrobial Activities of Soybean Tempeh and Split Gill Mushroom ( <i>Schizophyllum commune</i> ) as Plant-Based Diets |
| 157 | 14:40-15:00 | <b>Pawat Seritrakul:</b> Mitochondrial DNA analysis revealed genetic diversity of captive-bred hog deer ( <i>Axis porcinus</i> ) population in Thailand                                     |
| 158 | 15:00-15:20 | <b>Natthapon Jaisue:</b> Distribution and Management of Total and Available Sulfur under Durian Orchard Soils in the Eastern Thailand   |
| 159 | 15:20-15:40 | <b>Heejung Kim:</b> Developing an International Cooperation Training Program and Designing Sustainable Agriculture Systems under the Climate Crisis Era.                                    |
| 160 | 15:40-16:00 | <b>Napassawan Fungsoonnoen:</b> Survival of contaminated pathogenic bacteria in Thai fruit and Vegetable juice  |
| 161 | 16:00-16:20 | <b>Prapasri Theprugs:</b> Research and Development of the healthy ready-to-eat strip Chinese sausage  |
| 162 | 16:20-16:40 | <b>Sarocho Phopaijit:</b> Effects of Chicken Manure and Chemical Fertilizer on Growth and Yield of Japonica Rice  |
| 163 | 16:40-17:00 | <b>Phatthira Sakamut:</b> Improvement of Threadfin bream ( <i>Nemipterus</i> spp.) surimi gel properties by electron beam irradiation   |
| 164 | 17:00-17:20 | <b>Nantawan Inban:</b> Effects of Calcium Sources on Physiological Traits Related to Pod and Seed Yield of Peanut   |
| 165 | 17:20-17:40 | <b>Kittiya Showpanish:</b> Isolation and Optimization of Enhanced Anti- <i>Streptococcus suis</i> Bacteriocin Production by <i>Lactobacillus plantarum</i> RB01-SO                          |
| 166 | 17:40-18:00 | <b>Suworanee Pancharoenn:</b> Effect of ingredients, storage temperature and time on texture properties and retrogradation rate of butter cake  |
| 167 | 18:00-18:20 | <b>Jatuporn Anuchai:</b> Determination of biochemical activities of <i>Dendrobium</i> spp.  |
| 169 | 18:00-18:40 | <b>Person Pesona Renta:</b> Growth of diatom <i>Amphora</i> sp. cultured on agar plates by streak plate technique   |

## Session 10: ADVANCED DEVELOPMENT IN AGRICULTURAL SCIENCES

**Chair persons:**

**Chair: Dr. Naruemon Mongkontanawat (RMUTTO)**

**Co-chairs: Prof. Ivan Tarakanov (Russia), Dr. Nithya Priya (India); Dr. Rujira Tongon (Thailand)**

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| 171 | 13:00-13:20 | <b>Tanthai Waiphanta:</b> Control mechanism of nano-Chaetogobosin-C constructed from <i>Chaetomium globosum</i> 0805 against root rot of papaya caused by <i>Phytophthora palmivora</i> |
| 172 | 13:20-13:40 | <b>Racha Tepsorn:</b> Kinetic Reduction of UV-C against <i>Salmonella Typhimurium</i> Contaminated on Radish sprouts ( <i>Raphanus sativus</i> L.)                                      |
| 173 | 13:40-14:00 | <b>Sujitra Jorjong:</b> Effect of Paclobutrazol on yield and quality of Mao laung ( <i>Antidesma thwaitesianum</i> Müll. Arg.) Cultivars  |
| 174 | 14:00-14:20 | <b>Apisit Chittawanij:</b> Study of Biochar on Growth and Yield of Choy Sum ( <i>Brassica chinensis</i> L.var <i>parachinensis</i> )  |
| 175 | 14:20-14:40 | <b>Darinthip Thiphinkong:</b> Effect of Seed Coating with Fluorescent Compound on Quality and Fluorescence of Cucumber seeds  |
| 176 | 14:40-15:00 | <b>Marlin Marlin:</b> Acclimatization of Micropropagated <i>Dendrobium</i> sp with The Application of Organic Fertilizer  |
| 177 | 15:00-15:20 | <b>Racha Tepsorn:</b> Antimicrobial Susceptibility of Chili Extract against Foodborne Pathogens and Food Related Bacteria   |
| 178 | 15:20-15:40 | <b>Sarocho Thongmakha:</b> Application of nano-Chaetogobosin-c from <i>Chaetomium globosum</i> to control of tomato wilt caused by <i>Fusarium oxysporum</i> f.sp. <i>lycopersici</i>   |
| 179 | 15:40-16:00 | <b>Nontawan Rawangpai:</b> Application of nano-Chaetoglobosin-C from <i>Chaetomium globosum</i> to control anthracnose of chilli caused by <i>Colletotrichum gloeosporioides</i>        |
| 180 | 16:00-16:20 | <b>Pettida Malai:</b> Application of nano-Chaetogobosin-C from <i>Chaetomium globosum</i> to control brown leaf spot of rice caused by <i>Drechslera oryzae</i>                         |
| 181 | 16:20-16:40 | <b>Theeraphol Senphan:</b> Extraction and antioxidant activities of broken <i>Ganoderma lucidum</i> spore   |
| 182 | 16:40-17:00 | <b>Dilek Kaya Özdoğan:</b> Genetic Characterization of <i>Rhizobium</i> Bacteria Isolated From Bean Nodules and Its Effect on Soil Quality  |
| 184 | 17:00-17:20 | <b>Çağlar Sagun:</b> Status of Arbuscular Mycorrhizal Fungi Populations in Some Pastures of Ankara Region, Turkey   |
| 185 | 17:20-17:40 | <b>Quang Le Dang:</b> Potential use of extracts and active constituent from <i>Desmodium sequax</i> to control fungal plant diseases  |
| 186 | 17:40-18:00 | <b>Salit Supakitthanakorn:</b> Simultaneous and sensitive detection of CVB, CChMVd and CSVd mixed infections in chrysanthemum using multiplex nested RT-PCR                             |
| 187 | 18:00-18:20 | <b>Anandyawati Anandyawati:</b> The role of <i>Lumbricus rubellus</i> for improving the quality of various animal manures through vermicomposting                                       |
| 188 | 18:20-18:40 | <b>Elviana Manalu:</b> Potential of PGPR isolated from the rhizosphere of pulpwood trees in stimulating the growth of <i>Eucalyptus pellita</i> (F. Muell)                              |

## Session 11: ADVANCED DEVELOPMENT OF BIOLOGICAL TECHNOLOGY

**Chair persons:**

**Chair: Dr. Hoang ND Pham (Vietnam)**

**Co-chairs: Dr. Wichai Supalucksana (Thailand), Dr. Virapol Jamsawat, (Thailand), Dr. Pornpan Sukhumpinij (RBRU)**

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| 189 | 13:00-13:20 | <b>IS: Hoang ND Pham:</b> Ectomycorrhizal communities of pine forest in south Vietnam and applying for reforestation  |
| 190 | 13:20-13:40 | <b>Hoang Quoc Chinh:</b> Potential of <i>Trichoderma asperellum</i> as a bio-control agent against citrus diseases caused by <i>Penicillium digitatum</i> and <i>Colletotrichum gloeosporioides</i> . |
| 191 | 13:40-14:00 | <b>Suteera Vatthanakul:</b> Effects of Hydrocolloid Addition on the Quality of Cookies Substituted Wheat Flour with Sinin Rice Flour  |
| 193 | 14:00-14:20 | <b>Jawanchanok Preesong:</b> Changes in soil properties affected by rice stubble burning in Bangkok soil series   |
| 194 | 14:20-14:40 | <b>Ariefa Primair Yani:</b> Identification of soil insect diversity in the turtle conservation area, Bengkulu university  |
| 195 | 14:40-15:00 | <b>Chirasak Phoemchalard:</b> The effects of sous-vide cooking on the physicochemical, microbiological, and carbon footprint of buffalo meat at various temperatures and times                        |
| 197 | 15:00-15:20 | <b>Bootsrapa Leelawat:</b> Development of Soft Cookie from Pregelatinized Banana Flour and Germinated Brown Rice  |
| 198 | 15:20-15:40 | <b>Unnop Tassanaudom:</b> Combination of Humectants with Potassium Sorbate and Sodium Benzoate to Inhibit <i>Curvularia clavata</i> Contamination in Thai Fermented Fish Spicy Dip (Nam Phrik Pla Ra) |
| 199 | 15:40-16:00 | <b>Onanong Bunserm:</b> Antibacterial and anti-biofilm formation activities of high heat tolerant herbal extracts against white feces syndrome-associated <i>Vibrio parahaemolyticus</i>              |
| 200 | 16:00-16:20 | <b>Atra Romeida:</b> <i>In vitro</i> shoot proliferation of Mangosteen's micro shoots using combination of 6-Benzylaminopurine and 1-Naphthaleneacetic concentrations.                                |
| 201 | 16:20-16:40 | <b>Thitaree Lengnuy:</b> Application of nano-Trichotoxin A50 from <i>Trichoderma harzianum</i> PC01 to control Anthracnose of papaya cause by <i>Colletotrichum gloeosporioides</i>                   |
| 203 | 16:40-17:00 | <b>Pheaktra Phal:</b> Biological control of <i>Colletotrichum gloeosporioides</i> causal agent of citrus anthracnose by using <i>Trichoderma hamatum</i> K01  |
| 204 | 17:00-17:20 | <b>Arunrussamee Sangsila:</b> Isolation and characterization of actinomycetes with antibacterial and plant growth-promoting activities from maoberry cultivated soil in Northeast Thailand            |
| 205 | 17:20-17:40 | <b>Solmaz Najafi:</b> Karyological Analysis on Wheat Tir ( <i>Triticum aestivum</i> L. ssp. <i>vulgare</i> Vill. v. <i>leucospermum</i> Körn.) Populations in Lake Van Basin, Turkey                  |
| 206 | 17:40-18:00 | <b>Chaowanee Laosutthipong:</b> Partial Sequence Analysis of Cellulose Synthase <i>OsCESA4</i> and <i>OsCESA9</i> Genes in Native Upland Rice, Thailand   |

**19:40**

## CLOSING CEREMONY

### BEST PAPER AWARDS

**Closing speech**

**Dr. Tongchai Putthongsiri Dean, FAT, KMUTL, Bangkok, Thailand**

**Conclusion Remarks:**

**Prof. Dr. Hiroyuki Konuma (Japan)**

**Welcome to the 10<sup>th</sup> ICIST 2022 in India**

**Dr. TSSK Patro and Dr. Lalitha Sundaram (India)**

**Closing Address and Future Remarks:**

**Dr. Kasem Soyong, AATSEA President**

**The ICIST Theme Song "IMAGINE"**



## TABLE OF CONTENT

<i>FOREWORD</i>	<i>I</i>
<i>International Advisory Committee</i>	<i>VI</i>
<i>PROGRAM</i>	<i>XX</i>
<i>Abstracts</i>	<i>XLII</i>
<i>Plenary and Keynote Speakers</i>	<i>43</i>
Sustainable Development and New Challenges (Covid-19)	43
The Planetary Health Diet: advancing human nutrition and safeguarding the environment in the Anthropocene	44
True, full, and fair costs accounting of rice, the staple food of half the people of the world	44
Health Benefits of Organics : Herbal formulations to fight against the Pandemic Sar-Cov-2 corona virus	45
Can we effectively control pine wood nematode by plant resistance inducers ?	46
Investigation on the Efficacy of Bio-agents and Chitosan against Finger millet Blast Disease	46
Internet of thing (Iot) for smart agriculture in rural areas	47
Agricultural Technologies of the Future: Intelligent Plant Factory	48
Circular bio-economy perspectives for sustainable management and effective valorization of food industrial wastes and by-products	49
Research investigation and application in organic agriculture for sustainable development goals (SDGs)	50
<i>RESEARCH FORUM</i>	<i>51</i>
<i>Session 1: ORGANIC AGRICULTURE AND RELATED FIELDS</i>	<i>51</i>
Allelopathic Effect of Sorghum Root Extract and Its Potential Use as a Bioherbicide	51
A paradigm shift in the Promoting the Adoption of Organic Agriculture	51
The organic coffee production at the Phouphieng Paksong Boloven Plateau in Lao PDR	52
Organic agriculture in Myanmar	53
Yield enhancement of <i>Lycopersicon esculentum</i> Mill. Using microbial consortium	53
Circular economy of Oyster Shell in Taiwan	54
Influence of exogenous growth-regulators on physiological and growth processes of dwarf mandarin cv. 'Miagava-Vase'	54
Weed and Pest Management on Paddy Rice Cultivation Based on Farmers Practices	55
Mass production of pseudomonas biofertilizer and its large scale application in arachis hypogaea	55
The Art and Myth of Organic Agriculture for Nature Conservation and Sustainable Food Production: Perspective of Bangladesh	56
Organic agriculture in LAOS	56
Practical experience in application of bioproducts for crop production in Cambodia and ways how to make them work more effectively	57

Organic beekeeping and value addition of bees wax and honey for livelihood of rural women and youth in andhra pradesh, India	59
Community Structure of Arbuscular Mycorrhizal Fungal Species in Saline Soils of Turkey	60
Exploration of earthwormcast associated actinobacteria for plant growth promoting properties	61
Biological activities of extracts and beauvericin from <i>Cordyceps catenianmulata</i> CPA14V.	62
How to be a “fungi’ not a dead guy	63
Phytostabilization of glyphosate contaminated soil using Plant Growth Promoting Rhizobacteria	63
Field Evaluation of Blast Resistance on Inbred Lines Rice Derived from Crossing Bengkulu Local Varieties	64
The trial of fresh straw mushroom ( <i>Volvariella volvacea</i> ) preservation in 9 days	64
Protein hydrolysates from agricultural wastes for plant bacterial disease control	65
Evaluation of bacterial bio-agents against <i>Alternaria alternata</i> (Fr.) Keissler causing leaf blight in little millet	66
Bioremediation of Oil-contaminated Soils of Mechanic Workshops	66
An Assessment of Sustainable Agroforestry Livelihood of K'Ho Cil Minority in Da Nhim Commune, Lac Duong District, Lam Dong Province, Vietnam	67
Implementing payment environmental services in Langbiang Biosphere Reserve, Vietnam	68
Development and evaluation of the formula for healthy mushroom beverage with high $\beta$ -glucan prepared from <i>Schizophyllum commune</i> Fr. in Thailand	68
Antifungal Activity and Phytochemical Analysis of <i>Miliusa Sessilis</i> Twig Extract to Control Anthracnose Disease in Mango ( <i>Mangifera indica</i> )	69
The Correlation Between Mycelial Growth and Fruit Body's Yield of Oyster Mushrooms ( <i>Pleurotus</i> Spp.) in Southern Vietnam	70
Antifungal activity of <i>Bacillus subtilis</i> subsp. <i>spizizenii</i> BL-59 to control some important postharvest diseases of mango fruits ( <i>Mangifera indica</i> L.)	71
Identification of lovastatin analogs-producing <i>Pleurotus</i> cultivars in southern Vietnam	71
Species Diversity, Tetracycline Resistance and Virulence Factor Gene Profile of Pathogenic <i>Aeromonas</i> Spp. Isolated from Nile Tilapia Seed Farms in Southern Thailand	72
Biological Characteristics of the <i>Pleurotus</i> Cultivars in Southwestern Viet Nam	73
Growth and Survival of Lactic Acid Bacteria during the Fermentation of Durian Yogurt	73
Phytochemical analysis and antifungal activities of <i>Passiflora edulis</i> var. <i>flavicarpa</i> on <i>Fusarium verticillioides</i>	74
Proximate analysis, Mineral and germanium of <i>Ganoderma lucidum</i> (Lingzhi) powder by spray dry as affected by different species and maltodextrin	75
Soil Nitrate Availability Pattern as Influenced by the Application of Vermicompost Supplemented with a Liquid Organic Fertilizer	75
Reliability of Seedling Stage Selection for Aluminium Stress Tolerance in Hot Pepper ( <i>Capsicum annum</i> L)	76
Use of <i>Tithonia diversifolia</i> Leaves for Liquid Organic Fertilizer	77

Sweet Corn Root Distribution Under Different Fertilizer Applications	77
Coffee Cherry's Pulp Variety and Pulping Delay Time Leading to Cascara Tea Products	78
Identification of soil porosity using geophysical and geotechnical observation for agricultural application	78
Enhancing Soil Characteristics and Yield Response of Coffee Cultivated under Reduced Chemical Fertilizer in Ultisols with Application of Bio-organic Fertilizer Containing Plant Growth Promoting Microbes	79
Effects of Draw Solution Concentration and Operating Factors on Forward Osmosis for Lime juice Concentration	79
Detection of <i>S. aureus</i> and <i>E. coli</i> Strains and Bacterial Count Determination in Selected Agro-ecologically and Conventionally Grown Salad Vegetables in Laguna and Quezon Provinces, Philippines	80
Effect of ethephon on fruit ripening and fruit components of durian cv. 'Monthong' after harvest	81
Micropropagation of young inflorescence Curcuma hybrid <i>In vitro</i>	82
Reducing the Use of Mineral Fertilizer and Enhancing Growth Performance of Green Onion by Applying Pelletized Organomineral Fertilizer	82
Understanding the Response of Antioxidant Mechanisms to Abiotic Stress in the <i>Arabidopsis</i> Negev desert relative, <i>Anastatica hierochuntica</i>	83
Crop Residue Management for Enhancing the Soil Health and Productivity in Red Sandy Loam Soils	84
The Effect of Timing and Storage Temperature on Pollen Viability and Pollen Germination in <i>Zephyranthes</i> Hybrid	85
Metal Accumulation of Leguminous Crops in Mine Tailings of Camarines Norte, Philippines: Basis for Soil Remediation Strategies	86
Identification of phenolic compounds and evaluation of biological activities of methanolic extracts obtained from two varieties of longan ( <i>Dimocarpus longan</i> ) peels	86
Effect of dietary supplementation with Vietnamese coriander ( <i>Persicaria odorata</i> ) extract on growth performance, carcass characteristics and meat quality of broilers	87
Effects of genetic groups, and age within genetic groups on milk chemical composition of buffaloes	88
The Preference of PE Goats on Poly-herb Supplementation	88
Growth Performance and Nutrient Digestibility of Thai Native Compared with Lowline Angus Crossbred Beef Cattle Fed with Regional Feedstuffs	89
Milk fatty acid profile in different genetic groups and age of buffaloes.	90
Determination of Pregnancy Associated - Glycoproteins (Pags) During and Post Pregnancy in Riverine Buffaloes ( <i>Bubalus bubalis</i> Linn.)	90
Yield grading and prediction of combined closely trimmed and semi-boneless lean percentage using carcass traits of fattening culled dairy cattle in Thailand	91
Effect of <i>Mucuna pruriens</i> leaves in dairy cow feed on gas production, digestibility and rumen fermentation by using <i>in vitro</i> gas production technique	92
Effect of feeding banana stalk on the physical quality and nutritive value of eggs, fatty acid profile, and lipid quality index in yolk of laying hens under a free-range rearing system in bamboo plantation	92

Supplementation of synbiotic in diets of Thai native chicken: the effect on its production performance, intestinal histomorphology and carcass quality.	93
Short-Term Herbal Supplementation on the Physiological Condition of Bali Cattle under the Oil Palm Integration System	94
A Molecular Survey of <i>Theileria</i> spp. in Ruminants in the Thailand-Cambodia border region	95
Ribeye areas and sizes of fattening culled dairy carcasses determination using plastic grid and geometric methods	95
Development of Loop-mediated Isothermal Amplification (LAMP) for rapid detection of Methicillin-resistance <i>Staphylococcus aureus</i> (MRSA) from dairy cattle	96
Dietary of probiotics and organic acids supplementation on productive performances, intestinal morphology, carcass characteristics, and meat quality of broiler chickens	97
The influence of fattening periods on chemical composition, fatty acid profile, cholesterol, and ribonucleotide content of Charolaise crossbred steers	98
Effect of storage temperature on the quality of live mud crabs	98
Influence of age on the incidence of wooden breast and white striping, carcass composition, meat physicochemical property, texture profile, and chemical composition of broiler chickens	99
Effect of strain and gender on production performance, carcass characteristics and meat quality of broiler chickens	100
Effects of different starch sources in concentrates on meat characteristics, nutrient composition, and collagen solubility of dairy steers	101
<i>Session 5: Entomology and related fields</i>	101
A First Record of Mealybug, <i>Planococcus bendovi</i> Williams (Hemiptera: Planococcus) in Southeast Asia	101
Adulticidal toxicity of trans-anethole and geraniol from natural essential oils against house fly, <i>Musca domestica</i> (L.), Muscidae; Diptera	102
Larvicidal and pupicidal activities against <i>Musca domestica</i> L. of several combinations of Cinnamomum verum, Cymbopogon citratus (Stapf.), and Illicium verum Hook. f	102
Larvicidal and ovicidal activities against <i>Aedes aegypti</i> (L.) of combinations between plant essential oils and their major constituent	103
Predatory efficiency of <i>Euborellia</i> species against fall armyworm, <i>Spodoptera frugiperda</i> (J.E.Smith) (Lepidoptera:Noctuidae)	104
Adulticidal activity against housefly ( <i>Musca domestica</i> L.; Muscidae: Diptera) of eucalyptol, limonene, and their combined formulation	104
Ovicidal and adulticidal activities of <i>Cymbopogon citratus</i> (DC.) Stapf and <i>Illicium verum</i> Hook. f. against <i>Aedes aegypti</i> (Linn.)	105
Repellency of six plant essential oils against <i>Periplaneta americana</i> L. and <i>Blattella germanica</i> L.	105
Productivity of Five Entomopathogenic Nematodes in <i>Galleria mellonella</i> L. and Their Persistence in Soil under Laboratory Conditions	107
Adoption of Integrated Pest Management (IPM) Technologies in Southern Philippines: Constraints and Motivations	107
Ovicidal effect against <i>Musca domestica</i> (L.) of several combinations of plant essential oils and their major constituent	108
Insect diversity in forest and beach ecosystems in pelabuhan ratu, sukabumi, west java	109

Identification and Biology of Fruit Fly Attacking Some Citrus Varieties in Bengkulu	109
Study on different concentrations and timing of 17 $\alpha$ -methyltestosterone to accumulate in water flea ( <i>Moina</i> spp.) from lab-scale	110
Carcass quality traits and omega-3 content in different pork cuts from pigs fed a diet supplemented with linseed	110
The Diversity of Terrestrial Earthworm in Agricultural Land and Adjacent areas, Uttaradit Province, Thailand	111
<i>Session 6: Agricultural Sciences and Biology</i>	112
The novel investigation of natural product nano-particles from fungi for plant immunity	112
Progress in rice breeding for Indonesian swampland areas	113
Effect of Drying Methods during Priming on Quality and longevity of Rice Seeds	114
New hybrid varieties of sugar apple and giant sour tamarind	115
Larvicidal and pupicidal activities against <i>Aedes aegypti</i> L. (Diptera: Culicidae) of several combinations of plant essential oils and their major constituent	116
Growth and yield of Chili cuttings under different compositions of inorganic fertilizer applications	116
Heterotrophic and Coliform Counts, and <i>S. aureus</i> and <i>E. coli</i> Detection in Soil and Fertilizer Samples Obtained	117
Effects of N and P dosages on crop growth, yield, and attack of pod borer ( <i>Etia zizchenella</i> ) of soybean c.v. detam-1 grown at swampy land	118
The inhibition of seed germination treated with water extract of sorghum ( <i>Sorghum bicolor</i> , L.) cultivated in histosols	119
Functionality of Insulin Plant ( <i>Costus igneus</i> N.E. Br.) Leaf Extracts	119
Natural plant growth regulator effects on the vegetative growth of long pepper ( <i>Piper retrofractum</i> Vahl.)	120
Evaluation on Salinity Tolerance of New Maize Hybrids at Early Growth and Their Performance in Coastal Field	121
Research and Development of the Restructured Shrimp Product	121
Enhanced partnerships with farmers' associations, the key in sustaining rice productivity and income	122
Influence of Organic Fertilizer on the growth of Arrowroot	123
Cost and return analysis of organic potato in Gasa District, Bhutan	124
Disease Incidence and Molecular Diversity of Tungro Virus on Rice ( <i>Oryza sativa</i> ) in Bengkulu, Indonesia	125
Biological activity of rhizobacteria isolated from rhizosphere <i>Acacia crassiparpa</i> A. Cunn ex Benth. in timber plantations	125
<i>Session 7: ENVIRONMENTAL SCIENCE, AGRICULTURAL EDUCATION AND DEVELOPMENT</i>	126
Farmer's Learning Hub for Organic Agriculture Education	126
Agricultural Skills for the Promotion of Future Careers of Special Students at Phrae Panyanukul School, Phrae Province	127
Effect of Black Soldier Fly, <i>Hermetia Illucens</i> (Linnaeus), Larvae on Production Performance, Egg Quality, and Nutrient Digestibility in Post-Peak Chicken Layers,	128
The carbon footprint Assessment from Electricity in Amnatcharoen Province of Northeastern Thailand	128
Chemical Intensive Rice Production vs. System of Rice Intensification (SRI): Which Direction shall Cambodian Rice Agriculture be?	129

Farmers' Economic Status and Acceptability of Goat Farm Management Technology: A Case Study in the Lower Central and Upper Southern Regions of Thailand	130
Soil erosion rate estimates using USLE of selected corn producing areas in Barangay Vitali, Zamboanga City, Philippines	131
Environmental Awareness and the Role of Women in Environmental Preservation In Central Mindanao, Philippines	132
Improving Production Practices to Increase Rice Grain yield in Liberia	133
Energy inputs and carbon emission equivalent of selected agroforestry systems in zamboanga city, Philippines	134
Management for Promoting Agriculture Subject Learning in the Elementary School Level through KLUATOD Model, Num Nao District, Phetchabun Province	135
Promotion of Vegetable Gardening for Household Food Storage during Covid-19 Pandemic of Farmers in Praibung District, Srisaket Province	136
Composting of boiler-ash and biogas-sludge from the palm oil industry for use as plantlet growing media	136
Importance of marketing mix factors on consumer purchase decision towards organic rice of a community enterprise	137
Factors Affecting Farmers' Decision in Using Subsidized and Non-Subsidized Seeds in Hybrid Corn Farming in Seluma Regency, Bengkulu Province	138
The Comparison of Cost and Return from Raw and Ripe Namdokmai Mango Planting of Large Plots in Bang Phli District, Samutprakarn Province	138
Assessment of socio-economic aspects of farmers under Social Forestry program and its environment: Study Case at Tanjung Alam Village, Kepahiang, Bengkulu, Indonesia	139
Management of organic sweet potato from production to markets	139
<i>Session 8                      Advanced Research in Agricultural and Biological Sciences for Sustainable development goals ( SDGs)</i>	<i>140</i>
Exploring Medicinal Plant Associated Mycoendophytes: Phytochemistry and Bioactivity	140
Effect of Carboxymethylcellulose and Xanthan Gum on the Physicochemical and Sensory Properties of Passion Fruit Topping Sauces	141
Yield stability of new elite lines of yardlong bean ( <i>Vigna unguiculata</i> (L.) Walp. ssp. <i>sesquipedalis</i> Verdc.)	142
Allelopathy for Sustainable Weeds Management	142
Nanoparticles from <i>Neosartorya hiratsukae</i> against brown leaf spot of rice caused by <i>Drechslera oryzae</i> .	143
Natural product nano-particles from <i>Chaetomium</i> for resistant of Durian Phytophthora rot	144
Agricultural nanotechnology for plant immunity	144
Molecular Divergence Analysis for Pre-Harvest Sprouting Resistance in Rice ( <i>Oryza Sativa</i> L.) genotypes	145
Antimicrobial Enhancement of Red Onion Crude Extract using Epsilon-polylysine	146
Effect of Different Planting Materials Ratios on the Growth of Foliage Plants	147
Technical Efficiency of Rice Production in Klong Suan Sub-District, Bang Bo District, Samut Prakan Province, Thailand	147
Neglected useful crops of africa	148

Development of Inulin Beads from Jerusalem Artichoke by spherification and reverse spherification techniques	149
<i>In vitro</i> effect of <i>Callistemon viminalis</i> and <i>Melaleuca cajuputi</i> ethanolic extracts as botanical fungicide and insecticide	149
Application of organic soybean tempeh in raisin purple sweet potato cookie	150
Influence of perceived risks in farmer's decision towards sustainable farm practices: Evidence from Northern Thailand	151
Improvement of wool dyeing quality and antimicrobial activity using nano forms of silver	151
<i>Session 9      Advanced Research in Biological Agriculture</i>	<i>152</i>
Diversity of fungal spores in the canopy of two mangrove tree species of southwest India	152
Macronutrients (NPK) and other soil properties influenced by long term organic and conventional potato farming in West-Central Bhutan	153
Ectoparasite Species Attacking Chicken in Eastern Area of Bangkok, Thailand	154
Supply chain structure and constraints of a rice production community enterprise: Evidence from rural Thailand	154
<i>In vitro</i> Study of Antioxidant and Antimicrobial Activities of Soybean Tempeh and Split Gill Mushroom ( <i>Schizophyllum commune</i> ) as Plant-Based Diets	155
Mitochondrial DNA Analysis Revealed Genetic Diversity of Captive-Bred Hog Deer ( <i>Axis porcinus</i> ) Population in Thailand	156
Distribution and Management of Total and Available Sulfur under Durian Orchard Soils in the Eastern Thailand	157
Developing an International Cooperation Training Program and Designing Sustainable Agriculture Systems under the Climate Crisis Era	157
Survival of contaminated pathogenic bacteria in Thai fruit and Vegetable juice	158
Research and Development of the Healthy Ready-to-eat Strip Chinese Sausage	158
Improvement of Threadfin bream ( <i>Nemipterus spp.</i> ) surimi gel properties by electron beam irradiation	160
Effects of calcium sources on physiological traits related to pod and seed yield of peanut	160
Isolation and Optimization of Enhanced Anti- <i>Streptococcus suis</i> Bacteriocin Production by <i>Lactobacillus plantarum</i> RB01-SO	161
Effect of ingredients, storage temperature and time on texture properties and retrogradation rate of butter cake	161
Determination of biological activities of <i>Dendrobium</i> spp.	162
Growth of diatom <i>Amphora</i> sp. cultured on agar plates by streak plate technique	163
<i>Session 10      Advanced Development in Agricultural Sciences</i>	<i>164</i>
Control mechanism of nano-Chaetogobosin-C constructed from <i>Chaetomium globosum</i> 0805 against root rot of papaya caused by <i>Phytophthora palmivora</i>	164
Kinetic Reduction of UV-C against <i>Salmonella</i> Typhimurium Contaminated on Radish sprouts ( <i>Raphanus sativus</i> L.)	164
Effects of Paclobutrazol on yield and quality of Mao Laung ( <i>Antidesma thwaitesianum</i> Müll. Arg.) Cultivar	165
Study of Biochar on Growth and Yield of Choy Sum ( <i>Brassica chinensis</i> L. var <i>parachinensis</i> )	166
Effect of Seed Coating with Fluorescent Compound on Quality and Fluorescence of Cucumber seeds	166

Acclimatization of Micropropagated <i>Dendrobium</i> sp with the Application of Organic Fertilizer	167
Antimicrobial Susceptibility of Chili Extract against Foodborne Pathogens and Food Related Bacteria	168
Application of nano-Chaetoglobosin-C from <i>Chaetomium globosum</i> to control of tomato wilt caused by <i>Fusarium oxysporum</i> f.sp. <i>lycopersici</i>	168
Application of nano-Chaetoglobosin-C from <i>Chaetomium globosum</i> to control anthracnose of chilli caused by <i>Colletotrichum gloeosporioides</i>	169
Application of nano-Chaetoglobosin-C from <i>Chaetomium globosum</i> to control brown leaf spot of rice caused by <i>Drechslera oryzae</i>	169
Extraction and antioxidant activities of broken <i>Ganoderma lucidum</i> spore	170
Genetic Characterization of <i>Rhizobium</i> Bacteria Isolated from Bean Nodules and Its Effect on Soil Quality	171
Status of Arbuscular Mycorrhizal Fungi Populations in Some Pastures of Ankara Region, Turkey	171
Potential use of extracts and an active constituent from <i>Desmodium sequax</i> to control fungal plant diseases	172
Simultaneous and sensitive detection of CVB, CChMVd and CSVd mixed infections in chrysanthemum using multiplex nested RT-PCR	173
The role of <i>Lumbricus rubellus</i> for improving the quality of various animal manures through vermicomposting	173
Potential of PGPR isolated from rhizosphere of pulpwood trees in stimulating the growth of <i>Eucalyptus pellita</i> F. Muell	174
<i>Session 11 Advanced Development of Biological Technology</i>	175
Ectomycorrhizal communities of pine forests in south Vietnam and applying for reforestation	175
Potential of <i>Trichoderma asperellum</i> as a bio-control agent against citrus diseases caused by <i>Penicillium digitatum</i> and <i>Colletotrichum gloeosporioides</i>	176
Effects of Hydrocolloid Addition on the Quality of Cookies Substituted Wheat Flour with Sinin Rice Flour	177
Changes in Soil Properties Affected By Rice Stubble Burning In Bangkok Soil Series	177
Identification of soil insect diversity in the turtle conservation area, Bengkulu university	178
The effects of sous-vide cooking on the physicochemical, microbiological, and carbon footprint of buffalo meat at various temperatures and times	179
Development of Soft Cookie from Pregelatinized Banana Flour and Germinated Brown Rice	179
Combination of Humectants with Potassium Sorbate and Sodium Benzoate to Inhibit <i>Curvularia clavata</i> Contamination in Thai Fermented Fish Spicy Dip (Nam Phrik Pla Ra)	180
Antibacterial and anti-biofilm formation activities of high heat tolerant herbal extracts against white feces syndrome-associated <i>Vibrio parahaemolyticus</i>	181
<i>In vitro</i> shoot proliferation of Mangosteen's micro shoots using combination of 6-Benzylaminopurine and 1-Naphthaleneacetic concentrations	182
Application of nano-Trichotoxin A50 from <i>Trichoderma harzianum</i> PC01 to control Anthracnose of papaya cause by <i>Colletotrichum gloeosporioides</i>	182



Biological control of <i>Colletotrichum gloeosporioides</i> causal agent of citrus anthracnose by using <i>Trichoderma hamatum</i> K01	183
Isolation and Characterization of Actinobacteria with Antibacterial and Plant Growth-Promoting Activities from Maoberry Cultivated Soil in Northeast Thailand	184
Karyological Analysis on Wheat T1r ( <i>Triticum aestivum</i> L. ssp. <i>vulgare</i> Vill. v. <i>leucospermum</i> Körn.) Populations in Lake Van Basin, Turkey	185
Partial Sequence Analysis of Cellulose Synthase <i>OsCESA4</i> and <i>OsCESA9</i> Genes in Native Upland Rice, Thailand	185

## Abstracts

## Plenary and Keynote Speakers

### Sustainable Development and New Challenges (Covid-19)

**Konuma, H.**

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**Abstract** UN estimated that nearly 690 million global undernourished (hungry) population existed in early 2020 would have increase by 132 million to 822 million by the end of same year (16 % increase in one year), and acutely food insecure people, or people at a risk of starvation, would have increased from 149 million in early 2020 to 271 million in November 2020 (nearly 50% increase in one year) due to Covid-19 pandemics. Indeed, it affected seriously in food systems such as transport and marketing, high food production cost and food price increase, agricultural labor shortage, etc., while purchasing power of people especially those who lose jobs and living in urban areas declined considerably. It also created widening the gap and inequality between those who lost jobs and negatively affected by COVID19, and those who didn't. The world is expected to add nearly 2 billion population by the year 2050 from present level of 7.6 billion. The average per capita calorie consumption has also been increasing rapidly and would reach a range of 3,000 – 3,200 kcal per day by 2050 from that of 2,780 kcal in 2005/07. The combination of these factors would necessitate the increase of global food production by 49 percent by the year 2050 from the level in 2012 to satisfy rapidly increasing food demands. However, if we look at developing countries alone where the vast majority of chronic hunger population exist at present, and where almost all the world population increase would occur in the future, we need to increase food production by 112 percent during the same period (FAO, 2017). Against these challenges, in addition to negative impacts of Covid-19, the world has been experiencing serious constraints and uncertainties, such as the stagnation of expansion of arable lands, increasing scarcity of water resources, stagnation of annual crop productivity growth, loss of bio-diversity, high food losses and waste, and negative impacts of natural disasters and climate change. While FAO predicts that it would be possible to increase food production by 49 percent by 2050 mainly from existing arable lands with a benefit of technological innovation and yield increase through harnessing research and technology, it would remain very uncertain if the target is achievable due to unpredictable impact of Covid-19, climate change and other factors. If we fail in achieving these targets, poor people in developing countries would most suffer, world food security would seriously be threatened, and it would result in losing world peace and stability. Under these constraints, it is obviously clear that agricultural research, science and technology have the highest importance in our development challenge and future sustainability. They must play a key role with increased investment, collaborative research and concerted efforts among all actors among governments, academic/research institutions and private sectors.

## The Planetary Health Diet: advancing human nutrition and safeguarding the environment in the Anthropocene

**Guinto, R. L. L.**

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**Abstract** Planetary health is a new systems paradigm that integrates the health of the human civilization and of the natural systems on which it depends. This new discipline emerged in recognition of the Anthropocene – the proposed geological epoch which emphasizes the massive influence of human activities in shaping the dramatic changes afflicting the Earth's geology and its ecosystems. One of the major human systems that are driving these transformations is the food system. Food is essential for sustaining the health of human populations, but its production and distribution are exerting tremendous pressures on the Earth's vital processes. To address these intersecting problems, a scientific commission proposed in 2019 the concept of the “planetary health diet” – a global diet that meets humanity's nutritional needs while protecting the planet's boundaries. This lecture will provide a brief introduction of planetary health, discuss the science behind the planetary health diet, and present some ideas and recommendations for the way forward.

## True, full, and fair costs accounting of rice, the staple food of half the people of the world

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**Abstract** True Cost Accounting (TCA) in food and agriculture is an evolving method for assessing the true costs and benefits of different food production systems. TCA was employed in accounting the true cost of rice, the staple food of over half of the people of the world. Our objectives are: a) to calculate “what is the true, full and fair cost of rice” b) to present strategies on how to reduce the full costs of rice to comply with the sustainable development goals (SDGs) of the United Nations and c) to recommend transformative or progressive transition policies to reduce the full costs of rice. As to the question, is the price of rice really high ?. It very difficult to answer this question now! Due to Pandemic, more tha 100 million people became poor any more will become poorer as the become unemployed, underemployed due indudtry go bankrupt. Ou calculations showed true costs of well milled rice is PhP266/Kg (the costs of biodiversity loss and health are not yet included). In the Philippines, the current retail price of conventionally grown rice ranges from P28/kg to P55/kg which is only 10.5% to 20.6% of its full costs. Even the inflation corrected price at P113/kg is only 42.5% of the total costs. The monetary costs accounting for 14% of total cots is suggestive that we are only paying fourteen centavos (14) of the one (1) peso worth of rice. Of the 3 costs items, the cost of carbon emission monetized as social costs of carbon (SCC) was

the highest at P161/kg for rice grown the highly chemical intensive way. This was due to the high soil emissions of methane and nitrous oxide. Growing rice organically had only PhP 75/kg as SCC. With or without pandemic, the inter-related challenges of reducing the monetary costs, water footprint, and the high emissions of methane and nitrous oxide in paddy fields (at 72% of the total CO<sub>2</sub>eq emission of 4.8 tons per tone of milled rice) should be addressed. This calls for transformative culture in eating and growing rice. Consuming dehulled rice or brown rice and reducing per capita consumption (from 119 to 80 kg per person shall make the Philippines self-sufficient in rice) and it can pave the way to the progressive transition of growing organic rice through the systems of rice intensification (SRI). Growing organic rice reduce the water foot print by 50% and the social costs of carbon emission by 53.4% due to reduction of nitrous oxide and methane emission. Rice grown through organic SRI led to about 53% reduction (PhP141/kg) in the true costs of rice

### Health Benefits of Organics : Herbal formulations to fight against the Pandemic Sar-Cov-2 corona virus

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**Abstract** Organic products reduce health risks to consumers by decreasing their exposure to toxic substances and pesticides being used in non-organic farming. Plants grown organically are rich in nutrients and active ingredients beneficial to human health. The presence or absence of carbon is what differentiates organic from inorganic nutrients. The organic fertilizers consist of natural materials, such as bacteria, molds and other organisms providing the soil environment suitable for better yields of organic constituents. Our research have developed herbal formulations consisting of *Houttuynia cordata*, *Curcuma longa* and *Boesenbergia rotunda* to fight against Sar-Cov-2 corona virus. Polyphenols are the main active ingredients of these herbs and can be broken down into flavonoids, phenolic acids, stilbenes and lignans. About 5-10% of polyphenols are absorbed in the small intestine. The nano-encapsulation techniques were used to improve the bio-availability of these active ingredients allowing the active ingredients to be much better absorbed when being given orally. Curcuminoids, Quercetin Glycosides and Panduratin A derived from tumerics, *Houttuynia cordata* and finger root respectively, have been shown to inhibit viral replication and prevent the viral synthesis of capsid and spike proteins of Sar Cov-2 virus. In addition, the anti-oxidant and anti-inflammatory effects of these synergistic active ingredients can also protect the damage of organs and tissues inflicted by corona virus. Anti-oxidants inhibit the oxidation reaction of other molecules that can produce free radicals. Quercetin, a plant derived flavonoid glycosides inhibit inflammatory enzymes thereby decreasing inflammation. Due to the remarkable biological activities of these active ingredients and their safety profiles make these herbal formulations very promising to be utilized for prevention and treatments of Covid 19 infections. Organically grown herbs used did not have contamination with heavy metals and toxic chemicals.

## Can we effectively control pine wood nematode by plant resistance inducers ?

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**Abstract** Pine wilt disease (PWD) is a devastating tree disease caused by the pine wood nematode *Bursaphelenchus xylophilus* (PWN). Generally, plants resist pathogen attack through a combination of constitutive and inducible defense. To investigate whether previously known resistance inducing chemicals prevent the spread of PWNs through the induction of resistance in pine trees, several SAR inducers, including acibenzolar-S-methyl (ASM), were tested for the disease control of PWD using *Pinus densiflora* seedlings. The foliar application of ASM formulation showed high efficacy of PWD control in 3-, and 5-year old red pine seedlings. Additionally, in order to investigate whether microorganisms prevent the spread of PWNs through the induction of resistance in pine trees, ca 1,500 bacterial strains isolated from soils and plant tissues were tested for the activity as resistance inducers in Arabidopsis system. Out of 48 bacterial isolates selected through the 1st screening, a foliar spray of the culture broth of *Bacillus subtilis* JCK-1398 showed the strongest control efficacy against PWD in pine seedlings. Both ASM and JCK-1398 also effectively suppressed the development of PWD under field conditions. After preparing the optimum formulations of the two materials, the disease control efficacy of the two prototypes is in progress in fields with aerial application using either a drone or unmanned helicopter. This study suggests that the aerial spray of ASM and JCK-1398 may effectively and environmental-friendly reduce the incidence of PWD by induced resistance.

**Keywords:** pine wilt disease, pine wood nematode, resistance inducer, acibenzolar-S-methyl, aerial application, *Bacillus subtilis*

## Investigation on the Efficacy of Bio-agents and Chitosan against Finger millet Blast Disease

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**Abstract** To evaluate the efficacy of different biocontrol agents in controlling blast disease in finger millet caused by *Pyricularia grisea*, a field experiment was conducted during *kharif* 2018-19 and 2019-20 at Agricultural Research Station, Vizianagaram. There were 9 treatments replicated 3 times. The treatments included seed treatment and its combination with foliar application of biocontrol agents viz., chitosan, *Pseudomonas fluorescens* and *Bacillus subtilis*. Seed treatment with carbendazim was also evaluated. Seed treatment was done at the time of sowing and the foliar application of biocontrol agent was done at the time of panicle initiation stage and grain filling stage of the crop. Among all the treatments seed

treatment with chitosan + 2 foliar sprays of *Pseudomonas fluorescens* (T6) was the most effective in controlling leaf blast severity, neck blast and finger blast incidence followed by seed treatment with *Pseudomonas fluorescens* + 2 foliar sprays with *Pseudomonas fluorescens* (T7). Significantly higher grain yield, fodder yield and benefit cost ratio was also recorded in T6. The combination of seed treatment with chitosan and foliar spray with *Pseudomonas fluorescens* was found effective in managing blast disease of finger millet. Further, blast disease in finger millet is externally seed borne. Seed treatment followed by foliar application of biocontrol agents not only reduced disease pressure but also enhanced the grain yield.

**Keywords** Bacillus subtilis, Biocontrol agents, Chitosan, Finger millet, Pseudomonas fluorescens, Pyricularia grisea

## Internet of thing (Iot) for smart agriculture in rural areas

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**Abstract** The main challenge in the world is the insufficiency of food and land to ensure food security. To achieve this task we need to increase food production in the world. Therefore, today agriculture uses sophisticated technologies increasingly such as robots, sensors, aerial images, automation in Agriculture, and GPS technology. Smart Farming uses those technologies which are focusing on the use of data acquired through various sources (historical, geographical, and instrumental) in the management of farm activities. It means we use several devices and technologies to manage the farm. The main goal of transferring to smart farm technologies is to increase the quantity and quality of agricultural production while optimizing labor for production. IoT can add value to all stages of farming, from growing crops to harvesting and marketing. Using IoT is helping small-scale farms as well as large-scale farms to make informed decisions. Moreover, IoT assists in collecting, monitoring, and analyzing data related to crops even from a remote area. As a result, the smart farm will support farmers to economize the labor time on the farm as well as consume less energy, water, fertilizer, seed, pesticide, and other inputs. Finally, IoT brings efficiency to the agricultural space, and creates a good cycle that makes food products more promptly available to consumers, saves farmers' time and money, and reduces the environmental impact of farming by driving sustainability into the achievement.

**Keywords:** Internet of Things, smart agriculture, rural areas



## Agricultural Technologies of the Future: Intelligent Plant Factory

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**Abstract** One of the new directions in the development of intensive plant cultivation technologies is the creation of so-called vertical farms. Other names for this technology are city farm, plant factory, plant factory with artificial lighting. Vertical farming appears to be a fundamentally new level of development of plant growing systems that allows us to settle crop production practically in any place, including densely populated urban areas. New technologies of horticultural lighting (growing plants using artificial radiation sources) based on the light-emitting diodes (LEDs) suggest effective regulation of the spectral composition of light during plant vegetation. Thanks to this, today we can influence the quality of crop biomass by reducing the content of nitrates, enhancing the biosynthesis of target functional compounds - vitamins, essential oil components in spice-flavoring crops, etc. Extensive opportunities in regulating light spectral composition and optimizing light modes of plant cultivation serve as the basis for the transition to a qualitatively new level - to combinatorial horticultural lighting. Selection of optimal light modes for growing plants (in fact - the development of a kind of "light recipes") is one of the crucial areas of research in the development of smart technologies for intensive cultivation. Further development of LED lighting systems for intensive plant cultivation is associated with the development of control protocols that provide fine-tuning and automatic correction of lighting parameters during plant vegetation. We are talking about fundamentally new approaches to the development of smart technologies for plant growing with artificial lighting, based on the possibility of effective regulation of their photosynthetic activity and production process, on one hand, and the widespread use of modern digital technologies (computer vision and machine learning, artificial intelligence, the Internet of Things), on the other hand. The creation and practical application of a set of software and hardware solutions and robotic intelligent approaches for growing agricultural plants in closed systems ("Smart, or intelligent, greenhouses"), which can significantly reduce production costs and increase labor productivity, is one of the key areas in the development of cutting edge crop production technologies today.

**Keywords:** Vertical farms, horticultural lighting, LEDs, light recipes, digital technologies, artificial intelligence

## Circular bio-economy perspectives for sustainable management and effective valorization of food industrial wastes and by-products

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**Abstract** The entire agri-food industrial sector produces enormous amount of wastes (biomass) and by-products (post-processing) that are disposed-off unsustainably or are burnt or go as a landfill, creating much burden on the environment. Today, the world is facing various recurring challenges like population explosion, hunger, scarcity of fertile land/natural resources, climate change impacts, and coupled with this is the recently witnessed pandemics (like Covid-19), which are all creating instability in sustainable food production and imbalance towards ensuring food security. Besides, these facets are also rendering it practically impossible to attain the sustainable development goals of the UN, to be achieved by 2030. Sustainable management strategies goal is to minimize the use of natural resources, adopt appropriate processing technologies and thereby reduce the amount of wastes/by-products generated along the entire supply and production chain. Mitigating excessive consumption of raw materials and effective valorization via reducing the amounts of wastes generated with maximal utilization of by-products to produce value-added products is the requirement of the present day. In this sense, the circular economy concept (of the EU) revolves around designing and proposing a systemic approach for economic development to benefit the society, environment, and safeguarding sustainable economic growth in the agri-food business sector. The circular economy (bioeconomy) concept is a practical solution that provides an opportunity to support the sustainable development of agri-food industries, reduce greenhouse gases and enhance the competent use of natural resources (food-water-energy/fuel). The main emphasis of agri-food based researchers is now focused on optimization of the available innovative processing technologies to produce minimal amount of wastes/by-products and develop (or adopt) appropriate green technologies for effective valorization to convert them into high-value-added functional ingredients. Valorization of industrial wastes/by-products has led to the recovery of many valuable components like bioactive compounds (e.g. polyphenols, dietary fiber, pigments, vitamins, protein hydrolysate with bioactive peptides, oligosaccharides, oil, etc) with confirmed bioactivities (e.g. antioxidant, anti-inflammatory, antimicrobial, anti-tumor, anti-cholesterol activity, etc). Besides, industrial wastes have also been explored to produce bio-fuel, bioplastics, organic acids, enzymes, and livestock feed. Some of the valorized raw materials have been derived from the wastes and by-products of the fruits and vegetable processing industries (peel, seeds, pomace), dairy industry (colostrum, whey), fish industry (skin, bone), poultry industry (feather, skin, eggshell) and meat industry (bones, skin). Besides, underutilized produce (wild fruits, vegetables, legumes) have also been explored. The opportunities are profuse to exploit these wastes and by-products sustainably in various food, eco-cosmetics & pharmaceutical industries applications. Within this background, this keynote will focus on sharing updated information on the need for valorization of food industrial wastes/by-products (with case study examples), life cycle assessment and sustainable management strategies within the circular economy context. In addition, the present global scenario, opportunities, constraints, and future prospects will also be highlighted.

**Keywords:** Circular economy, Valorization, Agri-Food Industrial Wastes and By-Products, Life Cycle Assessment, Sustainable Management.

## Research investigation and application in organic agriculture for sustainable development goals (SDGs)

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**Abstract** A key of the sustainable development goals is to build up food security and safety and to serve human being for good health with long life. Organic crop and animal production for consumers would become one of the important attention in each country by the strong policy of the government and politicians to encourage organic agriculture as well as scientists, farmers and consumers. Organic agriculture is non-toxic agrochemical application in all processes from the fields to consumers. It is a crucial period to change from the conventional and chemical agriculture to organic agriculture. It will serve the sustainable development goals toward green biotechnology which benefit for the world. Research and development in organic agriculture are urgently needed to investigate the bioproducts as agricultural inputs. The bio-revitalizer and bio-remediation to cultivated soil can be firstly apply to improve soil fertility and possible remove the contaminants, pollutants, and toxic substances from soil, water and surrounding environments. Bio-decomposer would be used to promote the farmers to make organic compost/fertilizers to improve the cultivated soil leading to low production cost. Microbial fertilizers with high nitrogen, phosphorous, potassium will help the plant growth and increase yield. The naturally inorganic substances provide to neutralized soil for proper plant nutrient uptake, eg lime, dolomite etc. Biochar may provide the agricultural benefits to increase soil fertility and crop productivity. The natural bio-nutrients are used for plant growth stimulant and increased quality and quantity of yield. Bio-fungicides are applied for disease control (*Chaetomium*, *Trichoderma*, *Gliocladium*, *Streptomyces* etc.). Bio-nematicides for nematode control are developed from *Paecilomyces*, *Dactyrella*, *Arthrobotrytis*, *Verticillium* etc. Bio-insecticides are used for repellent or kill specific insect pest (*Metarhizium*, *Beauveria*, *Isaria*). Moreover, the other techniques would be integrated as herbs/medicinal plant extracts, cultural practice, crop rotation, inter-cropping, mulching, organic amendment, solarization, wood vinegar pheromones, insect trap etc. Presently, there are successfully cultivated organic crop for the consumers. However, organic agriculture includes crop and animal production, organic seed production, organic animal feed, organic food processing etc. Organic certification is urgently needed to make the consumers trust to be reliable organic products. Hopefully the promotion of organic agriculture would be increased year by year to reach food security and safety and serve the target of sustainable development goals (SDGs).

**Keywords:** Organics, Safety food, Bioproducts, Organic certify

## RESEARCH FORUM

### Session 1: ORGANIC AGRICULTURE AND RELATED FIELDS

#### Allelopathic Effect of Sorghum Root Extract and Its Potential Use as a Bioherbicide

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**Abstract** The bioherbicide of sorghum root extract had a significant effect on seed germination. It inhibited the seedling growth of test plants, i.e., rice (*Oryza sativa*) and mung beans (*Vigna radiata*). The test plant treatment significantly affected the radicle and plumule length, radicle and plumule fresh weight, and the radicle and plumule dry weight. Bioherbicide concentration, on the other hand, affected all observed variables i.e. normal and abnormal sprouts, radicle and plumule length, and radicle and plumule weight. The percentage of normal and abnormal sprouts, radicle and plumule length, and radicle fresh weight correlated with the test plant and bioherbicide concentration. The higher the concentration of sorghum root extract, the lower the normal sprouts, radicle length, plumula length, and the fresh weight of mung beans (representing broadleaf weed) and rice (representing narrow-leaf weeds). The regression analysis showed that LC 50% sorghum root extract was 5.24% for rice and 4.93% for mung bean. In summary, sorghum root extract can be a bioherbicide to control both narrow and broadleaf weeds in marginal land of coastal environment.

**Keywords:** biopesticide, dhurrian, organic agriculture, sorgoleone, weed control

#### A paradigm shift in the Promoting the Adoption of Organic Agriculture

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**Abstract** Our food production threatens climate stability and ecosystem resilience. It constitutes the single largest driver of environmental degradation and transgression of planetary boundaries. There is a need for radical transformation of the food system. In the Philippines, more than 98% still practice the conventional highly agri- chemical intensive production systems. in this paper, we discussed a paradigm shift in promoting the adoption of organic agriculture comprising mainly of consumption-based and demand-led approach. The demand-driven promotion of organic requires changing food

consumption patterns. In turn, it requires consumer welfare education and food production policies and programs supportive of consuming organic and healthy foods. Demand-driven consumption is anchored on changing food habits. This calls for incorporating organic and healthy food system education at all levels. It is a holistic consumption-oriented training and mind-setting to become a responsible food consumer. Food production policies and programs supportive of consuming organic and healthy foods should be institutionalized as follows: Government-led and private sector sponsored feeding programs in schools to nourish children and to serve and feed victims of calamity (floods, mega typhoons) or even those who find daily living a calamity by itself. The government and private sector should take a more active role in promoting responsible consumption i.e. avoiding food wastage. Thus, a more consumer-welfare oriented multi-quad-media campaign with emphasis on the use of social media, in terms of information, education and communication modalities must be launched to empower consumers to adopt responsible consumption under the platform of nutrition and health security considerations which in turn, support demand-led promotion of organic and green agriculture. As a guide in designing food production program, the government can now use the planetary health diets (PHD) concepts. Planetary health diet is a new systems paradigm and discipline that integrates the health of the human civilization and of the natural systems on which it depends.

**Keywords:** Paradigm shift, organic agriculture, demand-driven consumption, planetary health diets

## The organic coffee production at the Phouphieng Paksong Boloven Plateau in Lao PDR

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**Abstract** Lao PDR is one country, which based on agriculture as the main factor of economic system. Agriculture is one of the most important sectors of the economy of the Lao PDR. It currently contributes 51% to gross domestic products (GDP) and accounts for 85.5% of the total force. Its contribution to national export earnings has been estimated at approximately 40%. Among the agricultural sub sectors in Lao PDR are coffee, etc. Coffee production is the most important permanent crop, mainly grown on the Phouphieng Paksong Boloven Plateau. There are 50,000 ha of coffee grower, There areas are suitable for growing the coffee. It is known that the region in a good coffee growing potential area. The government through MAF is trying to promote the planting of this crop as much as possible in order to support local organic coffee. Families of coffee smallholders are benefiting from the cooperative services. Each family owns an average of 5 hectares of plantations 841 families in the organic process. Groups of producers distributed in 43 villages 37 groups in the organic process. Employees dedicated to support coffee producers cooperative members including the management team, technicians, officers and workers, 8 women working full-time. Total area 3,319 hectares of Arabica plantations in the organic process. Average 3,95 h/family in the organic process. Organic 2,316 Ha/9,753MT of cherries. In-conversion: 1003Ha/3,522MT of cherries. This is for Robusta plantations in the organic 1,128 Ha. Average: 1,34 Ha/family. Organic 858Ha/1,830 MT of cherries. In-conversion:270Ha/928MT of cherries. Dry mill and laboratory to collect and prepare

members coffee for export with a capacity of one container of green coffee daily. 9,506 Tons of cherries processed by coffee producers cooperative members during 2020 – 2021 harvest Arabica: 8,751 MT and Robusta : 755 MT. 1,355 Tons of coffee exported during 2019-2020 harvest, worth than 71 containers, including 1,150.8 MT of washed Arabica and 204.6 MT of Robusta semi-washed.

**Keywords:** coffee organic Arabica and Robusta variety

## Organic agriculture in Myanmar

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**Abstract** Organic agriculture in Myanmar is the period in crucial turning point as we have known that agrochemicals that have negatively affected to human health and our environment. Shew Khat Kyaw Manufacturer has one of the policy to be a part of organic crop production and organic fertilizers which produced for contributing to farmers according to know how of Prof. Kasem Sioytong from Thailand. Organic markets are interesting attention from the educated consumers who are aware of their health. The detail information will be explained in my presentation.

## Yield enhancement of *Lycopersicon esculentum* Mill. Using microbial consortium

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**Abstract** Plant associated microorganisms play a crucial role in agricultural productivity. The application of Plant Growth Promoting Rhizobacteria (PGPR) in agriculture represents an environmentally sound way of increasing crop yield by increasing plant growth through various mechanisms like solubilising nutrients, hormonal balance, siderophore production and inducing resistance against plant pathogens. Tomato (*Lycopersicon esculentum* Mill) is one of the most popular and widely grown vegetable in India. The average yield of tomato is not according to the crop potential due to various factors. The use of Plant Growth Promoting Rhizobacteria as a biofertilizer is eco-friendly and more economic. Therefore, the goal of the present study was to investigate the synergistic interaction of PGPR consortium (*Pseudomonas fluorescense*, *Bacillus subtilis*, *Azospirillum brasilense*) and to evaluate its efficiency on the growth and yield attributes of tomato. Pot culture studies were carried out using the formulation of these rhizobacteria. The tomato plants were treated with the single inoculation and combined inoculation of PGPR. The triple microbial inoculation of PGPR significantly improved the growth characteristics (root length, shoot length, fresh and dry weight), photosynthetic pigments and total yield of tomato plants compared to control. Further, the influence of PGPR consortium resulted in the enhancement of nutritional status of tomato plants as determined by their nitrogen, phosphorus, potassium, carbohydrate and protein contents. It also showed

considerable increase in vitamin C and lycopene content. Therefore, consortium of Plant Growth Promoting Rhizobacteria possessing growth promoting traits can be effectively used as a biofertilizer to improve crop productivity for sustainable agriculture.

## Circular economy of Oyster Shell in Taiwan

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**Abstract** Oyster dish is a traditional and popular food in Taiwan. However, Oyster shell induces environmental pollution. This study introduces the circular economy of oyster shells and a novel method in Taiwan. Taiwan Sugar Company established a circular economy process to recycle the oyster shell. Firstly, a bio-material factory was built to transfer oyster shells to powder. Secondly, Taiwan Sugar Company developed the agricultural/industrial application of oyster shell powder. This study displayed the application of oyster shell powder in building material. Concrete consists of cement, coarse aggregates, fine aggregates, and water. This study replaced the fine aggregates with oyster shell powder by the substitution ratio of 10%, 20%, 30%, and 40%. The compressive strength of 40% substitution ratio is 31.558Mpa, which reach the requirement of building material. In addition, 40% substitution ratio can reduce the specific gravity by 9.64% to be the lightweight concrete.

**Keywords:** bio-material factory; building material; concrete; environmental pollution; oyster shell.

## Influence of exogenous growth-regulators on physiological and growth processes of dwarf mandarin cv. 'Miagava-Vase'

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**Abstract** The influence of biologically active substances of a new generation (growth regulators and fertilizers) on the process of ovary fall, improving the quality of fruits and increasing the adaptive potential of tangerine was studied. Objects are dwarf mandarin cv. 'Miagava-Vase'. Tangerines are growing for 1986 year at plantation Subtropical Scientific Centre (Sochi, Russia). The experimental scheme included three options as exogenous growth-regulators: obstaktin (5 ml/l water); nano elisitor (1 ml/l water) and siliplant (5 ml/l water). Control –was spraying by water. Laboratory studies were conducted in the laboratory of physiology and plant biochemistry of the Centre. The content of chlorophyll and carotenoids are determined; the assessment of the functional state of plants was carried out on the parameters of slow induction of



chlorophyll fluorescence. It was found that the treatment of plants with growth regulators did not affect the content of green pigments in the leaves. In the processing plant nanoelisor and siliplant increases the number of carotenoids, thereby enhancing the defense reactions. Treatment with growth regulators led to an improvement in the functional state of plants, which was expressed in a higher value of the viability index, especially on variants with the introduction of nanoelisor and siliplant.

**Keywords:** chlorophyll, carotenoids, exogenous growth-regulators, fluorescence, mandarin

## Weed and Pest Management on Paddy Rice Cultivation Based on Farmers Practices

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**Abstract** Paddy rice is an important staple food. There are 155million ha grown to rice producing about 481,540 metric tons. Asia produced about 90%. About 4 billion people rely on rice. It has been found rice blast, sheath blight and leaf blight and some others serious diseases. *Cinnamomum burmannii* mixed fresh turmeric, BD 501 and BD 508 were found effective for control two fungus diseases and inhibited other diseases. Growing green manure crops with beneficial microorganism could control weeds, enrich soil fertility reduce fertilizer application. Many people concerned pesticides and herbicides which cause water and environment pollution affecting human health at present and generations to come. It is nice to control pest and weed by natural plant extractions and liquid microorganisms.

## Mass production of pseudomonas biofertilizer and its large scale application in arachis hypogaea

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**Abstract** Biofertilizers are one of the qualities advanced equipment for agriculture. Biofertilizer is a substance which contains living microorganisms, when utilized to the seed, plant surfaces or soil colonizes the rhizosphere or the inside of the plant and promotes increase through growing availability of major vitamins to the host plant. Pseudomonas biofertilizers furnish eco-friendly natural agro-input and extra low priced than chemical fertilizers. The field experiment was conducted in a farmer's field Salem district, Tamil Nadu, India respectively to evaluate the efficacy of *Arachis hypogaea*. During the whole growth period no agrochemicals and additional artificial watering were applied to the farmland. *Arachis hypogaea* were harvested at 60DAI compared to inoculants treated plants and non-inoculants plants.

**Keywords:** Microorganisms, Biofertilizer, *Arachis hypogaea*, *Pseudomonas*

## The Art and Myth of Organic Agriculture for Nature Conservation and Sustainable Food Production: Perspective of Bangladesh

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**Abstract** Bangladesh has really plenty of opportunities to promote organic agriculture in producing safe food for its huge malnourished population and maintain the sustainability of agricultural systems as well as conserve the nature. Moreover, due to having pro-poor attributes, organic agriculture of Bangladesh can provide better income for the smallholder organic growers through lowering production costs and ensuring premium prices. However, public sector research and extension agencies need to have some massive programme to remove farmers' confusion and link organic farmers with market. In addition, Ministry of Agriculture and Ministry of Commerce need to work jointly for introducing certification for organic produces that might create quicker access of Bangladesh's organic produces in global organic market that will ultimately contribute in national economy and wide spread rural poverty reduction through export earnings.

## Organic agriculture in LAOS

Douangphrachanh, B.

**Abstract** Lao PDR prioritized clean agriculture production as an important strategy policy. Organic Agriculture (OA) plays a crucial role in supporting this policy to enhance the production of the food for consumers, sustainable production, and conservation of natural resources and to provide the opportunities to generate income for farmers. Organic Agriculture production is deemed to have significant potential in the Lao PDR. Agriculture production in Laos has been widely practiced in a traditional way of subsistence farming systems which are resource based productions. The production systems are mainly based on indigenous knowledge and local conditions. However, this practice typically has a lack of diversity, consideration for the variable factors and the adaptive solutions to the unique conditions in each environmental condition. Laos has potentials to support Organic Agriculture production due to its enriched and abundant biodiversity and its favorable climate. On the other hand, the use of chemicals in agricultural production remains low level, which is considered as an advantage for clean agriculture production. Organic Agriculture production systems face several limitations and challenges that shall be overcome in order to enable Organic Agriculture development successful. In order to be recognized as Organic Agriculture for both domestic sale and export, the prioritized focus is the management of inorganic chemical usage, standardization of production systems and enhancing the certification for quality and safe produce.

## Practical experience in application of bioproducts for crop production in Cambodia and ways how to make them work more effectively

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**Abstract** My name is Vojtech Nemec, I am the Director of Bio Hi-tech Solutions. Our company distributes Prof. Soyong's bio products and others throughout Cambodia. In my presentation I will share some practical experiences where we recommended our bio products and solutions to farmers. For over 2 years we have been testing our bio fungicides (bio stimulants) Mocabi SL (known as Super Ketomium) containing 7 strains of *Chaetomium* spp, 2 strains of *Trichoderma harzianum* for diseases control, Bio nano elicitor which contains non-living nano particles of *Chaetomium* spp. and nano chitosan for plant immunity and disease control and finally Green Earth which contains bio stimulants – soil conditioners, humic and fulvic acids and various microorganisms such as *Aspergillus oryzae*, *Lactobacillus* spp., *Trichoderma* spp., *Chaetomium* spp and others. These 3 bio products we normally combine together to prevent and control various diseases in all sorts of plants as well as help them recover from stress and so on. First of all, I would like to talk about an experiment with fig cuttings variety BTM 6, we did along with farmers in Malaysia who had sent us the cuttings and we compared the results done by 2 different methods by using the same cuttings. Unfortunately, the cuttings we received had been packed poorly and mold was growing on them when we received them. We first removed the mold and soaked the cuttings for 12 hours in our 3 bio products at the recommended dose of 2.5ml / 1L of water each while delivering oxygen to the water tank to see if we can help to speed up new growth not only by using our bio products, but also by using an advanced technique. This experiment was done in Cambodia by a new farmer who has been following our recommendations and used air-pruning non-woven bags with potting mix made out of 70% compost and 30% coconut fiber with chips. This growing medium was treated with our Mocabi SL and Green Earth a week prior to planting, left in the bag to allow the microorganism to grow. Soil and plants in air-pruning bags were watered with Mocabi SL, Bio Nano Elicitor and Green Earth at the recommended dose after planting and this was repeated weekly together with a bio fertilizer containing amino acid, NPK 6-2-4, fulvic acid, calcium, magnesium and organic matter. In Malaysia farmers used a chemical fungicide and a rooting powder, soaked cuttings in them for 5mins then planted in black plastic bags traditional way, using soil from the farm that was not treated or amended, the way they have been doing for years. The results surprised all of us as nearly all our cuttings had shown new growth in less than 24 hours from the time we planted them which took over 2 weeks for the method in Malaysia. What was the most interesting about this experiment was the fact that only 2 cuttings out of 400 died by using our method in 25 days while in Malaysia it was over 10% in first 2 weeks and over 20% in a month. We found that the thickness of the cuttings significantly influenced the speed in which plants grew. Thicker cuttings were taking longer, but still had grown nicely. The additional costs of all materials we used, compared to the farmers in Malaysia was not only covered by the very low death rate, but in the end our way saved money and enhanced the growth rate dramatically. This experiment was to demonstrate that not only choosing the right products, but also improving the technique

significantly influenced the overall success and growth rate. We often hear that organic products are more expensive and less effective, but there many reasons behind to consider, and I will mention some of them later in addition to the ways we use and what we can use to reduce the cost and increase the efficiency of bio products. I would like to start with one example from an asparagus farm where we diagnosed root and crown rot from pictures we received. Unfortunately, we did not have the opportunity to visit the farm so we had to find out all needed over the internet. At that time the farmer was applying a bio product containing *Trichoderma harzianum* with *Bacillus* spp., but unable to solve the problem. Before I started recommending any products and solutions I asked to check the soil and make a video. The soil PH was 6-6,5 , but the soil was completely dry after lunch time. The farmer was irrigating every morning, but the soil was drying too fast, which most likely had a negative effect on the microorganism they used as well as the way they stored the product, which is a big problem. Often at farms, they don't pay enough attention to it and products are stored in shipping containers under the sun in the field during the hottest months. Another problem is that we see farms buying bio products for 12 months in advance which is a long time and will likely have a negative effect on the efficiency of microorganism based products. First of all I recommended irrigating the field to make it moist and mulching the field to retain the soil moisture and removing all dead and decayed parts of the plants followed by a foliar application and irrigating our bio products. Foliar feeding was done after 5pm when the sun was low by using our 3 bio products together at a recommended dose 2,5ml each together with a silicone emulsifier – sticker 0,25ml / 1L that can significantly reduce the cost of foliar applications and makes all products more effective. Irrigation was done early in the morning as water is cold and irrigation pipes are not boiling hot which is hard to avoid after 9am during the hottest months. First they irrigated only water for 5mins followed by recommended dose of our 3 bio products together with a seaweed fertilizer. First 2 applications were done 5 days apart followed by another 2 applications 7 days apart, all together 4 applications by spraying and irrigating. Over 80% plants started new growth after 3 weeks from the first application and in 6 weeks the plants recovered. We also did an experiment to see if we can completely prevent diseases in asparagus by applying our products on regular basis under different growing conditions and compare. We planted 4 months old asparagus plants that were in small air-pruning bags with treated potting mix right before floods started on a mound which was not high enough to completely prevent floods. Some compost was added into the mound to surround the plant and our 3 bio products were sprayed and watered with at recommended rate. Another plants were planted in larger air pruning bags with potting mix that had been treated with our products in advance and we used sand mulch to prevent soil insects. These bags were sitting on wooden pallets that also could not completely prevent the floods, all together we had 8 floods in 6 weeks. Now it is exactly one year and we have never had any disease and not one plant died. This experiment shows that even when we grow in bad conditions we can still do it without problems when plants are strong and bio products are used to prevent, rather than treat. Of course, the most important is the genetics, that is something we can never fix with any product, it is absolutely essential that farmers look for the best genetics available that are very resistant and also high value so they can make money in the end. Asparagus takes a long time and needs some care, growing not suitable or not valuable varieties and not preparing soil is where problems at farms in Cambodia start followed by often 0 budget for plant maintenance. Plants need more than just water, clay and manure.

**Keywords:** Biological fungicide, biocontrol of plant disease, plant immunity

## Organic beekeeping and value addition of bees wax and honey for livelihood of rural women and youth in andhra pradesh, India

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**Abstract** Honey Bees are very significant for ecological balance in agriculture, horticulture and forestry as they pollinate plants. Organic beekeeping is currently being carried out at college of Horticulture venkatramannagudem, Dr YSR Horticultural University, AP India and the local farmers are trained in scientific bee keeping by placing the *Apis mellifera* bee boxes in insecticide free cropping systems. The hives were placed in the nectar and pollen supplier plants within the flying radius of the bee colonies are on organically farmed land or from cultures and/or wild plants that do not jeopardize the organic quality of the beekeeping products. During the dearth period, feeding was given for a bee colony to survive; the bees were allowed to feed on organic sugar or organic syrup. All activities concerning the bee colony were documented such as extracting honey, feeding, pest and disease management. Maps were kept of the hive locations and were available for the inspection. The state Andhra Pradesh has unlimited source of pollen and nectar and bees aid greatly in the natural cross pollination of local crop and has been greatly gifted with a varied horticultural ecosystems that favors beekeeping. ATMANIRBHAR BHARAT, which interprets as 'SELF-RELIANT INDIA' or 'SELF-SUFFICIENT INDIA', is the vision and passion of our Prime Minister Sri Narendra Modi. Toning to the accord of 'SELF-RELIANT INDIA' programme, multiple indigenous VALUE ADDED PRODUCTS OF HONEY AND BEESWAX viz, Honey, Lip balms, Bees wax candles, Mosquito repellents, Shoe polish, Cockroach baits, pain balms, Sanitizers, honey cakes, Room freshener, crayons, lipsticks, Dry fruit honey laddoo, Eye liner, honey lollipop, Honey chocolates, Honey peanut butter sweets, Honey Ragi pudding, Honey fruit custard etc were prepared at the college of Horticulture, Venkatramannagudem, DrYSRHU. These products are 100 % organic and safe for consumption and use which can be scaled up for sales and marketing in Indian market in tune with the slogan 'VOCAL FOR LOCAL' Nevertheless, the profits gained through value addition of honey and bees wax in an novel expertise for improving the livelihood of the rural youth and women.

**Keywords:** Beekeeping, Value addition, Honey, Bees wax, Livelihood

## Community Structure of Arbuscular Mycorrhizal Fungal Species in Saline Soils of Turkey

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**Abstract** Salinization of soil is a serious problem and is increasing steadily in many parts of the world, in particular in arid and semiarid areas. Saline soils occupy 7% of the earth's land surface and increased salinization of arable land will result in to 50% land loss by the middle of the 21st century. This project was establish to: a) Isolation and enumeration of AMF spore populations in soils of different sampling sites showing a gradient of salinity, b) Determination of Mycorrhizal colonization indices on different host plants in sampling saline sites, c) Relationship among different soil physico-chemical features and AMF spore population and mycorrhizal colonization indices, d) Diversity and community composition assessment of AMF species in different sampling sites based on morphological and molecular methods and f) In vitro mass propagation of AMF prevalent species in laboratory conditions. For this purpose, Soil and root samples were collected from different regions including Ankara, Eskisehir, Iğdir, Samsun, Izmir and Konya. From 75 collected soil samples, 28 samples selected based on five EC groups. Different physicochemical parameters were also measured in all soil samples. Significant differences observed among soil samples EC in sampling regions. 24 different host plants in all sampling regions were also identified, dried and kept in institute herbarium. Significant difference observed in spore density among soil samples in different regions based on host plant species as well as soil parameters. The minimum and maximum average of spore density observed in Konya region from the Suaeda maritima and in Eskisehir region from wheat rhizospheric soil, respectively. The Eskisehir soils had the highest spore numbers and Samsun had the least spore numbers mean among the sampling regions. Host plant roots cleared and stained for observation mycorrhizal colonization as well as colonization indices assays (F% and M%). Fungal structures including mycelia, vesicles and arbuscules observed in all root samples. F% index had no significant difference among soil samples but the M% index was different except of Samsun soil samples. Three way ANOVA showed the significany effects of sampling regions, soil parameters as well as host plant species on Mycorrhizal colonization (M%). The highest and the least total averages of spore numbers, F% and M% obtained in samples collected from Eskisehir and Samsun regions, respectively. So, it seems that the most fungal spore numbers in the samples means the most values of mycorrhizal colonization. Pearson correlation analysis was also confirmed the positive significant correlation between spore density and root colonization index (M%). For morphological identification of AMF species trap culture was established using white clover as host plant in greenhouse condition for 120 days. Then, microscopic slides prepared from isolated AMF spores. Species identification was carried out based on spore morphology and wall characteristics using standard manuals and specialized websites. Then, different biodiversity indices were measured. Totally, Totally, 33 definite and 1 indefinite AMF species were identified from 12 genera, 6 families and 4 orders. The diversity of fungal genera as well as species was heterogenous among soil samples. It means that some fungal genera or species only observed in specific regions or samples. Also, the dominant AMF genus was *Glomus* with the most identified species. Samples from Eskishehir and Samsun had the most and the least species richness values, respectively

which is in agreement of the results of Spore density and cononization indices. On the other hand, *R. intraradices* determined as dominant fungal species with the highest values of FO, RA and IV indices. *Gigaspora gigantea* found as the rarest fungal species in all sampling regions due to the least IV value. Jaccard index showed the most similarity of AMF species between Eskishehir-Konya regions (0.74) as well as Ankara-Igdir regions (0.74). Also, the least similarity observed between Ankara-Izmir regions (0.34). Species richness (SR) mean ranged between 5.33 in Samsun 14.67 in Eskishehir. Shannon index (H) average varied between 0.99 in Samsun to 1.76 in Eskishehir. Comparatively to Hmax, Eskishehir and Konya regions presented the higher AMF biodiversity. The Eveness index ranged between 0.73 in Samsun to 0.98 in Eskishehir. High Equitability or Eveness values obtained in Eskishehir and Konya regions (close to 1) testified to an equitable distribution of AMF species. Lowest E value in Samsun region referred to the presence of some rare species, which were unequal distributed. The ecological conditions of Eskishehir and Konya regions seemed to be favorable for all AMF identified species and offered equal survival opportunity. Results of correlation between important soil parameters with AMF biodiversity parameters showed that soil EC, available P and K had negative effects on all of AMF biodiversity indices. Also, soil texture is an important factor in AMF biodiversity. Soil organic matter had most significant positive effects on fungal species richness, Shannon index as well as Eveness index in different sampling regions.

### Exploration of earthwormcast associated actinobacteria for plant growth promoting properties

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**Abstract** Earthworms, cast and gut are potential sources of high biotechnological interest because of its great diversity of compounds exhibiting a broad spectrum of biological activities. To date, researchers focusing on novel microbes in unusual and unexplored ecosystems. Actinobacteria are unique secondary metabolites producers having versatile bioactive compounds with industrial importance. The present study designed to isolate the actinobacteria from earthworm cast for its antimicrobial properties. Totally 12 actinobacterial colonies were taken from Sathyabama Culture collection and cultures were isolated earthworm cast of Kanchipuram agricultural area. All the actinobacterial cultures were screened for antimicrobial activity against one or more tested human and plant pathogens eg *Staphylococcus aureus*, *Enterococcus faecalis*, *Escherichia coli*, *Klebsiella pneumonia*, *Pseudomonas aeruginosa*, and *Ralstonia solanacearum*. All the cultures were also screened for Indole Acetic Acid (IAA), Phosphate (P) solubilisation, Extra cellular enzyme activities like amylase and cellulose. Optimization, characterization and taxonomy also done for the potential strain. Morphologically different colonies were isolated and sub-cultured for screening. In antimicrobial activity, among 12 isolates (EWCAA2,



EWCA3,4,5,7,10,11,21,22,23,24 and 25), 6 were showed antimicrobial activity against one or more tested pathogens eg *Staphylococcus aureus*, *Enterococcus faecalis*, *Escherichia coli*, *Klebsiella pneumonia*, *Pseudomonas aeruginosa*, and *Ralstonia solanacearum*. Of 6 isolates, strain EWCA21 showed activity against maximum pathogens and selected as a potential strain for further screening. EWCA21 was showed IAA, Phosphate (P) solubilisation, extra cellular enzyme activities like amylase and cellulose. In optimization, carbon and nitrogens sources were increased the activity and also bio-fertilizer production. Based on the characterization and taxonomy, the potential strain belong to Streptomyces.

The strain EWCA21 earthworm cast associated actinobacteria was found to be an imperative resource for biofertilizer applications and also for bio-prospecting that could produce novel bioactive metabolites useful for agriculture applications.

**Keywords:** Actinobacteria, Earthworm cast, Streptomyces, Antimicrobial and bio-fertilizer

### Biological activities of extracts and beauvericin from *Cordyceps cateniannulata* CPA14V.

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**Abstract** Antioxidant activities *in vitro* were recorded for antimicrobial and cytotoxic activities (liver cancer cells (HepG2), prostate cancer cells (PC-3) and normal cells (Vero)) of the extract of ethanol (CCM), *n*-hexane (CCH), dichloromethane (CCD), ethyl acetate (CCE), and water (CCW), and a cyclooligomer depsipeptide, beauvericin (CC1) from *Cordyceps cateniannulata* CPA14V. The results showed that CCD contained the main compound, beauvericin (CC1) and exhibited higher activities than the other extracts. Especially, CCD and CC1 displayed good cytotoxicity against HepG2 and PC-3 cell lines with IC<sub>50</sub> values from 19.17 to 45.29 µg/mL; the CCM and CCD exhibited good free radical scavenging capacity and antioxidant activity with SC<sub>50</sub> values of 102.95 and 86.87 µg/mL, respectively; CC1 demonstrated potent antimicrobial activities with MIC value of 100 µg/mL (for *Aspergillus niger*, *Escherichia coli*, *Fusarium oxysporum*, *Pseudomonas aeruginosa* and *Staphylococcus aureus*) and MIC value of 200 µg/mL (for *Bacillus subtilis*, *Candida albicans* and *Saccharomyces cerevisiae*), CCM inhibited *E. coli* and *C. albicans* with MIC values of 200 µg/mL and *A. niger* with MIC values of 100 µg/mL. In addition, all samples did not show cytotoxicity to normal cells (Vero) at the tested concentrations.

**Keywords:** *Cordyceps cateniannulata*, Beauvericin, Antioxidant, Antimicrobial, Cytotoxic

## Session 2. MICROBIAL TECHNOLOGY, BIODIVERSITY AND FOOD TECHNOLOGY

### How to be a “fungi” not a dead guy

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**Abstract** Of more than 14,000 known species of macrofungi, only a small percentage are deadly or potentially deadly to humans. Despite this low number of deadly species, every year hundreds of people die around the world because of poisoning by macrofungi. Insufficient knowledge, unclear taxonomy, a rise in the consumption of fungi, and misleading folklore are all contributing factors to these deaths. Methods to avoid future poisonings and the need for developing targeted education and awareness programs in regions where they would be of most benefit are discussed.

**Keywords:** amatoxins, edible mushrooms, deadly mushrooms, look alikes

### Phytostabilization of glyphosate contaminated soil using Plant Growth Promoting Rhizobacteria

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**Abstract** Studies of glyphosate degrading bacteria have involved selection and isolation of pure bacterial strains with enhanced or novel detoxification capabilities for potential uses in biodegradation of polluted soil. Microorganisms are known for their ability to degrade glyphosate in soil. In the present study, soil samples were collected from Steel Plant located in Salem District, Tamil Nadu, India. Soil was sprayed with 1% of glyphosate herbicide. Glyphosate soil and non-glyphosate soil were put in 16 pots (8 pots: 8 pots). Microorganisms are *Bacillus*, *Rhizobium*, and *Pseudomonas* were diluted with sterile water at a density of 10<sup>8</sup> CFU and inoculated to the soil surface (50ml .pot<sup>-1</sup>). *Zeamays* L. seeds were sown in each pot at the green house. In pot culture studies 45DAI *Zeamays* L. plant showed significantly increasing in the root length, shoot length, fresh weight, dry weight and total chlorophyll and carotenoids significantly increased in glyphosate treated plant compared to non-glyphosate control plant. The result showed that inoculation of bacterial cultures possess potential to be used in bioremediation of glyphosate contaminated environments and protect the agricultural soil.

**Keywords:** Microorganisms, Glyphosate, Polluted soil, Bioremediation

## Field Evaluation of Blast Resistance on Inbred Lines Rice Derived from Crossing Bengkulu Local Varieties

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**Abstract** Blast caused by the fungus *Pyricularia grisea* (Cooke) Sacc, is an important disease in rice. In the tropics, blast is generally more important in dryland than in lowland rice. Blast disease is one of the biotic constraints in the development of upland rice. This pathogen causes a yield loss of 1-50%. Evaluation of blast resistance was carried out in the Desa Aur Gading, Kerkap District, North Bengkulu. The materials were 18 lines derived from crossing local varieties (landraces) Bengkulu (Sriwijaya and Bugis) with drought resistant lines (IR7858 and IR148+), Situpatenggang and Kencana Bali were used as a check, respectively, as resistant and sensitive varieties. Data gathered included plant height, number of productive tillers, number of filled grain per panicle, percentage of empty grain, flowering age, weight of 1000 grains, weight of grain per hill, and yield potential. Blast symptoms and severity were assessed using a scale based on the IRRI Standard Evaluation System for Rice. All of the evaluated lines showed a level of severity below the susceptible variety Kencana Bali which reached 65%. The lines evaluated had the highest severity ranging from 30-43%, namely the G3, G5, G11, G12, G15, and G16 genotypes with scores between 5-6 which had moderately susceptible criteria. Situ Patenggung as a resistance check showed a score of 1. Several lines showed the same score as Situ Patenggung which had a severity level of <10% with a scale of 0-2 for the resistance criteria, namely G1, G2, G4, G6, G7, G8, G13, G17, and G18 lines.

**Keywords:** field evaluation, blast resistance, inbred lines, local varieties

## The trial of fresh straw mushroom (*Volvariella volvacea*) preservation in 9 days

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**Abstract** Straw mushroom (*Volvariella volvacea*) was the largest mushroom production in Vietnam and fresh mushroom consumed popularly in southern Vietnam. However, fresh straw mushrooms were difficult to store and easily damaged after a few days, leading to unstable supplies and fluctuating market prices from month to month. This research aimed to

understand the factors affecting the preservation of straw mushrooms such as temperature, packaging specifications, type of packaging, electromagnetic preservation, respiratory inhibition by nitrogen gas or irradiation. The comparative index includes RGB color change, brittleness change on texture meter, humidity, volume change, odor, and viscosity on the surface of fruit bodies. The results showed that, when storing straw mushrooms at a temperature of 15°C, packed 500g/pack in ethylene-reducing nylon bags, placed in an electromagnetic environment, the quality of mushrooms is equivalent to 90% of the original mushroom quality after 5 days, 80% after 7 days, and 75% after 9 days according to the survey criteria. The research results are the premise to have a pilot model to evaluate the preservation process better.

**Keywords:** *Volvariella volvacea*, straw mushrooms, preservation

## Protein hydrolysates from agricultural wastes for plant bacterial disease control

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**Abstract** Agricultural wastes, agro-industrial wastes and fishery wastes were collected and the protein hydrolysates were obtained with pepsin. Antibacterial activity of smaller than 3 kDa protein hydrolysates was determined against the plant pathogenic bacteria; *Xanthomonas citri*, *Ralstonia solanacearum*, *Burkholderia cepacia* and also against plant growth promoting rhizobacteria (PGPRs); *Bacillus subtilis*, *Pseudomonas aeruginosa* and *P. fluorescens*. Coconut residues (agro-industrial waste from coconut milk production), peanut seed coat (from peanut-based snack production) and rice straw (waste from rice farms) showed antimicrobial activity against *X. citri*, *R. solanacearum* and *B. cepacia* with higher than 74% inhibition. Coconut residue also increased growth of PGPRs, *B. subtilis* and *P. fluorescens*. Further protein hydrolysates from Nile tilapia (*Oreochromis niloticus*) and snake-head fish (*Clarias batrachus*) fin increased growth of all PGPRs.

**Keywords:** Agricultural wastes, antimicrobial activity, protein hydrolysates, plant pathogenic bacteria

## Evaluation of bacterial bio-agents against *Alternaria alternata* (Fr.) Keissler causing leaf blight in little millet

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**Abstract** Millets are one of the oldest food crops known to human, possibly the first grains to be used for domestic purpose. Among the small millets, little millet (*Panicum sumatrense*) is one of the hardiest minor cereal crops and indigenous to Indian sub-continent. Leaf blight disease has been a major production constraint for successful cultivation of little millet. Leaf blight pathogen was confirmed as *Alternaria alternata* based on morpho-cultural characteristics and molecular characters (ITS, SSU, Species specific primer (AA) and major allergen Alt a1 gene regions). A total of ten bacterial bio-agents: *Bacillus velezensis* (A6), *Bacillus* sp (GPUR-12), *Enterobacter cloacae* (GPUL-19), *B. mojarensis* (UMR-9), *Bacillus cereus* (GPUR-10), *Bacillus velezensis* (P42), *Pennibacillus polymyxa* (GPUS-13), *Bacillus megaterium*, *Bacillus subtilis* and *Pseudomonas fluorescens* were evaluated against the leaf blight pathogen *in vitro*. Among them, *Bacillus velezensis* strain P42 showed the highest mycelial growth inhibition (84.75%) followed by *Bacillus velezensis* strain A6 (81.10%), whereas the least inhibition of mycelial growth was recorded with *B. subtilis* (20.64%).

**Keywords:** *Alternaria alternata*, Bacterial bio-agents, Control, Identification, Little millet.

## Bioremediation of Oil-contaminated Soils of Mechanic Workshops

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**Abstract** The study was carried out to isolate and identify the fungi species present in contaminated soil samples from various mechanic workshops and also evaluate their biodegradation potential. Soil samples were obtained from three locations and one gram of each was added to nine milliliter of distilled water to give a tenfold serial dilution of which was made up to 10<sup>-3</sup> dilution. Zero point one milliliter aliquot of 10<sup>-3</sup> of each sample was pour-plated on prepared Sabouraud Dextrose Agar (SDA) and incubated at 25°C for 5 days for isolation of the heterotrophic and hydrocarbonclastic fungi. The fungal species isolated were seven namely; *Aspergillus niger*, *Aspergillus terreus*, *Aspergillus fumigatus*, *Candida albicans*, *Saccharomyces cerevisiae*, *Fusarium solani* and *Penicillium chrysogenum*. The fungal counts ranged from 1.6 x 10<sup>-4</sup> to 5.1 x 10<sup>-4</sup> (cfu/ml) There was variation in the morphological and microscopic characteristics of the seven fungal isolates. The percentage occurrence amongst the fungal isolates was higher in *Aspergillus niger* (41.17%) followed by *Aspergillus terreus* (17.64%), *Aspergillus fumigatus* (17.64%), *Fusarium solani* (5.88%), *Saccharomyces cerevisiae*

(5.88%), *Candida albicans* (5.88%), and *Penicillium chrysogenum* (5.88%). The biodegradation potential of the fungal isolates were confirmed using used engine oil as sole source carbon and energy through the vapour phase transfer method and *Aspergillus niger* was demonstrated as the most versatile among other isolates, making it a promising candidate for bioremediation of soil polluted with petroleum hydrocarbons. Thus, these oil-degrading microbes are abundant in soil and can be applied for bioremediation of soils contaminated with petroleum and petroleum products.

**Keywords:** Fungi, Contaminated soil, engine oil, petroleum hydrocarbon

## An Assessment of Sustainable Agroforestry Livelihood of K'Ho Cil Minority in Da Nhim Commune, Lac Duong District, Lam Dong Province, Vietnam

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**Abstract** K'Ho Cil is an indigenous community in Da Nhim Commune, Lac Duong District, Lam Dong Province, Vietnam. Besides participating in local forest management, the people plant coffee and others for their living. To gain more knowledge about K'Ho Cil's agroforestry livelihoods as inputs for development projects, we conducted a study aimed at seeking answers to the following questions: (1) to what extent the K'Ho Cil's agroforestry livelihoods practice sustainability; (2) are these livelihoods adaptable to climate changes; and (3) to promote the sustainability and adaptability, what are key measures needed and which stakeholders need to play on what roles?. To collect data, we interviewed 80 households and 5 representatives from Da Nhim Commune People's Committee, Da Nhim Protection Forest Management Board, and JICA and SNV projects. We adopted a scale system of sustainable livelihood practices to assess the sustainability of K'Ho Cil's agroforestry livelihoods. We also conducted a SWOT analysis to propose improvement orientations. The results showed that K'Ho Cil's livelihoods have a moderate level of sustainability. To foster its sustainability and adaptability to climate change, local government should support diversifying sources of forestry income, strictly control agricultural chemical uses, and strategically develop commercial brands and outputs for local agricultural products. We also suggested that NGOs could engage more to support the people with innovative livelihoods, farming techniques, and initial capital.

**Keywords:** Agroforestry livelihood, sustainability, adaptability, indigenous people, K'Ho Cil

## Implementing payment environmental services in Langbiang Biosphere Reserve, Vietnam

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**Abstract** Langbiang Biosphere Reserve (total area of 275,439 hectares) was in the North of Lam Dong Province, in Southern Highland Region, Vietnam. The biosphere reserve holds the global values of biodiversity and diverse natural landscapes in the mixture with the unique Gong cultural space in the Central Highlands. The sustainable financing mechanisms for conservation based on payment for forest environmental services (PFES) was established successfully. Through PFES, There were more than 8,000 households benefited from PFES in this biosphere reserve through their contributions to the protection and maintenance of ecological values. However, there was a lack of discussion and information sharing among stakeholders, especially between the buyer and seller. Mechanisms for information sharing need transparency and time.

**Keywords:** benefit sharing mechanism, collaborative management, payment environmental services

## Development and evaluation of the formula for healthy mushroom beverage with high $\beta$ -glucan prepared from *Schizophyllum commune* Fr. in Thailand

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**Abstract** *Schizophyllum commune* Fr., an edible mushroom, is a fungi with the good unique taste and high  $\beta$ -glucan content. The objective of this research was to develop healthy mushroom beverage with high  $\beta$ -glucan and to evaluate the qualities of the beverage formula which uses dried mushroom powder from *Schizophyllum commune* Fr. The formula of mushroom beverage was prepared by the ratio of the dried powder of 1-day-old mushroom fruiting bodies of *S. commune* Fr. with water (1:15) and varied the amount of honey and lime juice. The criterion used for selecting the best formula was the amount of  $\beta$ -glucan content and antioxidant properties. The formulation contained with 10% honey and 1 % lime juice received the highest sensory scores of most acceptable (7.03 $\pm$ 1.00), with total phenolic compound of 1.23  $\pm$  0.11 mg/ml and amount of  $\beta$ -glucan content of 7.24  $\pm$  0.31 % v/v as well as high potential antioxidant activity of 82.43  $\pm$  0.61 DPPH % and 91.91  $\pm$  0.23 ABTS % (p < 0.05). Then, the formula development of the mushroom beverage by using ratio profile test



(RPT) was found that the closest to an ideal formula contained 10% honey and 1.5% lemon juice, which had  $7.99 \pm 0.31\%$  (v/v)  $\beta$ -glucan and potential antioxidant activity of  $82.92 \pm 0.43$  DPPH %, and  $92.55 \pm 0.33$  ABTS % being higher than the control formula. The physical and chemical characteristic of the product was:  $2.25 \pm 0.03$  lightness ( $L^*$ ),  $(-1.25) \pm 0.07$  redness ( $a^*$ ),  $2.35 \pm 0.07$  yellowness ( $b^*$ ),  $14.40 \pm 0.10$  °Brix total soluble solid,  $3.61 \pm 0.01$  pH,  $89.86 \pm 0.06$  % moisture content,  $0.36 \pm 0.01$  % protein content, and  $8.67 \pm 0.07$  % carbohydrate content. Viable plate count, yeast and mold count exhibited less than 10 CFU/ml. This study provided benefits to the local beverage industry in Thailand.

**Keywords:** *S. commune* Fr., mushroom,  $\beta$ -glucan, Product development

### Antifungal Activity and Phytochemical Analysis of *Miliusa Sessilis* Twig Extract to Control Anthracnose Disease in Mango (*Mangifera indica*)

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**Abstract** The aim of this study was to determine the efficacy of crude extract of *Miliusa sessilis* to control *Colletotrichum* sp. causing anthracnose disease of mango *in vitro*. The *M. sessilis* twigs were extracted with four different organic solvents (hexane (Hex), ethanol (EtOH), ethyl acetate (EtOAc), *n*-butanol (*n*-BuOH)). In a preliminary study, crude extracts at various concentrations from 1000-7000 ppm were tested by dual culture assay. The results showed that Hex and EtOAc crude extract at 7000 ppm had a high percentage of mycelial growth inhibition. For further study, Hex and EtOAc crude extracts were carried out to investigate the diameter of mycelia growth inhibition by poisoned food technique at different concentrations (1000, 5000 and 10000 ppm). The inhibition toward mycelial growth of *Colletotrichum* sp. was increased with increasing concentrations of Hex and EtOAc crude extract as compared with control. The highest percentage of inhibitory control of 90.07% and 78.52% were obtained with the efficacy of EtOAc and Hex crude extract at 10000 ppm, respectively. The minimum inhibitory concentration value of Hex and EtOAc crude extract was  $125 \mu\text{g mL}^{-1}$  against *Colletotrichum* sp. Phytochemical investigation of Hex and EtOAc crude extracts was performed by NMR spectroscopic techniques and thin layer chromatography (TLC) profiling. <sup>1</sup>H NMR spectra of Hex and EtOAc crude extracts exhibited that neolignans were predominant in the extracts. TLC profiling of the crude extracts constituted different coloured phytochemical compounds with different  $R_f$  values. The present study provides evidence that Hex and EtOAc crude extracts of *M. sessilis* contains bioactive compounds that promise cytotoxic effects against *Colletotrichum* sp.

**Keywords:** *Colletotrichum* sp., phytochemical, biological control, <sup>1</sup>H-NMR, TLC profiling

## The Correlation Between Mycelial Growth and Fruit Body's Yield of Oyster Mushrooms (*Pleurotus* Spp.) in Southern Vietnam

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**Abstract** Oyster mushroom (*Pleurotus* spp.) is one of the most important cultivated mushrooms in Vietnam. This study aimed to understand the correlation between mycelial growth and fruit body's yield of 10 mushroom strains, including both wild and commercial strains. The mycelial growth rate was conducted by several models such as the acreage of mycelial colonies on PDA, the dried weight of mycelia in PDB, the acreage of mycelial colonies on sawdust plates, and the height of mycelial colonies on sawdust testubes. Then, the mycelial growth rate were analyzed as to their relationships with biological efficiency in each strain. The results showed that the mycelial growth rate was 184.5 – 888.6 mm<sup>2</sup>/day on PDA medium, 629.8 – 841.2 mm<sup>2</sup>/day on sawdust plates, 5.69 – 7.81 mm/day on sawdust test tubes, and obtained 1.41 – 3.73 g/L on PDB medium after 7 days of culture. The BE of the strains belonging to *P. pulmonarius* and *P. ostreatus* species was in the range of 13.52 – 23.43% and 38.03 – 49.73%, respectively by harvesting 2 times/spawn. These data proved that the wild mushroom strains exhibited good yield and therefore showed high potential for widespread commercial production. It was noted that there was highly positive correlation between mycelial growth rate on sawdust petri and BE (0.839) and the regression model was statistically significant (P-value = 0.037). These results provide the fundamentals for further studies on development of fast screening methods for selecting high yielding strains of oyster mushroom.

**Keywords:** Biological efficiency, *P. pulmonarius*, *P. ostreatus*, PDA, PDB, sawdust

## Antifungal activity of *Bacillus subtilis* subsp. *spizizenii* BL-59 to control some important postharvest diseases of mango fruits (*Mangifera indica* L.)

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**Abstract** This study aimed to investigate the antifungal activity of antagonistic bacteria isolated from the rhizosphere soil of rice in Ban-Laem district, Phetchaburi province, Thailand. The fungal pathogens, *Colletotrichum* sp. and *Pestalotiopsis* sp. were isolated from the infected fruit, causing postharvest diseases in mango. The preliminary study was conducted using a dual culture assay to determine the antifungal activity of the BL-59 isolate. The dual culture assay showed that the antagonistic bacteria inhibited the mycelial growth of *Colletotrichum* sp. and *Pestalotiopsis* sp. by 49.31% and 42.55%, respectively. Furthermore, this isolate BL-59 produced volatile organic compounds (VOCs), which inhibited the mycelial growth of *Colletotrichum* sp. by 60.00%. Microscopic observation of the hyphal morphology of *Colletotrichum* sp. revealed the presence of abnormal hyphal structure. Morphological and biochemical studies of antagonistic bacteria BL-59 demonstrated that this isolate was classified as gram-positive, rod-shaped, and endospore-forming, and it showed survival growth under salinity stress and high temperature (45°C). Moreover, this strain produces catalase and oxidase enzymes. BL-59 was identified as closely related to *Bacillus subtilis* subsp. *spizizenii* (99.79%) using molecular identification based on the 16S rRNA gene. This study revealed that antagonistic bacteria can be used as an alternative choice to control anthracnose disease by reducing the chemical residues in agricultural production.

**Keywords:** antifungal activity, biological control, volatile compounds, biochemical test, 16S rRNA

## Identification of lovastatin analogs-producing *Pleurotus* cultivars in southern Vietnam

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**Abstract** *Pleurotus* mushrooms have been widely cultivated worldwide due to their nutritional and medicinal value. Numerous bioactive compounds such as polysaccharides, polyphenols, proteins, and amino acids, have been well

documented in its fruiting bodies. However, lovastatin known as an anti-lipidemic medicinal compound produced by several *Pleurotus* strains is neglected. This study aimed to identify local *Pleurotus* strains capable of producing lovastatin analogs collected from southern Vietnam. Accordingly, 31 *Pleurotus* strains were isolated and belonged to 5 morphotypes: blue oyster, golden oyster, abalone, oyster, and phoenix. Lovastatin analogs were detected using a state-of-the-art method quantitative <sup>1</sup>H nuclear magnetic resonance (qHNMR). As a result, among 31 strains of *Pleurotus* mushrooms, 4 strains were capable of synthesizing lovastatin analogs. In which, one strain belonged to oyster morphotypes (*Pleurotus ostreatus* s. l.) and 3 strains were phoenix morphotypes (*Pleurotus pulmonarius* s. l.). This is the first to identify the production of lovastatin analogs by phoenix mushrooms.

**Keywords:** Lovastatin, <sup>1</sup>H nuclear magnetic resonance qHNMR, phoenix mushrooms, *Pleurotus pulmonarius*

### Species Diversity, Tetracycline Resistance and Virulence Factor Gene Profile of Pathogenic *Aeromonas* Spp. Isolated from Nile Tilapia Seed Farms in Southern Thailand

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**Abstract** This study aimed to investigate the species diversity, prevalence of tetracycline resistance and occurrence of tetracycline resistance determinants and virulence factor genes of the pathogenic *Aeromonas* isolated from motile *Aeromonas* septicemia (MAS)-exhibiting moribund Nile tilapia seeds from seed farms in five provinces in southern Thailand between 2016 and 2020. Bacterial species was identified through biochemical and molecular methods and tested for its antibiotic resistance ability against tetracycline drugs through disc diffusion method. In addition, tetracycline resistance genes and virulence genes were also determined in the tetracycline-resistant *Aeromonas* spp. using PCR method. Our results indicated that almost 70% (172/250 isolates) was tetracycline resistance. According to the biochemical test, 250 isolates were assigned to 7 different platforms. Five isolates from each biochemical platform were identified by *16S rRNA* gene sequence and phylogenetic reconstruction analysis. *A. veronii* biovar *veronii*, *A. veronii* biovar *sobria*, *A. hydrophila*, *A. caviae*, and *A. jandaei* were identified of which *A. veronii* biovar *veronii* was a dominant species. Efflux antibiotic genes (*tetA*, *tetB*, *tetC*, *tetD*, and *tetE*) was only found in the tetracycline-resistant *Aeromonas* spp. The predominant tetracycline resistance gene detected was *tetA*. Multiple *tet* genes were found in the tetracycline-resistant *Aeromonas* spp. In addition, 9 different virulence factor gene profiles of *lipase*, *elastase*, *enolase*, *aerolysin* (*aerA*), and *heat-labile cytotoxic enterotoxin* (*alt*) were established. Twelve of 35 isolates (34.29%) had 3 virulence genes; 6 (17.14%) for *lipase/enolase/alt*, 3 (8.57%) for *lipase/enolase/aerA*, 2 (5.71%) for *elastase/enolase/aerA*, and 1 (2.86%) for *elastase/enolase/alt*. Our results showed that there is a variation in isolated *Aeromonas* spp. with different phenotypes of tetracycline resistance and genotypes of tetracycline resistance genes and virulence factor genes.

**Keywords:** *Aeromonas* spp., Nile tilapia, tetracycline resistance, *tet* genes, virulence factor gene

## Biological Characteristics of the *Pleurotus* Cultivars in Southwestern Viet Nam

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**Abstract** The biological characteristics of *Pleurotus* cultivars in the southwestern region of Viet Nam were conducted by morphology, molecular phylogeny, spawn running and biological efficiency. Total 10 *Pleurotus* cultivars belong to 5 morphotypes as following: 5 cultivars GTG1, GBT1, GBT2, GVL1, GVL3 belong to phoenix type, 2 cultivars WSG1, WVL1 belong to oyster type, a cultivar YVL1 belonged to golden oyster type, a cultivar PVL1 belong to pink oyster type, and a cultivar DgSG1 belong to blue oyster type. By morphological and phylogenetic analysis, all 5 phoenix cultivars were identified to *P. pulmonarius*, both 2 oyster cultivars and a blue oyster cultivar were *P. ostreatus*, a golden oyster cultivar was *P. citrinopileatus*, and a pink oyster cultivar was *P. djamor*. By the model of 1.2 kg rubber tree sawdust in nylon bag, the spawn running of golden oyster cultivar ( $12.47 \pm 1.20$  mm/day) and pink oyster cultivar ( $11.29 \pm 1.00$  mm/day) was higher than all phoenix cultivars, and the spawn running of blue oyster cultivar was lowest ( $6.57 \pm 0.76$  mm/day). The biological efficiency in conventional production of oyster cultivars was highest ( $37.58 \pm 5.00\%$  of WSG1 and  $34.84 \pm 3.90$  of WVL1), opposite to blue oyster cultivar was lowest ( $12.93 \pm 3.93\%$ ). This first study described the macro and micro morphological characteristic of commercial mushroom cultivars in Viet Nam. Combining the molecular and morphological identification, all these cultivars could be used as the parent in crossing due to their putative strain and standard characteristic of species. The results of cultivation under a standardized conditions could provide data to screen and breed new cultivars.

**Keywords:** *Pleurotus*, spawn running, biological efficiency, identification, cultivars

## Growth and Survival of Lactic Acid Bacteria during the Fermentation of Durian Yogurt

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**Abstract** The behaviors of lactic acid bacteria, *Lactobacillus bulgaricus* and *Streptococcus thermophilus*, during the fermentation of durian yogurt was investigated. Ripened pulp of durian was found to support the growth of the both of *L. bulgaricus* and *S. thermophilus*. The pH values ranged between 4.58-4.68, TSS 24.0-26.0%, and acidity (as lactic) 0.95-1.21% in yogurt after 24 hr of fermentation. The viable populations of lactic acid bacteria increased rapidly in the fermented yogurt after 4 hr to 12 hr fermentation with numbers averaged  $1.22 \times 10^7$  cfu/g *L. bulgaricus* and  $1.85 \times 10^7$  cfu/g *S. thermophilus*, their population stabilized after 12 hr to 24 hr of fermentation with numbers averaged  $1.80 \times 10^7$  cfu/g *L. bulgaricus* and  $1.12 \times 10^7$  cfu/g *S. thermophilus* after 24 hr of fermentation. The time between 10-12 hr had the optimum

characteristics of yogurt with pH 4.61-4.73, TSS 26.5%, lactic acid 0.92-1.10% and lactic bacteria count of 1.20-1.50x10<sup>7</sup>cfu/g.

**Keywords:** durian, yogurt, lactic acid bacteria, lactic acid fermentation

### Phytochemical analysis and antifungal activities of *Passiflora edulis* var. *flavicarpa* on *Fusarium verticillioides*

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**Abstract** *Passiflora edulis*, locally known as passion fruit, is a tendril-bearing vine belonging to the family *Passifloraceae* that commonly grows in the wild. Several extracts from this plant and its fruit juice offer a wide range of health benefits and exhibit numerous biological activities such as antibacterial, antioxidant, anti-inflammatory, anti-hypertensive, anti-anxiety, and anti-tumor. Fruit and vegetable processing is one of the most significant contributors of waste in the environment due to its non-edible portions such as peels, seeds, and unconsumed flesh which causes pollution problems if not utilized or disposed off properly. Disposal of these materials usually presents an issue that is further aggravated by legal restrictions. However, these waste products thrown into the environment are rich in valuable compounds that can be used to develop plant-based products. With the aim of converting these wastes into a more valuable products with health benefits such as phytochemicals and antimicrobials, this study was conducted. The phytochemical components and antifungal activities of *P. edulis* was carried out using standard microbiological procedures. The mesocarp, seed and endocarp were used for the ethanolic extraction. Six (6) phytochemicals namely saponins, tannins, glycosides, steroids, alkaloids, and terpenoids were found to be present in the ethanolic extracts of endocarp while flavonoids were absent. Meanwhile, mesocarp active phytochemicals include alkaloids, tannins, glycosides, steroids, terpenoids, and flavonoids. Alkaloids were the only phytochemical present in the seed. Furthermore, the antifungal assay revealed that endocarp ethanolic extract could inhibit mycelial growth of *F. verticillioides* by 75.96% after seven days while mesocarp ethanolic extract could inhibit 69.26%. The seed ethanolic extract showed percent inhibition of 56.10%. Based on the results of this present study, endocarp has the highest antifungal effect against *F. verticillioides* compared to seed and mesocarp which can be attributed to the phytochemical constituents present in this plant part.

**Keywords:** mesocarp, seed, endocarp, bioactive compounds, mycelia, ear rot

## Proximate analysis, Mineral and germanium of *Ganoderma lucidum* (Lingzhi) powder by spray dry as affected by different species and maltodextrin

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**Abstract** In recent years, *Ganoderma lucidum* (Lingzhi) powder has been used for food and beverage ingredients for nutrition, health and wellness. The *G. lucidum* species MG2 and G2 were used in these studies. The dried mushroom was ground and stored in an air tight black polythene bag at room temperature until used. Commercial water extraction (100°C in 76 min) and spray drying (inlet temperature 140°C and outlet temperature 80°C) were used to produce lingzhi powder. *G. lucidum* MG2 and G2 extracted and then spray drying with and without maltodextrin for made lingzhi powder. It was found that species and maltodextrin effect on proximate constituent mineral and germanium of lingzhi powder. From the analysis, *G. lucidum* MG2 and G2 powder through spray dry was found to have nutritional values a good source of energy carbohydrate, protein and minerals. Results showed that germanium from *G. lucidum* powder of MG2 was higher than G2.

**Keywords:** *Ganoderma lucidum*, Germanium, Mineral, Proximate analysis, Spray dry

## Session 3: PLANT, WATER AND SOIL SCIENCES

### Soil Nitrate Availability Pattern as Influenced by the Application of Vermicompost Supplemented with a Liquid Organic Fertilizer

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**Abstract** Sorghum (*Sorghum bicolor* L.) natural compounds are environmentally friendly bioherbicides to control weeds. The sorghum root contains sorgoleone compounds for controlling the weeds as a bioherbicide. The study aimed to determine the Lethal Concentration (LC 50%) of the sorghum root extract in the test plant. The experiment was conducted in September 2018 through January 2019 in the Laboratory of Agronomy, Faculty of Agriculture, University of Bengkulu, Indonesia. The experiment used a Completely Randomized Design (CRD) with two factors: the bioherbicide concentration and the test plant type. The first factor consisted of five levels i.e.: 0%, 2.5%, 5%, 7.5%, and 10% of sorghum root extracts. The second factor consisted of two test plants, i.e. mung bean (representing broadleaf weeds) and rice (representing narrow-leaf weeds). The results showed that the higher concentration of the sorghum root extract lowered the germination, radicle



length, plumula length, and the test plant's fresh weight. The regression analysis showed that LC 50% sorghum root extract was 5.24% for rice and 4.93% for mung bean. The sorghum root extract has a potential as bioherbicide to control both narrow and broadleaf weeds.

**Keywords:** bioherbicide, sorgoleone, sorghum root, weed

## Reliability of Seedling Stage Selection for Aluminium Stress Tolerance in Hot Pepper (*Capsicum annuum* L.)

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**Abstract** In Ultisol, the presence of aluminium (Al) in high concentration is the main constraint hampering growth and yield of many crops, including hot pepper. The use of varieties tolerant to Al stress is one most prospective manner, which is relatively low cost and environmentally friendly, in exploiting this acidic soil to increase the national hot pepper production. Appropriate screening method is required to make variety development more efficient. Four consecutive experiments were performed from August 2016 to June 2018 to evaluate the reliability of seedling stage selection for Al tolerance and to determine hot pepper genotypes most tolerant to Al stress. They were experiment (1) determination of Al level for screening, (2) study on the reliability of early growth tolerance determination, (3) screening for Al tolerant genotypes at juvenile stage, and (4) selection for Al tolerant genotype in acidic soil. The first three experiments were conducted in the greenhouse in sand culture with a wick-system-hydroponics, each of which was arranged in a randomized completely design (RCD). Experiment 4, the field evaluation, was conducted in acidic Ultisol arranged in a randomized complete block design (RCBD). The results showed that the concentration of 2 mM Al in nutrient solution gave enough selecting pressure to determine genotypes which are tolerant to Al stress. Seedling stage selection was highly reliable to determine most tolerant genotypes against Al stress in hot pepper, with the key trait of plant fresh weight, plant dry weight, and stem diameter. The most tolerant genotype amongst 27 genotypes tested were 'HP', 'PBC621', 'PBC266', 'PBC 157', 'Mario', 'PBC155', 'PBC396', 'Sempurna' and the most sensitive ones were 'LPK' and 'Romario'. The result of field experiment confirmed the greenhouse finding. However, It is needed to be further evaluation in more acidic ultisol to obtain more accurate aluminum tolerance property of selected genotypes.

**Keywords:** acidity tolerance, Al, chili, screening

## Use of *Tithonia diversifolia* Leaves for Liquid Organic Fertilizer

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**Abstract** In the production of liquid organic fertilizer (LOF) for organic vegetable production, the portion of tithonia leaves determines LOF nutrient compositions. An experiment to evaluate the effects of tithonia leaves on LOF nutrient contents was established by using a complete randomized design. Treatments were the leaves portion; 5%, 7.5%, 10% and 12.5% of composting materials. Treatment effects were measured on pH, N, P, K, Ca-ex, Mg-ex., and organic-C of LOF. Results showed that P and C-organic contents were significantly affected by the portion of tithonia leaves, yet pH, N-total, K, Ca-ex., and Mg-ex were insignificantly affected. Treatment with 12.5 % of tithonia leaves had the highest P content, followed by 7.5, 5, and 10 % tithonia leaves. The highest organic C content was found in LOF with 12.5 %, trailed by those of 10, 7.5 and 5 % tithonia leaves. The percentage of tithonia leaves in the production of increased P and C-organic content. The best portion of tithonia leaves for LOF production was 12.5 % of composting materials.

**Keywords:** Liquid Organic Fertilizer; Nutrient Content; *Tithonia diversifolia*

## Sweet Corn Root Distribution Under Different Fertilizer Applications

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**Abstract** Optimum root growth of sweet corn plays a crucial role in absorbing water and minerals under given environment to attain the yield potential dictated by the genetics constitution of the plant. The present study was conducted to evaluate the root distribution of conventional and organic sweet corn hybrids. Two sweet corn hybrids bred for organic production and a commercial hybrid developed were evaluated in a randomized complete block design with three replications for their response to different sources of plant nutrients, namely no fertilizer application, liquid organic fertilizer (LOF), and synthetic fertilizer. Data were collected from the observation of root length, total root number, root weight at different depth and root distribution at different depth. No significant interaction effect of variety and source of nutrient was found on all observed characters. The root weight at 15 cm depth was significantly affected by sources of plant nutrients, in which LOF and synthetic fertilizer had much greater root weight compared to no fertilizer application. The varieties showed significant variation in total root number, root weight in all depth, and root distribution at 15 depth with the commercial hybrid performing better than the remaining hybrids.

**Keywords:** liquid organic fertilizer, root distribution, root depth, root weight, sweet corn hybrid

## Coffee Cherry's Pulp Variety and Pulping Delay Time Leading to Cascara Tea Products

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**Abstract** The effect cherry's pulp variety and pulping delay time after harvest on the physical, chemical, and organoleptic properties of cascara tea products were investigated. The results indicated that all parameters decreased with the pulping delay time, except the ash content. The best robusta cascara tea was characterized by 4.90% of yield, 6% of moisture content, the lightest color value 7.5 YR 7/8, 4.01 of pH, 7% of ash content, 241.19 mg/L of polyphenol content, 554.74 mg/L of tannin content, 32.67 ppm of antioxidant activity and 107.03 mg/L of caffeine content. On the other hand, the best arabica cascara tea demonstrated 7.74% of yield, 6.67% of moisture content, the strongest color intensity 5 YR 5/10, 4.33 of pH, 5.33% of ash content, 170.87 mg/L of polyphenol content, 334.91 mg/L of tannin content, 12.80 ppm of antioxidant activity and 56.08 mg/L of caffeine content. The robusta cascara tea excelled in the moisture content, polyphenol, and tannin content while the Arabica cascara tea was superior in yield, pH, ash content, antioxidant activity, and caffeine content. In term of organoleptic scores, the Arabica cascara tea produced from the fresh pulp was the most preferred by the panelists. All pulps were qualified as raw material for cascara tea production.

**Keywords:** Cascara, Coffee variety, Delay time, Pulp

## Identification of soil porosity using geophysical and geotechnical observation for agricultural application

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**Abstract** Until recently, laboratory testing was the main method used to measure soil porosity, as one of the main parameters determining soil health. This method has high accuracy, but has limited testing area, as well as the analysis time. Meanwhile, geophysical and geotechnical measurement methods offer the ability to test the soil's resistivity and physical values. Further analysis of these two parameters was conducted to determine the porosity value. These two methods offer measurement benefits in the form of higher accuracy, larger area tested and shorter test time. In this study, resistivity measurement was conducted using geo-electric tools in three different areas representing coastal, lowland, and upland agricultural areas. Meanwhile, the soil's physical value was determined using a handbor, to obtain the density, humidity, void ratio, mass density, dry density and soil type. In addition, validation was carried out using the Archie equation, to obtain each location's porosity value. The validation's results show a linear correlation, between porosity and resistivity.

**Keywords:** Geophysics, geotechnique, porosity, resistivity, and soil.

## Enhancing Soil Characteristics and Yield Response of Coffee Cultivated under Reduced Chemical Fertilizer in Ultisols with Application of Bio-organic Fertilizer Containing Plant Growth Promoting Microbes

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**Abstract** The replacement of chemical fertilizers with organic fertilizers is crucial to maintain high yields of plants and to protect the environment. Incubation trial and a field experiment were conducted with the aims: (1) determining the physical and chemical properties of the soil after the application of bio-organic fertilizer (BOF), and (2) determining the reduction of bio-organic fertilizer through its substitution by biofertilizer to enhance growth and yield of coffee. The two months incubation experiment including treatments of biofertilizer, they were 0, 5, 10, 15, 20 and 25 tons / Ha. The field experiment involving treatments of substitution of chemical fertilizer in the form of chemical Nitrogen fertilizer with BOF, which were 100% N, 75% N + 25% BOF, 50% N + 50% BOF, 25% N + 75% BOF, and 100% BOF. Application of BOF increased C-organic and N-total by 50% and 200% respectively and decreased the volume of soil weight by 13% compared to control. Bio-organic fertilizer increased coffee leaf greenness, number of cluster per branch (CB), number of fruits per tree, and weight of fresh fruit per tree (WFT) respectively 7.8%, 25.3%, 24.9%, and 31.2% compared to control (100% inorganic N). The highest WFT (573.33 g) was achieved in a combination of 25% N inorganic + 75% BOF. The yield of coffee per tree is closely related to leaf greenness, CB, and number of fruit per cluster.

**Keywords:** bio-organic fertilizer, integrated nutrient management, soil characteristics, coffee yield, coffee pulp compost

## Effects of Draw Solution Concentration and Operating Factors on Forward Osmosis for Lime juice Concentration

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**Abstract** Forward osmosis (FO) is a process that concentrates liquid food by slow water-transport which requires lower pressure and the product from this process has similar quality to natural one. This study aimed to find suitable operating factors in FO process including temperature (10 - 30°C), circulation flow rate (200 – 350 ml/min), and concentration of NaCl (1 – 4M) for concentrating lime juice. By using commercial flat-sheet Reverse Osmosis membranes installed in a 3×8×12 cm membrane module with a 45 cm<sup>2</sup> of cross-section area at the feed solution side, in order to study the effect of differences draw solution temperatures (10 to 30°C) on water flux value in a laboratory-scale. The result of the study found

that using lower-temperature of draw solution achieves lower water flux value because of increasing viscosity values that also decrease water flux. Moreover, increasing the circulation flow of draw solution is also increasing water flux and reducing membrane fouling during the process. Therefore, the suitable condition of Forward Osmosis is using 3M NaCl as Draw solution at 25°C, Synthetic lime at 20°C and operated with the circulation flow of draw solution side at 350 ml/min which results in a maximum average water flux of 2.33 l/m<sup>2</sup>h at 90 minutes of operating time.

**Keywords:** Forward Osmosis, Lime Concentration, Temperature effect, Water Flux, Circulation flowrate

## Detection of *S. aureus* and *E. coli* Strains and Bacterial Count Determination in Selected Agro-ecologically and Conventionally Grown Salad Vegetables in Laguna and Quezon Provinces, Philippines

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**Abstract** *Staphylococcus aureus* and *E. coli*, particularly its pathogenic serotypes, are among the commonly reported foodborne bacterial pathogens, aside from *Salmonella*, associated with raw or fresh vegetables used in salad preparations. In Southern Luzon, Philippines, the provinces of Laguna and Quezon are known commercial producers of vegetables, grown organically/agro-ecologically or through conventional or mixed farming. This study determined the heterotrophic plate counts (HPC) and coliform counts (CC) of fresh vegetables sampled from four organic and four conventional or mixed farming systems in Laguna and Quezon provinces in the Philippines. Also, the study aimed to detect the presence of *S. aureus* and *E. coli*, particularly in organically grown fresh vegetables. Standard methods were followed for the determination of the bacterial counts (HPC and CC), expressed as colony forming units per gram or CFU/g, while the conventional culture method was employed initially for putative *S. aureus* and *E. coli* detection. For the HPCs of vegetables obtained from organic or agro-ecological farms, these varied generally by type of vegetable within a farm, and by farm. The vegetable samples analyzed included sweet basil and tomatoes from Organic Farm (OF) 1, sweet basil and Japanese cucumber from OF2, Romaine lettuce from OF3 and cabbage from OF4. The HPCs ranged from 10<sup>4</sup> to 10<sup>6</sup> CFU/g, with the lower counts obtained from cabbage and the highest counts from sweet basil and Japanese cucumber. For the conventional or mixed farms sampled, the vegetables analyzed included chili pepper and tomatoes from conventional/mixed farm (C/M) 1, green tomatoes from C/M2, radish from C/M3, and patchay (Chinese chard) and mustard (mustard) from C/M4. The sample HPCs also ranged from 10<sup>4</sup> to 10<sup>6</sup> CFU/g with the lower counts obtained from radish and the highest counts from green tomatoes. The coliform counts of the organically grown vegetables ranged from <10<sup>3</sup> CFU/g in sweet basil to 10<sup>6</sup> CFU/g in tomatoes. The vegetables grown in conventional or mixed farming systems had CCs

ranging from 102 CFU/g (in green tomatoes) to 105 CFU/g (in patchay). Phenotypically typical *S. aureus* and *E. coli* isolates were detected in 66.7% and 100%, respectively, of the agroecologically grown vegetables sampled. The heterotrophic and coliform counts obtained, and the isolation of *S. aureus* and *E. coli* strains in the vegetables showed the potential risks of ingesting bacterial pathogens in improperly prepared salad vegetables.

**Keywords:** Heterotrophic count, coliform count, *S. aureus*, *E. coli*, salad vegetables, organic or agroecological and conventional/mixed farms

### Effect of ethephon on fruit ripening and fruit components of durian cv. 'Monthong' after harvest

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**Abstract** The results showed that the duration of fruit ripening had an interaction between the ripening method and fruit grade. Fruit grade A under natural ripening method (NRM) had significantly the longest duration of fruit ripening at 9 days, followed by grade B (8 days), grades C and D (7 days); while under ethephon-induced ripening method (ERM) for fruit grades A, B, C, and D was only 5 days. The 5-day ripening duration under ERM was significantly shorter than that of NRM by 3 days. The light fruit weight of fruit grades C and D had significantly high percentage of weight loss per fruit but short duration of fruit ripening compared with those heavy fruit weights of fruit grades A and B. Fruit grade A had significantly the highest fruit weight (3.40 kg/fruit), followed by grade B (2.69 kg/fruit), grade C (1.50 kg/fruit), and grade D (1.34 kg/fruit). Fruit weight did not change significantly under NRM and ERM. But the percentage of weight loss per fruit under ERM was significantly lower than that of under NRM by 7% mainly due to the short duration of fruit ripening under ERM as indicated by the value of the positive correlation coefficient ( $r$ ) that the percentage of weight loss per fruit was positively associated with the duration of fruit ripening ( $r = 0.59$ ). Therefore, the ethephon-induced ripening method (ERM) attributed to accelerate the duration of fruit ripening and less percentage of weight loss per fruit; also no effect on fruit weight, percentage of aril weight per fruit, percentage of pericarp weight per fruit, thickness of pericarp, and percentage of seeds weight per fruit as compared with the natural ripening method (NRM).

**Keywords:** Ethephon, Ripening, Durian, Aril, 'Monthong' cultivar, Weight loss

## Micropropagation of young inflorescence Curcuma hybrid *In vitro*

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**Abstract** Five cultivars of curcuma hybrid consisting of 3 Paracurcuma and 2 Eucurcuma young inflorescences were cultured on MS medium supplemented with 0, 0.5 and 1 mg/l NAA and BA for 8 weeks. It was found that young inflorescences Paracurcuma hybrid Curcuma 'Yuki' cultured on MS medium supplement with the 1 mg/l NAA and 0.5 mg/l BA were able to induce the most shoots at 2.67 shoots, with the highest percentage of shoots (80.00%) and the average plant height is 5 cm. For Curcuma 'Burgundy' and Curcuma 'Phonphisit' cultured on MS medium supplement with 1 mg/l NAA and 1 mg/l BA, they were able to induce the most shoots at 1.66 and 1.78 shoots, the highest percentage of shoots is 73.33 and 76.67% respectively and the average plant height is 5 cm. The other cultivars Eucurcuma consist of Curcuma 'Sweetmemory' and Curcuma 'Banrai Red'. The young inflorescences were divided into 2 parts, the upper and the lower one. The result showed that the lower shoot induction is better than upper one. Curcuma 'Sweetmemory' grown on MS medium supplemented with 0.5 mg/l NAA and 0.5 mg/l BA were able to induce the most shoots at 2.38 shoots, and the highest percentage of shoots is 83.33%. Curcuma 'Banrai Red' grown on MS medium supplemented with 0.5 mg/l NAA and 1 mg/l BA were able to induce the most shoots at 1.98 shoots, the highest percentage of shoots is 63.33% and both cultivars has the same height average at 5 cm.

**Keywords:** Paracurcuma, Eucurcuma and micropropagation

## Reducing the Use of Mineral Fertilizer and Enhancing Growth Performance of Green Onion by Applying Pelletized Organomineral Fertilizer

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**Abstract** With its slow release of nutrients, the use of pelletized organo-mineral fertilizer (OMF) reduces mineral fertilizer and promotes a more sustained yield response. The present study aimed to evaluate the efficiency of OMF in replacing the need for urea while maintaining a greater increase in the growth performance of green onion. The pot trial was conducted from March to June 2020 at the Teaching and Research Farm of the Faculty of Agriculture University of Bengkulu and involved six treatments laid out in a completely randomized design with five replications. They included 100% of the



recommended dose of urea as a control, 100% supply of OMF, and 100%, 75%, 50% and 25% supply of OMF with 50% dose of N. Results showed that growth and biomass yield were significantly affected ( $P < 0.05$ ) by the treatments. Application of 50% of urea dose with 100% of OMF resulted in the growth and yield higher than control. Plant height, number of leaves, stem diameter and shoot dry weight for the growth increased by 20, 28, 28, and 55%, respectively, while plant weight per clump and shoot fresh weight for the yield increased by 58 and 62%, respectively with the treatment of 50% of urea dose with 100% supply of OMF, as compared to the full rate of urea. These results showed that OMF formulated with the organic base of vermicompost and urea contributes to a 50% reduction in the dose of the mineral fertilizer and still maintain a greater growth and yield increase of green onion.

**Keywords:** fertilization, organic matter, integrated nutrient management, vermicompost

### Understanding the Response of Antioxidant Mechanisms to Abiotic Stress in the *Arabidopsis* Negev desert relative, *Anastatica hierochuntica*

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**Abstract** Investigation of stress-tolerant plants is crucial for understanding how plants can tolerate multiple abiotic stresses in the field. The extremophyte desert relative of *Arabidopsis thaliana*, *Anastatica hierochuntica*, is tolerant to several abiotic stresses. Because the secondary effect common to most abiotic stresses is production of damaging reactive oxygen species (ROS), we investigated the response of the *Anastatica* ROS-scavenging machinery in comparison to *Arabidopsis* during methyl viologen (MV)-induced oxidative stress and heat stress. *Anastatica* seedlings exhibited remarkable tolerance to increasing concentrations of MV, and to heat stress, compared to *Arabidopsis* by displaying better growth than *Arabidopsis* and was able to maintain total chlorophyll levels in response to both the stresses. The severe stress symptoms observed in *Arabidopsis* were also reflected in the high accumulation of anthocyanins. In response to both stresses, TBARS levels in *Arabidopsis* were higher than *Anastatica* under control conditions and significantly increased when *Arabidopsis* seedlings were exposed to stress. TBARS levels in *Anastatica* remained constitutively lower suggesting that *Anastatica* was better able to protect membranes from ROS-mediated oxidative damage. Antioxidant systems were compared by investigating the activities of the ROS-scavenging enzymes superoxide dismutase (SOD), ascorbate peroxidase (APX) and glutathione reductase (GR). Oxidative stress had no effect on the activity of any of the tested enzymes in *Arabidopsis* whereas in *Anastatica*, SOD activity increased two-fold and APX and GR activities were constitutively and considerably higher than in *Arabidopsis*. Heat stress did not affect SOD activity in both species. However, APX and GR activities were transiently induced after 2 h heat stress in *Anastatica* seedlings suggesting that higher activity of ROS-scavenging enzymes could contribute to the tolerance of *Anastatica* to oxidative stress. The expression of representative genes encoding isoforms of SOD, APX and GR by Real-time QPCR revealed high variance between the biological replicates making it difficult to draw conclusions. However, overall, it appeared that expression of these isoforms did not follow the same pattern as their

respective enzyme activities. Under heat stress, *Arabidopsis* exhibited very weak Nitroblue tetrazolium (NBT) staining for  $O_2^{\bullet-}$  while *Anastatica* displayed much stronger staining that increased during the time course. 3,3'-diaminobenzidine (DAB) staining for  $H_2O_2$  showed that *Arabidopsis* produced large amounts of  $H_2O_2$  in response to oxidative stress. *Anastatica* displayed no DAB staining suggesting  $H_2O_2$  produced by *Anastatica* was below the detection capability of the stain. Nevertheless, the results indicate that *Anastatica* can tolerate high cellular superoxide levels, and they might be a preferential ROS signaling molecule in *Anastatica*. That a highly active antioxidant system probably contributes to *Anastatica* tolerance to abiotic stresses such as heat stress that are characteristic of its desert environment

## Crop Residue Management for Enhancing the Soil Health and Productivity in Red Sandy Loam Soils

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**Abstract** Conventional farming practices such as extensive tillage, especially when combined with *in-situ* burning of crop residues, pose a very deleterious effect on the soil fertility. Extensive use of land over and over again and increased use of chemical fertilizers has led to the deterioration of the land leading to the decrease in the inherent capacity of the soil. Soil health and productivity can be determined by the physical, chemical and biological processes that are interlinked to its soil organic matter content and its quality. The increased emphasis on sustaining the fertility of soils has raised interest in maintenance and improvement of soil organic matter through appropriate land use and management practices. Crop residues, the products that are left-over after the procurement of the main produce are one of the important sources of organic matter which on returning to the soil for nutrient cycling helps to improve the soil physical, chemical and biological properties. Burning of the crop residues is usually a common practice done in an attempt to obtain a field that is easy to work on, improve tillage efficiency, to enhance the growth of the new crop, to reduce diseases as crop residues may sometimes serve as a host for pathogens, and to control weeds and insects, but repeated removal of residues by burning can cause significant environmental problems and loss in soil fertility due to land degradation. Effective management of the crop residue in the field conserves the soil and its nutrient resources causing least damage to the environment. Retaining of harvested crop residues in sufficient amounts on the soil surface together with no tillage, or its partial incorporation by minimal tillage not only have a positive effect on the level of soil organic matter but also decreases water and wind erosion, and thus enhances the soil health and productivity.

**Keywords:** Crop residues, Soil health, Productivity, Organic Matter, Sustainable agriculture

## The Effect of Timing and Storage Temperature on Pollen Viability and Pollen Germination in *Zephyranthes* Hybrid

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**Abstract** The effect of timing and storage temperature on pollen viability and pollen germination in *Zephyranthes* hybrid on eight cultivars i.e. 'Red Candy', 'Bright Eye', 'Golden Mango', 'POS', 'Lookmai', 'Island Breeze', 'Madam Butterfly' and 'Paradee' were studied. The experiment was divided into two experiments. The first experiment was the effect of timing on pollen viability and pollen germination in *Zephyranthes* hybrid. The experimental design was a completely randomized design (CRD) with three treatments and three replications, each flower per replication. The pollen was collected in different time periods; 1) 09.00-11.00 a.m., 2) 12.00 a.m.-02.00 p.m. and 3) 03.00-05.00 p.m. The result revealed that the maximum of pollen viability (72.24-88.06%) and germination percentage (23.33-54.33%) were at 09.00-11.00 a.m. for all eight cultivars. The second experiment was the effect of storage temperature on pollen germination in *Zephyranthes* hybrid which was carried out in two variants, using 2×6 factorial in CRD. The first variant was the storage temperatures (25±2°C and 5±2°C), the second variant was the storage periods (0, 4, 8, 12, 16, and 20 days). The results showed that the low temperature stored pollen maintained a higher germination percentage than the one stored in the room temperature for 4-8 days in which the germination percentage decreased when the storage period increased in all cultivars. Moreover, the interaction between the 2 factors showed that the pollen germination percentage was declined for 4 or 8 days when stored at low temperatures (15.59-27.96% or 10.10-19.25%). Therefore, the optimal time of pollination in *Z.* hybrid should do at 09.00-11.00 a.m. and stored at 5°C for pollen viability and germination. 'Bright Eye' and 'Island Breeze' could be maintained for 12 days, but 'Golden Mango', 'Red Candy', 'POS', 'Madam Butterfly', 'Lookmai' and 'Paradee' could be maintained only for 8 days.

**Keywords:** Pollen Grains, Stored Pollen, Rain Lily, Flowering Period

## Metal Accumulation of Leguminous Crops in Mine Tailings of Camarines Norte, Philippines: Basis for Soil Remediation Strategies

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**Abstract** The study utilized common leguminous crops in the Philippines, *Vigna radiata* (mung bean), *Arachis hypogaea* (peanut), and *Glycine max* (soybean), to investigate its potential on hyperaccumulating metals from gold mine tailings. Legumes were planted in potted mine tailings collected and previously analyzed for heavy metal contents. At crop maturity, heavy metal concentrations were analyzed from soil media (mine tailings), pods, stems, leaves and roots. Among the leguminous crops selected and planted, peanut is the most suitable in reducing most of the metal elements from mine tailings. Peanut accumulated most of the metals Mg, Cr, Cu, Fe, Mn, and Zn better in its organs. Mungbean and soybean accumulate best Ca and Ni respectively. In general, metals were found concentrated in the leaves and pods of the legumes even the heavy metal chromium and highly toxic lead. Growth rate is highest in soybean however total biomass produced is highest in peanut. Therefore, peanut is best in accumulating most metals in its organs effectively hence is the best legume for soil remediation. Mung bean is ideal for grain production and soybean is ideal for forage or green manure production. However, metal concentrations in all plant parts exceeds the safe intake per day hence not safe for human consumption unless there is further reduction in the long run.

**Keywords:** Soil remediation, partitioning, mine tailings, legumes, hyperaccumulation, peanut, mung bean, soybean

## Identification of phenolic compounds and evaluation of biological activities of methanolic extracts obtained from two varieties of longan (*Dimocarpus longan*) peels

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**Abstract** *Dimocarpus longan* belongs to the Sapindaceae family, which are revealed cryptic species. In Thailand, *Dimocarpus longan* spp. *longan* var. *longan* such as Edor, which is the most cultivated. Another *Dimocarpus longan* spp. *longan* var. *obtus* (*Dimocarpus obtusus*), called Lum-Yai Thao, is found in eastern Thailand. However, there is still little information on Thao biological activity. So, this research was designed to identify phenolic compounds and evaluate the biological activities of methanolic extracts obtained from peels in two longan varieties (Edor VS Thao). For the total phenolic compound, no significant differences were observed between the Edor and Thao. For antioxidant activity using DPPH, ABTS and FRAP assays, the analogs Edor showed more activity than Thao. The disc diffusion test at 5 mg/disc

showed that Edor peel extract effectively inhibited the growth of bacteria, except Thao extracts which were strong against *Propionibacterium acnes*. However, both of them did not have activity also against *Escherichia coli* and *Staphylococcus epidermidis*. For anti-tyrosinase activity, both cultivars extracts have less effective anti-tyrosinase activity. In addition, anti-inflammatory activity was evaluated by measuring nitric oxide (NO) generated from SNP and using LPS - stimulated RAW 264.7 cells showed excellent activity. In cytotoxicity using MTT assay, our results demonstrated that the methanolic extract of longan peel from Thoa exhibited low cytotoxicity against both L929 and HaCaT. On the other hand, the extract from Edor exhibited cytotoxic activity. These results suggested that the Thao peel extracts are different from Edor peel extract. The Thao peel extracts showed excellent anti-inflammatory and little cytotoxic activity for L929 and HaCaT cell lines and antibacterial against *P. acnes*. So, Thao peel extracts could be used to prepare products such as anti-inflammatory supplements and cosmetics.

**Keywords:** Dimocarpus longan, phenolic compound, biological activity

## Session 4: ANIMAL AND FISHERY SCIENCES AND RELATED FIELDS

### Effect of dietary supplementation with Vietnamese coriander (*Persicaria odorata*) extract on growth performance, carcass characteristics and meat quality of broilers

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**Abstract** A study was conducted to investigate the effect of Vietnamese coriander extract (VCE) supplementation in broilers diet on growth performance, carcass characteristics, and meat quality. A total of 300 one-day-old Ross 308 broilers were assigned into five groups, with four replicates according to a completely randomized design (CRD). Dietary treatments were composed of a corn-soybean meal based diet supplemented with several levels of Vietnamese coriander extract (0, 200, 400, or 600 mg/kg) or 500 mg/kg Oxytetracycline (OTC) were provided to the broilers for 35 days. The results indicated that 600 mg/kg VCE and OTC supplemented group had significantly greater weight gain and average daily gain than the 0, 200, and 400 mg/kg VCE supplemented groups ( $P < 0.05$ ). The feed conversion ratio significantly improved in VCE and OTC supplemented group compared with the control group ( $P < 0.05$ ). There were no significant differences in slaughter weight, carcass percentage, and dressing percentage among the treatment groups. The meat quality

in terms of pH values determined at 45 minutes post-mortem was higher in 600 mg/kg of VCE than other treatment groups ( $P<0.05$ ). Broilers fed 600 mg/kg VCE had significantly the lowest fat percentage ( $P<0.05$ ). In addition, feeding VCE supplemented diet had significantly decreased the TBARS value of breast meat during the storage time ( $P<0.05$ ). In conclusion, broilers fed with 600 mg/kg VCE and Oxytetracycline supplemented diets had an improvement in growth performance and meat quality compared to the control group.

**Keywords:** Vietnamese coriander, growth performance, carcass characteristics, meat quality

## Effects of genetic groups, and age within genetic groups on milk chemical composition of buffaloes

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**Abstract** Genetic groups of buffaloes had influenced all chemical composition traits ( $p<0.05$ ). The age of animals within genetic groups had not affected most studied traits ( $p>0.05$ ), except the percentage of milk fat content ( $p<0.05$ ). Milk from Swamp buffalo had the highest percentage of fat content (11.1%) compared to purebred Murrah (7.9%) and 75%Murrah crossbred (8.2%), but it had not statistically differed from 50%Murrah crossbred (9.5%). Similar results were found in percentages of protein, solid-not-fat, and total solids content. The purebred Murrah showed the highest average lactose content (4.9%), but it did not statistically differ from those of 50%crossbred (4.6%) and Swamp buffalo (4.5%). The 50% Murrah and Swamp buffaloes whose ages were 9 years had higher averages of fat content than the other groups.

**Keywords:** Buffalo milk, Chemical composition, Murrah, Swamp buffalo

## The Preference of PE Goats on Poly-herb Supplementation

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**Abstract** The research was conducted to assessed PE goat preference on pellet poly-herb supplementation namely: Non-poly herbs pellets (P0); Pellets (*Andrographis paniculata* + *Curcuma Mangga* + *Nigella sativa*) (P1); *Andrographis paniculata* + *Curcuma domestica* + *Nigella sativa* (P2); (*Curcuma mangga* + *Curcuma domestica* + *Nigella sativa*) (P3). All the poly-herbs 12.5 gram were delivered in a 50gram pellet. All goats maintaining in an individual pen of (1.4 m x 0.8 m.32 per goat) were divided into 4 groups. The first group was given P0, the second group P1 dan and the other P2 dan P4. Pellets were given 50gram pellets from 08.00 to 09.00 for 56 days before starting the preference test. On day 57 a cafeteria system of 4 formulations of pellets was used to study the preferences. The preference test was done on three consecutive days. Feed preference was determined from the Coefficient of Preference (CoP), Relative Preference Index, preference

rating as well as selection index. Our findings showed that there were no significant differences in sniffing and eating frequency also DMI. There is also an interaction amongst sniffing, eating frequency, pellets and DMI with the equation  $Y = 10.67 - (0.405 \text{ Sniffing frequency}) + (2.338 \text{ Eating frequency}) - (0.706 \text{ pellet}) + e$ , with the  $R^2 = 0.506$ ). However, when preconditioning/pre-ingestive goats with specific polyherbal pellets were calculated. Group of goats that previously eat pellets 0, the Dry matter intake (41.62 g/30 minutes) RPI, selection index and CoP were significantly higher ( $<0.05$ ) than the others. Three pellets (P0, P1, P2) were high acceptable by PE goat while P3 was medium acceptable. The result from Mann-Whitney Wilcoxon-Test indicates that frequency of eating, DMI (g/30 min), selection index and RPI were significantly higher in preconditioning goats.

**Keywords:** Coefficient of Preference, eating sniffing frequency, RPI

### Growth Performance and Nutrient Digestibility of Thai Native Compared with Lowline Angus Crossbred Beef Cattle Fed with Regional Feedstuffs

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**Abstract** Cassava starch residue and oil palm meal are massive industrial by-products which can be used as animal diet in Thailand. The aim of this study was to investigate voluntary feed intake, nutrient digestibility, and growth performance of Thai native cattle compared with Lowline Angus x Thai native crossbred beef cattle fed with those two local feedstuffs as supplement. Yeast fermented cassava starch residue mixed with oil palm meal prior fed to beef cattle at 1.50% BW, while rice straw was given in *ad libitum* during 6 months of experimental period. It was found that total intake and intakes of roughage and supplement did not different among breed of beef cattle. Growth rate and final body weight of Thai native cattle were greater than the crossbred but that caused by differences in initial body weight (covariate effect), then growth performance was similar between cattle group. Feed per gain of Thai native cattle (11.6 g/g) did not differ from the crossbred (12.1 g/g). Moreover, Thai native cattle and Lowline Angus x Thai native crossbred beef cattle had similar in nutrient digestibility including dry matter, organic matter, crude protein, crude fat, and fiber fractions. Lowline Angus x Thai native crossbred beef had similar ability of local feed resources utilization and growth performance as Thai indigenous cattle.

**Keywords:** cassava starch residue, oil palm meal, nutrient digestibility, growth performance, Thai native cattle



## Milk fatty acid profile in different genetic groups and age of buffaloes.

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**Abstract** Thirty-seven fatty acids were identified in 40 buffalo milk samples. Nineteen of total identified fatty acids were found in all samples. Sixteen fatty acids were detected in some samples.  $\gamma$ -Linolenic acid (C18:3n6) and cis-11,14,17-eicosatrienoic acid (C20:3n3) were not found in buffalo milk. Milk from 50% Murrah crossbred had the highest content of C6:0, C8:0, C10:0, C12:0, C14:0, C16:0, and C18:1n7t ( $p \leq 0.05$ ). There were no significant differences in the averages of docosahexaenoic acid (C22:6n3) contents between 100% Murrah and 50% Murrah crossbred. Averages of SFA and total fatty acids in 50% Murrah crossbred were higher than those of the 100% Murrah. The factor of age within different genetic groups affected six fatty acids such as C6:0, C8:0, C10:0, C12:0, C16:0, and C22:6n3 ( $p \leq 0.05$ ). The traits in 50% Murrah crossbred which younger than 7 years and older than 9 years were higher than those in others, except C6:0 and C22:6n3 that the 50% Murrah, which older than 9 years were the highest. Under the Murrah purebred, no significant differences in the traits in the different studied ages were noticed. The factor also affected the SFA and total fatty acids contents ( $p \leq 0.05$ ) but did not influence MUFA and PUFA ( $p > 0.05$ ).

## Determination of Pregnancy Associated - Glycoproteins (Pags) During and Post Pregnancy in Riverine Buffaloes (*Bubalus bubalis* Linn.)

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**Abstract** Through Pregnancy-associated glycoprotein assay, an overall conception rate of 54.17% (13/24) at d 25 and d 30 post fixed time artificial insemination (FTAI) was observed in the study. The pregnancy of the riverine buffalo cows (n=13) was further confirmed through trans-rectal ultrasonography (TRUS) at d 40 showing the presence of amniotic vesicle and an embryo with a beating heart. The mean plasma level of pregnancy associated-glycoproteins (PAGs) of the pregnant buffalo cows (n=11) were found to be at a high level as early as d 25, 30, 40 ( $1.21 \pm 0.20$  ng/ml,  $12.11 \pm 1.67$  and  $28.81 \pm 2.57$  ng/ml) and observed to have increasing trend/pattern with progression of pregnancy until d 300 ( $114.01 \pm 10.05$ ). Two of the animals that were confirmed pregnant at d 40 post AI via TRUS undergone early pregnancy loss. Whilst the not pregnant buffalo plasma PAGs remained at a very low level on day 25 ( $0.17 \pm 0.04$  ng/ml) to d 40 ( $0.06 \pm 0.02$

ng/ml) and further confirmed the non-pregnancy via TRUS. Two waves of peak increase in the concentration of PAGs were found in the course of the gestation period of the riverine buffaloes. The 1st peak was observed on the 1st trimester (d 60) and the 2nd peak was on the last trimester (d 270) of gestation. Generally, the present findings on pregnancy associated-glycoproteins (PAGs) at early and throughout the course of the gestation period of riverine buffaloes appeared higher than those reported in other studies. Post-partum residual clearance of PAGs concentration in the maternal circulation of the buffaloes was further studied and found to be slowly decreasing from the level of  $114.33 \pm 13.75$  ng/ml at week 1 (d 0) to nadir at week 10 with plasma level of  $0.11 \pm 0.01$  ng/ml.

**Keywords:** Binucleate cells, buffalo, pregnancy diagnosis, syncytiotrophoblast

### Yield grading and prediction of combined closely trimmed and semi-boneless lean percentage using carcass traits of fattening culled dairy cattle in Thailand

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**Abstract** The percentages of combined closely trimmed and semi-boneless lean of fattening culled dairy carcass were classified into five yield grades, 1 through 5. Yield grade 1 carcasses had the highest semi-boneless lean percentage more than 81 % and yield grade 5, the lowest %combined closely trimmed semi-boneless lean was less than 68. A multiple stepwise linear regression analysis was used to conduct the prediction equation. A significant regression equation was found ( $F = 13.321$ ,  $p < 0.05$ ), with an  $R^2$  of 0.305. The equation for predicting the combined closely trimmed and semi-boneless lean percentage of fattening culled dairy carcass is: combined closely trimmed and semi-boneless lean percentage =  $81.523 - 0.851$  (marbling score, 1-5) -  $1.209$  (rib fat thickness, cm.) -  $0.097$  (chest cavity width, cm.) +  $0.060$  (rib-eye area, square cm.) +  $1.302$  (sex, 0=male, 1=female)

**Keywords:** Dairy carcass traits, Combined closely trimmed and semi-boneless lean grading, Marbling score, Rib fat thickness, Rib-eye area

## Effect of *Mucuna pruriens* leaves in dairy cow feed on gas production, digestibility and rumen fermentation by using *in vitro* gas production technique

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**Abstract** The objective of this experiment was study to the *Mucuna pruriens* leaves in dairy cow feed on kinetic of gas production, nutrient digestibility and rumen fermentation. The experiment was randomly allotted according to completely randomized design (CRD). There are four dietary treatments: (T1) basal diet without *Mucuna pruriens* leaves (control group), (T2) basal diet used *Mucuna pruriens* leaves at 10%, (T3) basal diet used *Mucuna pruriens* leaves at 20% and (T4) basal diet used *Mucuna pruriens* leaves at 30%. The basal diet was 40:60 ratio of Ruzi grass (*Brachiaria ruziziensis*) and concentrate. The results shown that the *Mucuna pruriens* leaves at 10% in feed affect dry matter and organic matter digestibility was higher than with the control group ( $p < 0.05$ ). However, *Mucuna pruriens* leaves in all level were not different among dietary treatments on kinetic of gas production. Therefore, can use *Mucuna pruriens* leaves at 10% in dairy cow feed.

## Effect of feeding banana stalk on the physical quality and nutritive value of eggs, fatty acid profile, and lipid quality index in yolk of laying hens under a free-range rearing system in bamboo plantation

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**Abstract** Animal welfare in the livestock systems is a major concern around the world. Consumers, stakeholders, and governments increasingly desire and administer the well-being and better management of animals kept for food production. The performance of natural behaviors is one aspect of animal welfare that typically resonates strongly with the general public. More natural living condition is thought to be achievable, in the case of laying hens, by providing access to area outside a building. This experiment was conducted to determine the effects of feeding banana stalk on physical quality and nutritive value of eggs, including fatty acid profile, and lipid quality index in yolk to laying hens under free range rearing system in bamboo platation (FBS-FRRS). Three-hundred laying hens (Hisex brown®) were randomly divided into randomized completely block design (RCBD) with treatments and 6 blocks (sampling periods). FBS-FRRS and a conventional rearing system (battery cage) fed on a corn-soybean meal-based diet (CON) were used as treatments. The results showed that CON and FBS-FRRS had a significantly higher shell color score as well as redness and yellow value

of boiled yolk ( $P<0.05$ ). FBS-FRRS albumen and whole eggs had significantly higher protein content than CON group ( $P<0.05$ ). However, FBS-FRRS yolk had significantly lower dry matter, ether extract, and gross energy CON yolk ( $P<0.05$ ). Furthermore, FBS-FRRS showed increased total cholesterol and decreased iodine content in yolk ( $P<0.05$ ). Additionally,  $\Sigma$ MUFA,  $\Sigma$ PUFA, linoleic acid, linolenic acid, DHA,  $\Sigma$ Omega3,  $\Sigma$ Omega-6 and  $\Sigma$ Omega-9 contents of yolk increased in the FBS-FRRS groups ( $P<0.05$ ). Likewise, FBS-FRRS had a significantly decrease in thrombogenicity index ( $P<0.05$ ), indicating potential benefits for health-conscious consumers. The results of this experiment showed that FBS-FRRS can be used by farmers. It showed the potential of animal welfare management in enhancing yolk color and functional eggs production.

**Keywords:** Animal welfare, Prebiotics, Free range system, Laying hens

### Supplementation of synbiotic in diets of Thai native chicken: the effect on its production performance, intestinal histomorphology and carcass quality.

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**Abstract** This study focused on the effect of symbiotic supplementation in Thai native chicken diets, on production efficiency and morphology in the intestines of chickens where Jerusalem artichoke (*Helianthus tuberosus* L.) and BACTOSAC-P® were used as synbiotic sources, respectively. There were 320 indigenous black-tailed indigenous chickens bred at 10 days after incubation were assigned into a complete randomized design (CRD) with 4 replicates (25 chickens per replicate). There were four dietary treatments: control diet (T1), symbiotic supplemented 0.025 % of DM (T2), 0.050% of DM (T3) and 0.075 % of DM (T4), respectively. Data were collected at 180 day old for productive performance, intestinal histomorphology, and carcass qualities. Jerusalem artichoke and BACTOSAC-P® were used at a ratio of 1:9 (w/w) as the sources of prebiotic and probiotic, respectively. Full time feeding and water system (Ad libitum) and lighting of the chicken house for 23 hours (06.00h-05.00h+1). The results showed that final weight, ADG, and FCR were statistically different. ( $P<0.05$ ) with values of 2,422.35, 2,497.40, 2,585.70 and 2,599.12, (g); 25.45, 26.25, 27.25, and 27.44, (g/day); 2.98, 2.92, 2.74, and 2.86, respectively. While, the values of villous height, cryptal depth, lactic acid bacteria and NH<sub>3</sub> production were not statistically different. Carcass quality studies showed that the total internal organ was significantly reduced ( $P<0.05$ ) with values of 11.78 10.32 10.26 and 10.18 (%), respectively. However, meat quality, was found that the lightness (L\*value) was significantly reduced ( $P<0.05$ ) with values of 50.51, 48.81, 48.90, and 49.61, respectively and the reflectance of redness (a\*) was significantly increased ( $P<0.05$ ) with values of 1.57, 1.92, 1.96, and 1.81, respectively. Overall, the symbiotic supplementation from Jerusalem artichoke and BACTOSAC-P® can increase

growth parameters of Thai native black-tailed chickens, including weight gain, final weight, ADG and FCR. Increased villi height from symbiotic feed supplementation suggests increased efficiency of nutrient absorption and improved chickens' health.

**Keywords:** Thai Native chicken, Synbiotic, Intestinal histomorphology, Productive performance and Carcass quality

## Short-Term Herbal Supplementation on the Physiological Condition of Bali Cattle under the Oil Palm Integration System

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**Abstract** This study aimed to find out the effect of short-term herbal supplementation on the physiological condition of Bali cattle kept under the Oil Palm Integration system. The experiment was conducted from April to July 2021. Twenty-eight (28) 2 years old Bali cattle were divided into 4 treatments, with 7 cattle each. The 4 treatments were: T-0: no herbs/control; T1= *Andrographis paniculata* extract (200 mg/kg live weight), T-2= *Melastoma malabathricum* extract (200 mg/kg live weight), and T-3: *Andrographis paniculata* extract (100 mg/kg live weight) and *Melastoma malabathricum* extract (100 mg/kg live weight). All animals were fed *ad libitum* with a mix of 40% grass + 60% fermented palm oil sludge. Physiological parameters measured were respiration rate, pulse rate, skin temperature, and rectal temperature and conducted in the morning, noon, and afternoon. Temperature Humidity Index (THI) was calculated from daily temperature and relative humidity, while the Heat Tolerance Coefficient (HTC) was calculated from rectal temperature and respiration rate, was based on two methods (Benezra and Rhoad). In general, results showed that respiration rate and skin temperature measured in the morning have a similar effect for all treatments. However, when it was measured at noon and afternoon, the respiration rate of the T-0 value was significantly higher ( $p < 0.05$ ) than the T-1, T-2, and T-3. The pulse rate, skin temperature, and rectal temperature of the T-0 were significantly lower ( $p < 0.05$ ) than those of T-1, T-2, and T-3 respectively. There is no significant effect of all treatments for the THI and the HTC-Benezra values. However, the HTC-Rhoad of T-0 has significantly lower than that of the T-1, T-2, and T-3. All physiological values for all treatments were under the normal range for healthy cattle.

**Keywords:** Bali cattle, THI, herbs, supplementation

## A Molecular Survey of *Theileria* spp. in Ruminants in the Thailand-Cambodia border region

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**Abstract** Theileriosis is caused by *Theileria* spp. parasites, transmitted by various species of ticks including Amblyomma, Haemaphysalis, Hyalomma and Rhipicephalus. This pathogen can be found in red blood cells and white blood cells of farmed animals, including cattle, buffaloes, goats and sheep. *Theileria* spp. leads to a high morbidity in small ruminants, economic loss in agricultural production and time spent on infection prevention. It is necessary to detect the infection in a farm, as there are generally no clearly recognisable clinical signs. Our results revealed that infected animals displayed 230 bp DNA fragments, which is the length of the V4 region of the 18S rRNA gene of *Theileria* spp. The overall prevalence of *Theileria* spp. in ruminants farmed in Sa Kaeo Province, the border between Thailand and Cambodia, was 9% (29/314). The prevalence of *Theileria* spp. in meat cattle (6%), buffaloes (6%), meat goats (6%) and crossbred meat sheep (6%). It was also found that the prevalence of *Theileria* spp. was linked to neither species nor gender ( $p>0.05$ ). Polymerase Chain Reaction was used to analyse *Theileria* spp. since it is very sensitive, specific and fast. Our analysis can be used to prevent and control the spread of *Theileria* infection in ruminants. Furthermore, this information may guide implementation of a policy on animal movement within the border regions.

**Keywords:** Infection prevalence, Ruminant, Theileriosis, *Theileria* parasites, PCR Technique

## Ribeye areas and sizes of fattening culled dairy carcasses determination using plastic grid and geometric methods

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**Abstract** The ribeye areas (REA) of fattening culled dairy carcasses which measured using geometric method (GM) were significantly higher than those using plastic grid (PG) method with the averages of 84.12 and 81.42 sq.cm., respectively ( $P<0.01$ ). The factor of ribeye sizes had highly significantly influenced on REA. The averages of REA for small, medium, and large sizes were 61.94, 80.85, and 105.51 sq.cm., respectively ( $P<0.01$ ). In addition, the interaction between the factors of method and size affected on the REA. The averages REA of large size measured by GM method was 108.77 sq.cm.

higher than that measured by PG method 102.26 sq.cm. ( $P < 0.05$ ), whereas there was not significant difference for the small and medium sizes measured by both methods.

**Keywords:** Cross-section loin, Dairy beef, REA measurement methods

### Development of Loop-mediated Isothermal Amplification (LAMP) for rapid detection of Methicillin-resistance *Staphylococcus aureus* (MRSA) from dairy cattle

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**Abstract** Methicillin-resistant *Staphylococcus aureus* (MRSA) is a major cause of mastitis in dairy cattle, resulting in the loss of economic value in livestock. The gene *mecA* encodes penicillin-binding protein 2A (PB2A), which only binds weakly to  $\beta$ -lactam antibiotics such as penicillin and methicillin, thus conferring the antibiotic resistant property in MRSA. Currently, detection of MRSA in laboratory setting is commonly performed using bacterial culture or PCR assay targeting *mecA* gene, which is time-consuming, labor-intensive, and requires specialized personnel and equipment. A more rapid detection of MRSA is needed to effectively prevent the spread of MRSA. This study aims to develop a novel Loop-mediated Isothermal Amplification (LAMP) assay that can detect MRSA more conveniently, quickly, and accurately. Bacterial culture were isolated from milk samples from dairy cattle with mastitis and PCR primers were designed to target *femA*, *blaZ*, and *mecA* gene to detect *Staphylococcus aureus* (*S. aureus*), penicillin resistance, and methicillin resistance, respectively. We found that all isolates possessed *femA* and *blaZ* genes, and 30% of the isolates possessed *mecA* gene. For LAMP assay development, primers were designed to target the coding region of *mecA* gene, and reaction was monitored using the fluorescence labelling of the amplified products. We were able to detect the presence of MRSA quickly, and the results were consistent with those obtained by PCR and bacterial culture. LAMP assay successfully detected *mecA* gene in MRSA strains isolated from dairy cattle milk.

**Keywords:** Methicillin-resistant *Staphylococcus aureus* (MRSA), *Staphylococcus aureus*, Loop-mediated isothermal amplification, and Mastitis



## Dietary of probiotics and organic acids supplementation on productive performances, intestinal morphology, carcass characteristics, and meat quality of broiler chickens

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**Abstract** This experiment was conducted to determine the dietary supplementation of probiotics (Micromix® 3B Dry) and organic acids (Semalex®) on productive performances, intestinal morphology carcass trait, and meat quality of broilers in tropical climates. A total of 1,440 one-day old mixed sex Ross 308 chicks were assigned to 4 treatments, each with 5 replicates. Treatment groups consisted of control diet, diet supplemented with organic acids (Semalex®; fumaric acid, formic acid, lactic acid, propionic acid and citric acid) 2 kg/ton feed, diet supplemented with probiotics (Micromix® 3B Dry; *Bacillus sp.* 5×10<sup>11</sup> CFU/kg) 2 kg/ton feed, and diet supplemented with probiotic and organic acid 2 kg/ton feed. Results showed that supplementation of probiotics and combination of probiotics and organic acids in the level of 2 kg/ton feed had significantly higher ( $P<0.05$ ) villi height when compared with other treatments. It was also discovered that probiotics and organic acids supplementation improved ( $P<0.05$ ) feed conversion ratio of broilers in starter period (1-21 days) in comparison to the other groups. However, there was no effect of any of the dietary treatments on growth performance during the grower period (22-42 days) or the finisher period (43-56 days). Likewise, probiotics, organic acids, and combinations of probiotics and organic acids had no effect on broiler carcass trait or meat quality characteristics. However, probiotics and organic acids had no effect on carcass trait in terms of increasing the proportion of breasts and lowering the percentage of abdominal fat pads ( $P>0.05$ ). This experiment concluded that a 2 kg/ton feed supplementation of probiotics a combined with organic acids improved growth performance in terms of feed conversion ratio and villi height of female broilers during starter period.

**Keywords:** probiotic, organic acid, diet, feed additive, broiler

## The influence of fattening periods on chemical composition, fatty acid profile, cholesterol, and ribonucleotide content of Charolaise crossbred steers

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**Abstract** The chemical composition, fatty acid profile, cholesterol, and ribonucleotide content of *longissimus thoracis* muscle from Charolaise crossbred steers fattened for 12 and 15 months were measured and compared. Chemical composition did not differ between the two fattening periods. Fat content was 4.38 and 4.66 %, moisture content 72.79 and 71.14 %, ash content 1.24 and 1.23 %, and protein content 23.60 and 23.73 % for fattening periods of 12 and 15 months, respectively. Fatty acid composition was not affected by fattening period, except that C15:0 content was higher in steers fattened for 12 months than in steers fattened for 15 months ( $P < 0.05$ ). There was no effect of fattening period on cholesterol content ( $P > 0.05$ ). As for the effect of fattening period on ribonucleotide content, only guanosine monophosphate (GMP) of steers fattened for 12 months was significantly higher than those of steers fattened for 15 months ( $P < 0.05$ ).

**Keywords:** Meat quality, Meat flavour, Fattening period, Crossbred steer

## Effect of storage temperature on the quality of live mud crabs

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**Abstract** Live holding of mud crabs is a part of the post-harvest process. After capture, crabs are kept out of water and held for lengths of time. The aim of the present study was to determine the effect of chilling storage on the quality of live mud crabs. Muscle glycogen, muscle lactate, VBN, muscle pH, muscle yield, and chemical compositions were analyzed. The results showed that the chilling storage at 20°C could decrease delayed loss of quality change with high remained glycogen ( $7.40 \pm 2.30$  mg/100g), low accumulated lactate ( $9.75 \pm 0.12$  mmol/kg) and  $45.57 \pm 3.59$  mgN/100g of VBN, while the pH decreased slightly average to  $7.01 \pm 0.09$ . This condition maintained muscle yield of  $15.63 \pm 0.58\%$  after 7 days. The

total proximate compositions changed slightly during storage, the averaged between 78.10-79.10% of moisture content, 16.85-16.91% of protein, 0.10-0.22% of fat, and 1.4-1.54 % of ash on 4-7 days storage. Thus, this result indicated that the 20°C chilling storage can be useful for the handling process and transport of mud crabs.

**Keywords:** mud crab, chilling storage, glycogen, lactate

### **Influence of age on the incidence of wooden breast and white striping, carcass composition, meat physicochemical property, texture profile, and chemical composition of broiler chickens**

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**Abstract** The aim of this study was to investigate the effects of the age at 43 and 51 days on the incidence of wooden breast (WB) and white striping (WS), carcass composition, meat physicochemical property, textural profile, and chemical composition of broiler chickens. The frequency and percentage of WB and severity of WS did not differ between age groups. Live weight and carcass weight were affected by age, except the carcass composition percentages. Breast, thigh, wing, and leg weights were not different between groups. However, the percentage of the thigh was higher in broilers at 51 days of age than at 43 days of age. The percentage of meat physicochemical properties; pH3 and pH24 of broilers at 43 days of age were higher than those at 51 days of age ( $P < 0.01$ ). Broiler meat at 51 days of age had statistically significant higher  $a^*$  value, while  $L^*$ ,  $b^*$ , chroma, and hue values were not significant differences. There were not significant differences in drip loss percentage, cooking loss percentage, and shear force value. Hardness, gumminess, and chewiness were higher in 51-day-old broilers than 43-day-old broilers ( $P < 0.05$ ), except the cohesiveness of cooked meat of 51-day-old broilers was higher than that of 43-day-old broilers ( $P > 0.05$ ). For meat chemical composition, the different age groups did not affect the chemical composition, but only the percentage fat content of 51-day-old broilers tended to be higher than that of 43-day-old broilers.

**Keywords:** wooden breast, white striping, physicochemical property, texture profile

## Effect of strain and gender on production performance, carcass characteristics and meat quality of broiler chickens

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**Abstract** This study examined the effects of strain and gender on production performance, carcass characteristics, and meat quality of broiler chickens. There were no significant interactions between broiler strain and gender ( $P>0.05$ ). Arbor Acres showed significantly higher body weight (BW) and average daily gain (ADG), while feed intake (FI) and feed conversion ratio (FCR) were significantly lower than Ross308 and Cobb500, especially in the fifth and sixth weeks of age. Arbor Acres also showed the highest slaughter weight ( $P<0.05$ ). However, carcass composition was not significantly different between strains. There were no significant differences between the strains in muscle pH, drip loss and cooking loss. However, Cobb500 had a lower shear force value than the others ( $P<0.05$ ). As for the gender-specific effect, BW and ADG of male broilers were higher than those of females from the second to the sixth week of age ( $P<0.01$ ). At the second week of age, female broilers had higher FI, while male broilers had higher FI from the third to the sixth week of age ( $P<0.01$ ). Male broilers had lower FCR than females from the fourth to the sixth week of age ( $P<0.01$ ). Male broilers had higher slaughter weight, carcass weight and carcass composition weight ( $P<0.01$ ) except for abdominal fat ( $P>0.05$ ). Percent carcass composition did not differ among broiler strains except for percent tenderloin and percent abdominal fat, which were higher in females than males ( $P<0.01$ ). Broiler strains had no effect on meat quality except that Cobb500 had lower shear force ( $P<0.05$ ). The pH3, pH24 and yellowness color values had differed between genders, which male muscle had higher pH3 ( $P<0.05$ ), pH24 ( $P<0.01$ ) than female but female muscle had higher yellowness value than male ( $P<0.05$ ). Interaction effect between breed and gender was found in lightness ( $P<0.01$ ) and redness colors ( $P<0.05$ ).

**Keywords:** broiler, performance, carcass composition, meat quality

## Effects of different starch sources in concentrates on meat characteristics, nutrient composition, and collagen solubility of dairy steers

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**Abstract** This study examined the influence of three different starch sources in concentrates - ground corn (CO), ground cassava (CA), and pineapple stem starch (PI) formulated as a 40% in concentrate - on meat quality, texture profile, nutrient composition, and collagen solubility of the *Longissimus thoracis* (LT) of dairy steers. Meat quality and texture profile did not differ significantly between treatments ( $P>0.05$ ). Nutrient composition did not differ between treatments except that ash content of PI was higher than the other treatments ( $P<0.05$ ). Starch sources had no effect on collagen content and solubility in LT muscle. Based on the results of this study, pineapple stem starch can be used as an alternative energy source in concentrates without negative effects on meat characteristics.

**Keywords:** Starch source, Meat characteristics, Texture profile, Collagen solubility

## Session 5: Entomology and related fields

### A First Record of Mealybug, *Planococcus bendovi* Williams (Hemiptera: Planococcus) in Southeast Asia

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**Abstract** *Planococcus bendovi* Williams (Hemiptera: Planococcus) is a mealybug species that only found attacked on plants in India. A series of surveys set up randomly in Bengkulu province, Indonesia in the year 2020 recorded an occurrence of *P. bendovi*. The species was found attacks on the leaves, trunks, and branches of a semi-parasitic plant, *Loranthus pentandrus* L. (Loranthaceae) within 20-40% of incidence rate. This is the first report of *P. bendovi* in Indonesia as well as Southeast Asia regions. Morphological data and pictures of the species are also provided.

**Keywords:** Biodiversity, host plant, insect pest, mealybug, taxonomy.

## Adulticidal toxicity of trans-anethole and geranial from natural essential oils against house fly, *Musca domestica* (L.), Muscidae; Diptera

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**Abstract** Knockdown and adulticidal activities against house fly (*Musca domestica* (L.)) of major essential oil (EO) constituents, trans-anethole and geranial at 0.5, 1, and 1.5% in ethyl alcohol were evaluated with a standard WHO susceptibility test. Cypermethrin 1% (w/v) and 70% (v/v) ethyl alcohol were used as positive and negative controls, respectively. At 1.5%, the highest concentration, these EO constituents exhibited highly effective knockdown and adulticidal activities against *M. domestica*. The highest knockdown and adulticidal activities were achieved by geranial (1.5%), with a knockdown and a mortality rate of 98.0% and 100%, respectively, and a KT50 of 7.6 min and an LT50 of 7.6 min. Trans-anethole showed a knockdown and a mortality rate of 50.1% and 69.3%, respectively, with a KT50 of 36.2 min and an LT50 of 22.4 h. After 60 min of treatment, the lowest LC50 (most effective) achieved by geranial was less than 0.5%. Both compounds were more toxic than 1% (w/v) cypermethrin (KT50 of 95.7 min). Geranial was more potent than trans-anethole and cypermethrin against *M. domestica* and should be developed into a safe and effective adulticidal agent in a comprehensive *M. domestica* control program.

**Keywords:** *Musca domestica* L., Adulticidal activity, Geranial, Trans-anethole.

## Larvicidal and pupicidal activities against *Musca domestica* L. of several combinations of *Cinnamomum verum*, *Cymbopogon citratus* (Stapf.), and *Illicium verum* Hook. f

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**Abstract** This study was an investigation of the larvicidal and pupicidal activities against *Musca domestica* L. of each of 4 formulations of combined essential oil (EO) and its major constituent. The investigated formulations were 2% *Cinnamomum verum* EO + 1% trans-cinnamaldehyde, 2% *Cymbopogon citratus* EO + 1% trans-anethole, 2% *C. citratus* EO + 1% trans-cinnamaldehyde, and 2% *Illicium verum* EO + 1% trans-cinnamaldehyde. The efficacy of each formulation was compared to that of 1% (w/v) cypermethrin, a synthetic insecticide. The larvicidal and pupicidal assays were a dipping method and a topical method, respectively. The mortality rates of the larvae and pupae were observed and recorded after 1, 5, and 10 days of incubation. The highest larvicidal activity was achieved by the combination of 2% *I. verum* EO + 1%

trans-cinnamaldehyde, with 93.3% mortality rate at 10 days and an LT50 of 2.7 days, while the highest pupicidal activity was achieved by 2% *C. citratus* EO + 1% trans-cinnamaldehyde, with 25.3% mortality rate at 10 days and an LT50 of 12.2 days. These figures were almost the same as those exhibited by 1% (w/v) cypermethrin. The outcomes of this study indicate the high potential of combined *I. verum* EO + trans-cinnamaldehyde and *C. citratus* EO + trans-cinnamaldehyde, as safe and effective larvicidal and pupicidal agents for a comprehensive *M. domestica* control program.

**Keywords:** Larvicidal activity, Pupicidal activity, trans-cinnamaldehyde, *Musca domestica* L., *Cymbopogon citratus* EO  
*Illicium verum* EO

### Larvicidal and ovicidal activities against *Aedes aegypti* (L.) of combinations between plant essential oils and their major constituent

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**Abstract** We conducted this study to investigate, under laboratory conditions, the larvicidal and ovicidal activities against *Aedes aegypti* (L.) of each formulation of several combinations between a plant essential oil (EO) and its major constituent. These formulations were 2% *Cinnamomum verum* EO + 1% geranial, 2% *Citrus aurantium* EO + 1% geranial, 2% *Cymbopogon citratus* EO + 1% trans-anethole, and 2% *C. citratus* EO + 1% trans-cinnamaldehyde, which were compared against a commercial synthetic insecticide, (1% (w/v) Temephos). The larvicidal and ovicidal activities assay were a topical bioassay. The larvicidal activity assay was conducted on fourth instar larvae of *Ae. aegypti*. Larval mortality was observed and recorded at 30 min and 1, 2, 6, 24 and 48 h. The ovicidal activity was conducted on the eggs. The number of hatched eggs was counted at 1, 2, 6, 24, and 48 h after exposure. The outcomes of both assays were subjected to probit analysis, which yielded the lethal time (LT50) for each treatment. Overall, 2% *C. citratus* EO + 1% trans-anethole provided the strongest larvicidal activity against *Ae. aegypti* among the four tested formulations, with the highest mortality rate 100% at 2 h and an LT50 of 0.5 h. In addition, 2% *C. aurantium* EO + 1% geranial had the strongest ovicidal activity against *Ae. aegypti*, with an inhibition rate of 52.7% at 48 h and an LT50 of 12.4 h. This combination was more toxic to larvae and eggs than 1% (w/v) Temephos. According to our findings, *C. citratus* EO + trans-anethole and *C. aurantium* EO + geranial are useful bioresources for developing effective and comprehensive mosquito control program that are safe to humans and the environment.

**Keywords:** Larvicidal activity, Ovicidal activity, *Citrus aurantium* EO, *Cymbopogon citratus* EO, Geranial, trans-anethole.



## Predatory efficiency of *Euborellia* species against fall armyworm, *Spodoptera frugiperda* (J.E.Smith) (Lepidoptera:Noctuidae)

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**Abstract** The fall armyworm, *Spodoptera frugiperda* (J.E. Smith) (Lepidoptera: Noctuidae) which originated from the Americas recently invaded corn production areas in the Philippines. Suppression of this pest involved primarily the use of insecticides. To include the use of predatory earwigs in Integrated Pest Management of the pest, this study was conducted to determine the efficiency of two species, *Euborellia annulata* (F.) and *E. annulipes* (Lucas). In a laboratory assay, 3rd and 5th larval instars were offered one at a time, and replaced once dead/consumed. This was done separately for adult male and female predators. Females of *E. annulipes* consumed/killed significantly more 3rd and 5th instar larvae than their male counterparts. Similarly, *E. annulipes* females consumed significantly more prey larvae ( $X=3.4$  of 3rd and  $1.93$  of 5th instar) than both sexes of *E. annulata* ( $X=1.93$  of 3rd and  $0.6$  of 5th instar). On the other hand, there were no significant differences in the consumption of the males on both species. The predatory efficiency of both species also was evaluated in the field to determine further their potential as biocontrol agents of *S. frugiperda*. At a rate of one adult predator per square meter, released at 28, 33, 40 and 47 days after planting (DAP) result in reduced feeding damage of *S. frugiperda* on leaves and tassels and corresponding higher yields significantly better than the control.

## Adulticidal activity against housefly (*Musca domestica* L.; Muscidae: Diptera) of eucalyptol, limonene, and their combined formulation

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**Abstract** The insecticidal potency of eucalyptol, limonene, and a combined formulation against housefly (*Musca domestica*) was evaluated and compared to that of cypermethrin, a common synthetic insecticide. The knockdown and mortality rates were determined by a standard susceptibility assay recommended by World Health Organization (WHO). The tested concentrations of eucalyptol and limonene were 1, 5, and 10%, while the combined formulation was 5% eucalyptol + 5% limonene. The highest efficacy (100% mortality rate) was provided by the combined formulation (5% eucalyptol + 5% limonene). Both individual essential oil constituents provided a mortality rate ranging from 10.7-82.0% and a knockdown rate ranging from 8.0-81.3%. Most importantly, the 5% eucalyptol + 5% limonene combined formulation

provided as high a mortality and knockdown rate as that of 10% cypermethrin. Therefore, it has a good potential as a safer and equivalently effective, natural product alternative to cypermethrin.

**Keywords:** eucalyptol, insecticidal activity, limonene, *Musca domestica*

### Ovicidal and adulticidal activities of *Cymbopogon citratus* (DC.) Stapf and *Illicium verum* Hook. f. against *Aedes aegypti* (Linn.)

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**Abstract** This study was an evaluation of hatching inhibition and knockdown rates against *Aedes aegypti* of two essential oils (EOs): *Cymbopogon citratus* DC. Stapf and *Illicium verum* Hook F. The efficacy of each of these EOs, at 1, 5, 10% emulsion in water, stabilized by tween60®, was compared to that of 1% w/w temephos and 1% w/v cypermethrin (common, harmful synthetic insecticides). Topical and contact assays showed that 10% *C. citratus* and 10% *I. verum* emulsions were the most effective in inhibiting the hatching of mosquito eggs (100%) after 48 hours of exposure. Moreover, they were also the most toxic against mosquito adults (100% mortality) after 24 hours of exposure. This study also established that tween60® had no effect on hatching inhibition or mortality rate of treated *Aedes aegypti* mosquitoes. All EO emulsions were more potent than temephos and cypermethrin against these mosquito species. Coupling this higher efficacy with no or benign known side effects of natural EOs, it can be concluded that 10% *C. citratus* and 10% *I. verum* emulsions are better alternatives than temephos and cypermethrin for a mosquito control program at the present time.

**Keywords:** *Aedes aegypti*, *Cymbopogon citratus* (Stapf.), *Illicium verum* Hook. F.

### Repellency of six plant essential oils against *Periplaneta americana* L. and *Blattella germanica* L.

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**Abstract** Six essential oils (EOs) from *Cinnamomum cassia*, *Citrus sinensis*, *Mentha piperita*, *Syzygium aromaticum*, *Zingiber cussumunar*, and *Zingiber officinale* at 10% in soybean oil were evaluated for their repellent activities against *Periplaneta americana* L. and *Blattella germanica* L. adults and compared to that of naphthalene (1 g of sublimating ground powder), a common insect repellent. All six EOs exhibited a significantly higher effective repellency against *B. germanica* than against *P. americana*. Among all EOs tested, *C. cassia* EO exhibited the highest repellent activity against adult *B.*

*germanica* (90.0%) and adult *P. americana* (76.0%). Naphthalene, on the other hand, showed 88% repellency against *B. germanica* and 98% against *P. americana*. It can repel *P. americana* better but repel *B. germanica* worse than *C. cassia* EO. *C. cassia* EO has a good potential to be developed into an effective, and safe insect repellent for controlling *P. americana* and *B. germanica* populations.

**Keywords:** Cinnamomum cassia, Periplaneta americana L., Blattella germanica L., Repellency.

### Lethal Effect of Native *Metarhizium rileyi* (Farlow) Samson Isolate to Invasive Fall Armyworm, *Spodoptera frugiperda* (J.E. Smith), Infesting Corn in the Philippines

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**Abstract** Detection of fall armyworm, *Spodoptera frugiperda* (J.E. Smith) (Lepidoptera: Noctuidae), in the Philippines in October 2019 prompted research on pest management solutions aside from insecticide application. This paper presents the bioefficacy of an entomopathogenic fungus in controlling fall armyworm. A native *Metarhizium rileyi* was successfully isolated from naturally infected *S. frugiperda* larvae collected in corn fields in Lucena, Quezon Province in the Philippines. Laboratory bioassays were conducted to elucidate the virulence of *M. rileyi* to different life stages of *S. frugiperda*. Based on t-test, *M. rileyi* had no ovicidal activity. The larval instars of *S. frugiperda* were susceptible to *M. rileyi* with higher mortalities in early instars. Mycosed larvae were covered with white fungal growth and light olive green conidia. The mean time to larval death ranged from 5.10 to 8.67 days depending on conidial concentration while lethal concentration (LC 50) was computed from  $7.30 \times 10^5$  to  $3.81 \times 10^{13}$  conidia/ml. Based on t-test, reduced pupation and adult emergence were observed in fungal treated prepupa. However, there was no effect on the adult emergence of fungal treated pupa. Susceptibility of *S. frugiperda* to *M. rileyi* implies its potential use and integration in the Integrated Pest Management for *S. frugiperda* in the Philippines.

**Keywords:** biocontrol, pest management, fall armyworm

## Productivity of Five Entomopathogenic Nematodes in *Galleria mellonella* L. and Their Persistence in Soil under Laboratory Conditions

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**Abstract** The persistence and reproductive ability of entomopathogenic nematodes (EPN) are important factors to consider in insect biological control agents. Therefore, the present study compared the persistence and productivity of five EPN isolates namely, *Steinernema glaseri*, *S. siamkayai*, *S. carpocapsae* All, *Heterorhabditis bacteriophora* and *H. indica* EPNKU80 in *Galleria mellonella* larvae. The productivity among the EPN significantly varied among the nematode species. Generally, *Heterorhabditis* species produced more infective juveniles (IJ) than *Steinernema* species in the cadaver. The IJ production was highest in *H. bacteriophora* but was not statistically different from *H. indica* (EPNKU80). In contrast, the lowest number of IJ was produced by *S. carpocapsae* All. The persistence test showed that *H. bacteriophora* had the highest penetration ability and had the greatest number of EPN produce inside *G. mellonella* larvae at all exposure times than the other EPN species. In addition, the highest efficacy was observed in *H. bacteriophora* (84.40%) at 15 day after application, which was statistically different from *S. glaseri* (63.30%), *S. siamkayai* (59.10%), *H. indica* EPNKU80 (58.50%) and *S. carpocapsae* All (19.30%). We concluded that *Heterorhabditis* species have higher soil persistence and higher IJ reproduction than *Steinernema* species, hence, can be used for insect pest control.

**Keywords:** biological control agent, *Heterorhabditis bacteriophora*, *Heterorhabditis indica*, *Steinernema carpocapsae* All, *Steinernema glaseri*, *Steinernema siamkayai*, infective juvenile productivity, soil persistence

## Adoption of Integrated Pest Management (IPM) Technologies in Southern Philippines: Constraints and Motivations

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**Abstract** Determining the factors that influence farmers' adoption of IPM is critical to a successful sustainable pest management program. This study was conducted to determine the constraints and motivations in IPM adoption, involving 112 farmer participants of a Two-year IPM Training program (Years 2018 to 2019) in Southern Philippines. Of the 40 adopted technologies, ten were affected by training attendance. Most of the adopted technologies belonged to the bottom

tier of the IPM Pyramid, which are the abiotic actions such as crop rotation, adopted by 42 to 85% of the participants. Training completers had higher level of adoption, from moderate to very high, than absentees whose adoption were mostly from low to moderate. Learners of IPM-based pesticide use also adopted IPM technology at a higher level than non-learners. Motivations, such as increases farm productivity and income, highly influenced training attendance. Constraints influenced the level of adoption. Lack of time and capital were common constraints among the various adopters, from low to very high adopter types. Low to high adopters also indicated laziness as a constraint in IPM adoption. Thus, these constraints and motivations are important factors to consider in designing IPM training programs to encourage attendance to training and, eventually, adoption of IPM technologies.

**Keywords:** Adoption constraint, Adoption motivation, Integrated Pest Management, Technology adoption

### Ovicidal effect against *Musca domestica* (L.) of several combinations of plant essential oils and their major constituent

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**Abstract** Four formulations of combined essential oil (EO) and EO constituent—2% *Cinnamomum verum* EO + 1% geranial, 2% *Citrus aurantium* EO + 1% geranial, 2% *Cymbopogon citratus* EO + 1% limonene, and 2% *Illicium verum* EO + 1% geranial—were evaluated of their ovicidal activity against the eggs of *Musca domestica* (L.) as well as 1% (w/v) cypermethrin (positive control, synthetic chemical). The ovicidal activity assay was a topical bioassay. Hatched larvae were counted under a stereomicroscope at 1, 2, 6, 12, 24, and 48 h after treatment, and their number was recorded. The combination of 2% *I. verum* EO + 1% geranial exhibited the highest ovicidal activity against *M. domestica*, providing 28.7% inhibition rate at 48 h and an LT50 of 53.7 h. The other three formulations showed an inhibition rate ranging from 12.0-26.7%. Nevertheless, 1% (w/v) cypermethrin provided a higher ovicidal activity, a complete 100% inhibition rate and an LT50 < 1 h. Results showed that's in terms of ovicidal activity, the tested EO and their major constituent formulations were not as effective as cypermethrin. This and other findings from this study may help other researchers in their effort to develop safe and effective alternatives to synthetic insecticide.

**Keywords:** Ovicidal activity, Geranial, *Illicium verum* EO, *Musca domestica* (L.).

## Insect diversity in forest and beach ecosystems in pelabuhan ratu, sukabumi, west java

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**Abstract** Differences in the structure and composition of the constituents an ecosystem cause differences in the character ecosystem that can affect diversity and abundance insects. The abundance insect species is largely determined by reproductive activity which is supported by environmental suitability and the fulfillment of food source needs. This study aimed to determine the diversity insects in forest and coastal ecosystems in Pelabuhan Ratu, Sukabumi, West Java. Insect sampling were carried out using insect nets, pitfall traps, malaise traps, and light traps. The results showed that the total insects obtained were 560 individuals consisting of 14 orders, 80 families. Based on the analysis of functional roles, 51.60% were herbivores, 22.85% predators, 6.42% parasitoids, 14.82% detritivores, 0.178 indicators and 4.10% other insects. Insect diversity was greater in forest ecosystems than coastal ecosystems because forest ecosystems have more diverse types of vegetation. Ecosystems that are far from human activities can be an effort to conserve the environment as insect habitat.

**Keywords:** Insect abundance, diversity, ecosystem, forest, beach

## Identification and Biology of Fruit Fly Attacking Some Citrus Varieties in Bengkulu

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**Abstract** Citrus is one of important horticulture commodities in Bengkulu. There are some varieties of citrus cultivated in Bengkulu such as Kalamansi, Rimau Gerga Lebong (RGL), and pamelo. There are some pests attacking citrus, the most important is fruit fly *Bactrocera* spp. (Diptera: Tephritidae). To control that pest rationally, it is necessary to know the species and its biology. The aim of this research was to identify and study the biology of fruit fly attacking three varieties of citrus in Bengkulu, Kalamansi, RGL, and pamelo. Observed citrus were cultivated on three different geographic stratum such as next to sea shore, city, and sparsely populated area. The results showed that the three citrus varieties have different level of damage. The highest damage level was found on pamelo. There are two species of fruit fly attacking Kalamansi, *Bactrocera carambolae* Drew & Hancock and *Bactrocera papayae* Drew & Hancock. The biology of two species of fruit fly was studied including the life cycle and the morphometric of each stadium.

**Keywords:** kalamansi, RGL, pamelo, *Bactrocera carambolae*, *Bactrocera papayae*.

## Study on different concentrations and timing of 17 $\alpha$ -methyltestosterone to accumulate in water flea (*Moina* spp.) from lab-scale

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**Abstract** To study the different concentrations and immersion times of 17  $\alpha$ -Methyltestosterone (17 MT) on the accumulation in water flea. These water fleas were divided into 2 groups: group 1 immersed in 17MT at a concentration of 50 mg/L and group 2 at a concentration of 100 mg/L. Each experiment consisted of 18 experimental units, which were used to immerse in 17MT for 30, 60, and 420 minutes, respectively. After that, water fleas and the water were examined for the 17MT accumulation by using High Performance Liquid Chromatography (HPLC). Results were found that amount of 17MT of both groups in each period displayed significantly different ( $P < 0.05$ ). The highest accumulation of 17MT was found in the red mite soaked at the concentration of 100 mg / L for 420 minutes equal to  $0.46 \pm 0.10$  mg/L. In contrast, it was found that the amount of 17MT in both concentrations of water at three times was not statistically significant ( $P > 0.05$ ). In conclusion, different concentrations and immersion times had a significant effect on the accumulation of 17MT in water fleas, while 17MT can detect in water throughout the experiment.

**Keywords:** 17  $\alpha$ -Methyltestosterone, Water flea, Concentration, Immersion Time

## Carcass quality traits and omega-3 content in different pork cuts from pigs fed a diet supplemented with linseed

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**Abstract** A total of 300 crossbred pigs were divided into three groups to evaluate the optimal slaughter weight for pig fed with linseed diet. The control pigs (C) were fed a commercial feed mixture with slaughter weight of 100-105 kg. The linseed fed pigs were fed a diet supplemented with 5% ground linseed during the growing-finishing periods and slaughtered with 100-105 kg (designed as low weight group, L) or with 110-115 kg (designed as high weight group, H). Four animals per groups were randomly selected for analysis of carcass quality traits, omega-3 ( $n-3$ ) content, and lipid oxidation among different pork cuts. The results showed that feeding with linseed diet in H group seem to be higher Lenden-speck quotient (LSQ) index than L and C groups. There were no significant differences in lean cutting yields and percentage of retail cuts among treatments ( $P > 0.05$ ). Regarding  $n-3$  contents, especially in form of alpha-linolenic acid (ALA, C18:3 $n-3$ ), ham, belly,



boston butt, fore and hind legs, and backfat were higher in L and H groups than in control ( $P < 0.05$ ), which approximately 2.6—3.2 times greater than that in the control, depending on pork cuts. The oxidative stability of muscle lipids as indicated by TBARS values were not significantly differences among treatments ( $P > 0.05$ ). Due to the positive effects on higher  $n-3$  content related to human health, linseed supplementation can be recommended in pig diet with commercial slaughter weight with 100-105 kg.

**Keywords:** Omega-3 pork, Healthy meat, Linseed, Linolenic acid

## The Diversity of Terrestrial Earthworm in Agricultural Land and Adjacent areas, Uttaradit Province, Thailand

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**Abstract** The diversity of terrestrial earthworms was studied in 4 sub-districts of Uttaradit Province namely; Numrid, Kungtapao, Pasao, and Hadkruad. The earthworms and soil samples were collected in the same area of 3 replications in 6 lands use types consisting of Rice field, Vegetable plantation, Crop plantation, Orchard, Grove, and Residential area, 4 times in 2013, June, August, September, and December. The results showed that 24 earthworm species in 5 families were found. The *Pontoscolex corethrurus* was the only one of the family GLOSSOSCOLECIDAE. We found 15 species of the family MEGASCOLECIDAE, 3 species of the family MONILIGASTRIDAE, 4 species of the family OCTOCHAETIDAE, and 1 species of ALMIDAE. Of these 10 were supposed to be new species. The most diverse of earthworm species was found in the Pasao sub-district (21 species). The highly abundant species were *M. posthuma*, *M. peguana*, and *M. houlleti*, respectively. The population density of earthworms was significantly different in June and August; highly in vegetable plantation areas followed by residential areas, respectively.

**Keywords:** earthworm; diversity; agricultural land

## Session 6: Agricultural Sciences and Biology

### The novel investigation of natural product nano-particles from fungi for plant immunity

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**Abstract** *Chaetomium* spp. have been reported to degrade cellulolytic plant debris into soil to increase soil fertility as well as organic matter in the soil, and a specific isolate of *Ch. globosum* reported to inhibit *Pyricularia oryzae* causing rice blast. Chaetoglobosin C from *Ch. globosum* KMUTL-N0805 actively inhibited several plant pathogens, such as *C. lunata* (leaf spot of corn), *Colletotrichum* sp. (citrus anthracnose), and *Fusarium oxysporum* f.sp. *lycopersici* (tomato wilt). *Ch. globosum* KMUTL-N0802 produces a novel anthraquinone-chromanone compound, named chaetomanone, and known compounds as chaetoglobosin C and echinulin. Chaetomanone and echinulin were recorded to be active inhibited *Mycobacterium tuberculosis* causing Tuberculosis of human being. It is supposed to be expressed a control mechanism against the pathogens. The biodegradable nanoparticles from natural products of active metabolites of *Chaetomium* spp. are further investigated and discovered as a new scientific investigation, namely microbial degradable nano-elicitors for inducing immunity in plants by the authors. In recently years, the scientists are actively investigated the organic nanomaterials of different kinds of nanoparticles possessing biological properties. The nanotechnology for agriculture is interested in various areas. Plant disease control is to decrease or eliminate the nontarget effects either abiotic or biotic factors. Nano-sciences have become a new method to restructure the materials at atomic level. Molecular nanotechnology can be constructed the organic materials into defined structures and atom by atom. The natural products from *Chaetomium* species are proved for antifungal strategy against several plant pathogens. The alternative disease control is to safe, effective, and environmentally friendly methods to control plant pathogen is highly needed. The construction and characterization of copolymer nanoparticles loaded with bioactive. The biodegradable nano-particles constructed from active natural products of different species of *Chaetomium* for immunity. The natural bioactive compounds from *Chaetomium* species have been searched rather than toxic chemical constructed to be fine particles at molecular level as degradable nanoparticles used to control plant disease and induce plant immunity were investigated by electron spinning. Degradable nano-CGH, nano-CGE, and nano-CGM constructed from *Ch. globosum* KMUTL-N0805 actively inhibited *Curvularia lunata* causing leaf spot disease of rice var. Sen Pidoa in Cambodia. The effective dose of 50 % (ED50) of degradable nano-CGH, nano-CGE, and nano-CGM were 1.21, 1.19, and 1.93  $\mu\text{g/mL}$ , respectively at very low concentration to inhibit leaf spot pathogen of rice. These biodegradable nanoparticles actively forwarded to the pathogen cells to become disruption and distortion, those pathogen inocula lost pathogenicity according to preliminary Koch's postulate test. The nano-CGH, nano-CGE, and nano-CGM inhibited spore production by 92.70%, 93.44%, and 84.17%, respectively and resulted antifungal activity against *C. lunata* with ED50 values of 1.21, 1.19, and 1.93  $\mu\text{g/mL}$ , respectively. The applications of degradable nano-CGH, nano-CGE, and nano-CGM to inoculated *C. lunata* on rice seedlings var Sen Pidoa gave a good

disease in pot experiments. Degradable nano-CGH and nano-CGM gave higher disease reduction of rice leaf spot caused by *C. lunata* (61.54%) than nano-CGE (53.83%). These nanoparticles significantly increased the height and number of tillers of the rice plants at 60 days after treatment. Nano-particles from *Ch. lucknowense* (Nano-CLM, nano-CLE and nano-CLH) inhibited sporulation of rice blast pathogen which the ED50 values of 5.24, 7.01 and 10.72  $\mu\text{g/mL}$ , respectively. Interestingly, all tested nano-particles derived from *Chaetomium* caused pathogenicity loss of rice blast pathogen due to the broken of pathogen cells. The treated rice leaves with nano-CBH from *Ch. brasiliense* showed the Rf values of 0.05 and 0.28 which defined to produce Sakuranetin and Oryzaalexin B as phytoalexin against blast disease. Our research findings have developed to be a natural product of nanoelicitor for rice blast immunity. These active natural products from different strains of *Chaetomium* are further developed to be biodegradable nanoparticles from active metabolites as a new discovery of scientific investigation which used to induce plant immunity, namely microbial degradable nano-elicitors for inducing immunity in plants. The biodegradable nano-elicitors are developed to induce plant immunity through phytoalexin production in plants e.g. inducing tomato to produce alpha-tomaline against Fusarium wilt of tomato, capsidiol against Chilli anthracnose, sakuranetin against rice blast, Scopletin and anthrocyaidin against *Phytophthora* or *Pythium* rot, Durian and scoparone against *Phytophthora* or *Pythium* rot of citrus etc.

**Keywords:** nano-fibres, plant immunity, phytoalexins, plant pathogens

## Progress in rice breeding for Indonesian swampland areas

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**Abstract** The rapid decline in irrigated rice fields due to land conversion to non-agricultural or non-rice production use could threaten the Indonesian food supply for the growing population. The availability of vast swampland areas currently underutilized could serve as the backup for the declining irrigated field in maintaining the rice supply. Successful rice production on swampland areas, however, should be devised with the high-yielding varieties adaptable to biotic and abiotic limiting factors inherent in the swamplands ecology. The rice breeding program reported herein is our endeavor in developing high-yielding rice varieties for swamplands ecology. The program that was initiated in 2013 has generated ten advanced lines with superiority in yield and agronomic performances under the swampland breeding site. We named the lines as UBPR 1, UBPR 2, UBPR 3, UBPR 4, UBPR 6, UBPR 7, UBPR 8, UBPR 9, UBPR 10, and UBPR 11. The lines were developed through the involvement of Bengkulu heirloom swamp rice varieties as the genetic sources for swampland adaptability. Several tests for tolerance to submergence and salinity stresses had also been conducted along with their development. Work is underway for further evaluations on the adaptability and yield stability across different types of swampland.

**Keywords:** advanced lines, environmental stresses, heirloom, high-yielding varieties, swampland adaptability

## Effect of Drying Methods during Priming on Quality and longevity of Rice Seeds

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**Abstract** The purpose of this experiment was to evaluate the potential benefits of postpriming treatments to increase the shelf-life of primed rice seed, the quality and longevity of primed seed dried using different drying methods were analyzed and compared based upon several germination and vigor tests. The experiment was conducted at the Seed Technology Laboratory, Chao Khun Thahan Building, Department of Plant Production Technology, Faculty of Agricultural Technology, King Mongkut's Institute of Technology Ladkrabang. The research was designed with 4 replicates as Factorial Completely Randomized Design with 2 factors consisting of factor A which was seed drying methods and factor B which was storage conditions. The Khao Dawk Mali 105 rice seed were used in this experiment. The same priming procedure was conducted for all treatment: seeds were osmoprimed in glass containing a 1:30 ratio of pig placenta bio-extract and distilled water for 48 hours under the temperature of 18 °C. Seed were then rinsed briefly with water after incubation and surface water was removed by dab them almost dry with towel paper. The post-priming treatments were as follows: primed seeds were dried by using hot air oven at the temperature of 25 °C for 48 hours, 30 °C for 36 hours, 35 °C for 24 hours and 40 °C for 12 hours. The non-primed seeds were as a control. All 5 treatments were then stored under control (15 °C, 20% relative humidity) and ambient (approximately 30 °C, 65% relative humidity) conditions for 5 months. The non-stored and stored seeds were examined on 0, 1, 3, 5 months of storage for seed quality including moisture content, water activity, germination and germination index of seed. The result showed that the appropriate drying method for Khao Dawk Mali 105 primed rice seed was drying with a hot air oven at 30 °C for 36 hours then stored under control condition, this brings the low moisture in seeds and reduces the damage from moisture. In addition, the primed rice seeds have a longer shelf-life.

**Keywords:** Khao Dawk Mali 105 rice seed, drying method, seed longevity

## New hybrid varieties of sugar apple and giant sour tamarind

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**Abstract** The commercial varieties of sugar apple has released as Pech-Pakchong and Fai-Kaew-Kaset 2, The giant sour tamarind named Pakchong 1 has also released for the farmers in Thailand. IT has been over 20 years on breeding program, new hybrid varieties under registration are PechPakchong variety, PechPakchong variety , Fai-Kaew-Kaset 2., Fai-Kaew-Kaset 2, Fai-Kung Var. purple. Tamarind hybrid is also under registration. Withthis, Annona breeding program, germplasm collection and selection of sugar apple, Atemoya and *Annona* Hybrids , Hand Pollination on Fruit set of Sugar apple and Atemoya for Breeding , Development of Production Technology for Sugar Apple and Annona Hybrids, The Propagation of Petch Pakchong cv. ( *Annona* Hybrid ) by Grafting, Status of Sugar Apple and *Annona* Hybrids Production in Pakchong District, Nakhon Ratchasima Province, Germplasm Surveying Collection and Identification of Sugar Apple and *Annona* Hybrids in Thailand, Selection for Superior Growth, Yield and Fruit Quality of Sugar Apple and *Annona* Hybrid Cultivars in Pakchong Research Station , Production System of *Annona* Hybrid cv. Petch Pakchong in Nakhon Ratchasima and Saraburi Province, Characteristics of Sugar Apple and *Annona* Hybrid cv. A0013, B0003, C0001 and D0005, Guidelines for Implementing GAP for Sugar Apple and *Annona* Hybrids Production in Pakchong District, Nakhon Ratchasima Province , Fruit Development of *Annona* Hybrid cv. Petch Pakchong , Postharvest Changes of *Annona* Hybrid Fruit cv. Petch Pakchong , Harvesting Indices of *Annona* Hybrid Fruit cv. Petch Pakchong, PropagationProcedureof*Annona*spp.at PakchongDistrict,NakhonRatchasima Province, Production and Marketing of Nursery Stock Plants of Sugar Apple in Amphor Pakchong, Nakhon Ratchasima Province , Effect of Bagging Materials on Fruit Quality of *Annona* Hybrid cv. Petch Pakchong , Effect of Bagging Materials on Fruit Growth of *Annona* Hybrid cv. Petch Pakchong , Properties of Bagging Materials and Its Affected on Surrounded Atmosphere of *Annona* Hybrid “Petch Pakchong” Fruits, Grading Evaluation of Sugar Apple Fruits ,Tamarind Breeding Program , Germplasm Collection and Selection of Tamarind (*Tamarindus indica* Linn.) Program, Superior Growth and Yield of Tamarind (*Tamarindus indica* Linn.) Cultivars at Pakchong Research Station, Nakhon Ratchasima Province, A Comparison on Characteristics of 5 Cultivars of Sour Tamarind , Study on Pollen Viability and Number of Pollen Grain of 11 Cultivars of *Tamarindus indica* Linn. , Evaluation and Selection of Hybrid Thai Sour Tamarind, Effects of Sucross Concentration on Pollen Germination of Avocado: Booth 7 cv. and Peterson cv., Influence of 1-Methylcyclopropene on the Delayed Respiration Rate and Softening Process of Hybrid Sugar Apple (*Annona cherimoya* x *Annona squamosa*) Fruit cv. Petch-Pakchong., Evaluation of Antioxidant Properties in Naturally and Artificially Ripened Sugar Apple (*Annona squamosa* L.) Fruits Differences in Antioxidant Properties Among Cultivated Sugar Apples (*Annona* spp.) will be dicussed. The New Cultivars of Sugar Apple are introduced as PetchPakchong, NueThong, Pakchong46, Pakchong KU 1, Pakchong KU 2, Pakchong KU 3, Fai Khiew Kaset 1, NongKhiewKaset1 and Fai Khiew Kaset 2. The New Cultivars of Tamarind are introduced as G1 Hybrid ( Dok kinghuk X Pakchong 1), G2Hybrid (DokkinghukXPakchong1), G3Hybrid DokkinghukXPakchong1), G4Hybrid

(DokkinghukXPakchong1), Hybrid (DokkinghukXFuktrongRatchaburi), Hybrid ( Dok kinghuk X Fuktrong Ratchaburi )  
and Hybrid ( Dok kinghuk X Fuktrong Ratchaburi)

**Keywords:** plant breeding, custard apple, tamarind

### Larvicidal and pupicidal activities against *Aedes aegypti* L. (Diptera: Culicidae) of several combinations of plant essential oils and their major constituent

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**Abstract** The larvicidal and pupicidal activities of each of four formulations of combined essential oil (EO) and its major compound were evaluated against *Aedes aegypti* L. mosquitoes and compared with that of a commercial synthetic insecticide (1% w/v Temephos). These formulations were 2% *Cinnamomum verum* EO + 1% *trans*-anethole, 2% *Cymbopogon citratus* EO + 1% limonene, 2% *Illicium verum* EO + 1% geranial, and 2% *I. verum* EO + 1% *trans*-cinnamaldehyde. A topical method assay was conducted on the fourth instar larvae and pupae of *Ae. aegypti*. Larval mortality was observed and recorded at 30 min and 1, 6, and 24 h after the start of the assay, while pupal mortality was recorded at 24 and 48 h. All tested formulations exhibited higher larvicidal and pupicidal activities than 1% w/v Temephos except 2% *C. citratus* EO + 1% limonene. In particular, the combination of 2% *C. verum* EO + 1% *trans*-anethole exhibited the highest larvicidal effect against the larvae of *Ae. aegypti* with 100% mortality rate at 24 h and an LT50 of 46.5 min. The combination also showed the highest pupicidal effect with 79.7% mortality rate at 48 h and an LT50 of 31.1 h. The results of this study demonstrated the high potential of the combination of *C. verum* EO + *trans*-anethole as an effective and environmentally friendly larvicidal and pupicidal agent for a complete *Ae. aegypti* control program.

**Keywords:** Larvicidal activity, Pupicidal activity, *Aedes aegypti*, *Cinnamomum verum* EO, *trans*-anethole.

### Growth and yield of Chili cuttings under different compositions of inorganic fertilizer applications

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**Abstract** Vegetative propagation of chili by cutting offers an alternative method that produce planting materials genetically identical to the mother. This study aimed to compare the growth and yield of three hybrids chili cuttings grown with different compositions of inorganic fertilizer applications. A green house experiment was conducted to assign a factorial

arrangement of the treatments in a completely randomized design with five replications. The first factor was the hybrids, which produce cuttings of UNIB CH13, UNIB CH73, and UNIB CH65. The second was fertilizer compositions consisting of control (no fertilizer applied), 250 kg Urea /ha + 500 kg TSP /ha + 400 kg KCl /ha, 1214.6 kg NPK (16:16:16)/ha, and 607.3 kg NPK (16:16:16)/ha + 125 kg Urea/ha + 250 kg TSP /ha + 200 kg KCl /ha). Furthermore, each treatment combination is assigned to an experimental unit of two pots. The results showed that the fertilizer composition and its interaction with hybrids producing cutting were not significant for all growth and yield observed. Also, the cuttings of UNIB CH73 produced most fruit (59.50 g/plant) with harvest date at 70.7 days after planting (dap), followed by UNIB CH13 (47.10 g/plant) with harvest date at 75.4 dap; and UNIB CH65 (21.21 g) with harvest at 64.4 dap.

**Keywords:** hybrid chili, cuttings, inorganic fertilizers

### Heterotrophic and Coliform Counts, and *S. aureus* and *E. coli* Detection in Soil and Fertilizer Samples Obtained

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**Abstract** This study investigated the heterotrophic bacterial and coliform loads of farm soils and nutrient sources/fertilizers used in four farms adopting organic/agro-ecological practices and in four conventional/mixed vegetable farms in Laguna and Quezon provinces, Luzon island, Philippines. The Heterotrophic Plate Count (HPC) and coliform counts (CC), expressed as colony forming units per gram or CFU/g, were determined. To detect typical *S. aureus* and *E. coli* strains (potential pathogens) from selected soil and fertilizer samples, conventional culture methods were initially employed. The HPCs of the analyzed farm soils and nutrient sources generally differed by type of sample within a farm, and by farm. For the agro-ecological farm soil samples, the HPCs ranged from 105 to 106 CFU/g while these were 104 to 106 CFU/g for conventional or mixed farms. Additionally, the HPCs of the samples of nutrient sources from practicing-organic (PO)/agro-ecological farms were (in CFU/g): 108 for chicken manure in PO Farm 1 (PO1), 106 for both Bokashi (fermented organic matter/wastes) in PO2 and horse manure in PO3, and 106 and 104 for Fish Amino Acid (FAA) in PO4 and PO2, respectively. In the conventional or mixed (C/M) farming systems, the HPCs (in CFU/g) obtained for the fertilizers sampled were 105 for chicken manure with banana stalks in C/M1, and 103 for urea in C/M3 and C/M4, and 106 in C/M2. The coliform counts of soils obtained from farms practicing organic farming and from conventional or mixed farming systems ranged from 104 to 106 CFU/g and 103 to 104 CFU/g, respectively. For the fertilizers sampled from PO farms, the CCs (in CFU/g) were : 106 for chicken manure, 105 for horse manure, 105 for FAA in PO4 and <102 in PO2 and, <103 for Bokashi. In C/M farms, the CCs of the fertilizers analyzed were : 103 CFU/g for urea samples obtained from three farms



and 104 CFU/g for chicken manure used by one C/M farm. Phenotypically typical *S. aureus* isolates were obtained from the agro-ecological farms : 75% of farm soils and 40% of the nutrient source samples. *E. coli* isolates were also detected in 75% of these farm soils and in 60% of the sampled nutrient sources. Farm soils and nutrient sources can serve as reservoirs of a high population of bacteria, some of which may have pathogenic potential and may contaminate fresh produce. Knowledge of these should influence correct farm management practices to prevent foodborne outbreaks associated with the consumption of raw, fresh vegetables.

**Keywords:** Heterotrophic count, coliform count, *S. aureus*, *E. coli*, practicing-organic/agroecological and conventional/mixed farms, farm soils, fertility

### Effects of N and P dosages on crop growth, yield, and attack of pod borer (*Etiela zinchenella*) of soybean c.v. detam-1 grown at swampy land

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**Abstract** Soybean (*Glycine max* (L) Merr.) is one of the best protein sources for Indonesians. However, the national soybean production does not meet the demand due to the low crop productivity caused by major pests and poor soil nutrients. The objective of this experiment was to find out the best rate of N and P in promoting crop growth, get maximum yield, and minimize pod borer attack by *Etiela zinchenella* on soybean c.v. Detam 1. The experiment used a Completely Randomized Design arranged in factorial (2 factors). The first factor was N dosage (0, 25, 70, 75 kg.ha<sup>-1</sup> Urea) and the second factors was P dosage (0, 50, 100, 150 kg.ha<sup>-1</sup> TSP). The results showed that the interaction of N and P significantly affected the number of leaves, the number of pods produced, and the percentage of pod attacked by pod borer. We concluded that the interaction between 25 kg ha<sup>-1</sup> Urea + 100 kg ha<sup>-1</sup> TSP showed the best growth, the highest yield, and the lowest percentage of pod attacked by pod borer.

**Keywords:** *Etiela zinchenella*, N, P, soybean.

## The inhibition of seed germination treated with water extract of sorghum (*Sorghum bicolor*, L.) cultivated in histosols

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**Abstract** Allelopathy is a form of suppressing plant growth due to the release of toxins into the surrounding plants. Sorghum is a plant producing an allelopathic compound. Abiotic stress to sorghum planted in Histosols can determine the allelochemical release process. Application of an aqueous sorghum extract can control weeds nearby the main crop. The study aimed to determine the inhibition of seed germination treated with water extract of sorghum grown in marginal lands (Histosols) with different pattern of water application. The experiment assigned a two-factor randomized block design. The first factor was a watering pattern for four weeks, consisting of wet, alternate of a week wet and dry pattern, alternate of a week dry and wet pattern, dry and Ultisols (as a control). The second factor was the concentration of root water extract of sorghum, which consisted of 0.0%, 2.5%, 5.0%, 7.5%, 10.0%, 15.0%, 20.0%, and 25.0%. The experiment applied the bioassay method to Petri dishes. In each petri dish, 10 ml of root water extract were poured, sowed 25 sorghum seeds, and incubated for five days. The results showed that the highest inhibition of sorghum seed germination was under 7.5-10% concentration of water extract at dry Histosols as indicated by the lowest plumula and radicle fresh and dry weight. This finding indicates that drought stress sorghum in Histosols produces the highest allelopathic compound. Therefore, the plant has the potential as a source of bioherbicides.

**Keywords:** abiotic, allelochemical, autotoxic, stress, marginal

## Functionality of Insulin Plant (*Costus igneus* N.E. Br.) Leaf Extracts

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**Abstract** *Costus igneus*, a native of South and Central America, is commonly known as the insulin plant that belongs to family Costaceae. This plant is a perennial, upright, and spreading, growing to a height of two (2) feet with the tallest stems falling and lying on the ground. Studies claim that consumption of its leaves lowers blood glucose levels. This study aimed to evaluate the functionality of *C. igneus* leaves such as phytochemical properties, antibacterial activities, and its

cytotoxicity against *Artemia salina*. Qualitative phytochemical and antibacterial screening was carried out using modified standard chemical and microbiological procedures while cytotoxic activities was monitored using the brine shrimp lethality assay. Results showed that seven (7) out of nine (9) active phytochemical compounds tested was present in *C. igneus* ethanolic leaf extracts, namely: tannins, saponins, cardiac glycosides, steroids, flavonoids, terpenoids, and alkaloids. Disc diffusion assay revealed that the ethanol extract has exhibited a 20.73 mm and 20.86 mm zones of inhibition against *E. coli* and *S. aureus*, respectively. Furthermore, LC50 of 2.88 was observed in lethality assay after 24 hours using probit analysis. Based on these observations, the ethanolic extracts of *C. igneus* contains active biochemical compounds that contributes to its potentiality as antibacterial agent against common food-borne bacteria and can be further studied as anticancer agent due to its high levels of toxicity against *A. salina*.

**Keywords:** antibacterial, brine shrimp lethality assay, *Costus igneus*, phytochemical

## Natural plant growth regulator effects on the vegetative growth of long pepper (*Piper retrofractum* Vahl.)

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**Abstract** Long pepper (*Piper retrofractum* Vahl.) is an important medicinal plant in the medicinal industry. Long pepper is grown by cuttings, but the obstacles encountered in planting through cuttings are easy to wilt and slow growth. The use of natural growth regulators (PGR) is one method to accelerate the growth of plant cuttings. This study aims to determine the response of natural PGR to the vegetative growth of long pepper. The study used a completely randomized block design (RCBD) with two factors. The first factor was the concentration of banana weevil extract consisting of 4 levels, namely 0%, 5%, 50%, and 75%, and the second factor was the concentration of cow urine, consisting of 3 levels, namely 0%, 25%, and 50%. The study showed an interaction between PGR of banana weevil extract and cow urine on the time of shoot emergence, percentage of shoot emergence, shoot length, shoot number, leaves number, and fresh root weight. The fastest shoot emergence resulted from a combination treatment of 0% banana weevil extract and 50% cow urine, namely at two weeks after treatment (WAT), and the longest shoot emergence was in the treatment of 75% banana weevil extract and 50% cow urine, namely at 6WAT. The combination of 0% banana weevil extract and 50% cow urine resulted in the highest shoot length, shoots number, leaves number, root length, roots number, root fresh weight, and root dry weight of 18.98 cm; 2.47; 13.00; 12.61 cm; 3.93; 0.56 g; and 0.11 respectively. The highest shoot diameter resulted from the treatment of 75% banana weevil extract and 25% cow urine of 1.31 cm.

**Keywords:** banana weevil extract, cow urine, cuttings, long pepper, medicinal plants.

## Evaluation on Salinity Tolerance of New Maize Hybrids at Early Growth and Their Performance in Coastal Field

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**Abstract** Abiotic tolerance properties are valuable in newly developed varieties for specific purposes. Tolerance to salinity stress signifies the value of varieties developed for a coastal area. To evaluate salinity tolerance of newly developed maize hybrids, twenty hybrids were grown in nutrient culture supplemented with 150 mM NaCl and assayed at 4 weeks after seeding. Plant height, number of leaves, root length, shoot fresh and dry weight, root fresh and dry weight, shoot to root ratio and percent survival were measured to determine stress tolerance index (STI). Hybrids were considered tolerant to salinity stress when the value of  $STI > \bar{x} + \frac{1}{2}\sqrt{\sigma^2}$ . Simultaneously, the hybrids were grown in a coastal field in a randomized complete block design with three replications to evaluate their growth and yield performance. Growth and yield components i.e. shoot length, number of leaves, leaf width, leaf length, leaf area, stem diameter, time to harvest, ear length, ear diameter, number of kernel lines, plant fresh weight, grain weight per plant, weight of 100 grain, grain weight per plant, cob weight per plant and estimated yield per ha were measured and the data were analyzed by anova and main comparisons were conducted by the least significant difference (LSD). The results revealed that hybrids of H31, H33, H34, H48, and H50 were considered tolerant, while H16, H18, H19, H22, H25, H32, H42, and H49 were medium tolerance to saline stress. The hybrids exhibited high variation in the field performances, in either vegetative growth or yield components. Hybrids H17, H19, H29, H31, H33, H34, H48, H50 and H51 exhibited considerably high yields in the coastal field. All these salinity tolerant hybrids were prospective to grow in coastal area.

**Keywords:** corn, coastal, saline, stress tolerance index

## Research and Development of the Restructured Shrimp Product

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**Abstract** This research was to study the development of restructured shrimp products. Firstly, the curing temperature and time of the restructured shrimp processing were studied. The temperature varied between 2 levels; 4 and -18°C, with 3 levels; 1, 2, and 23 hours. It was found that the time at 4 °C at 1, 2, and 23 hours had no difference in weight loss after cooked. The texture values of the product cured at -18 °C were higher than those cured at 4 °C ( $p \leq 0.05$ ). Secondly, the

ratio of shrimp pieces to minced shrimp was varied in 3 levels: 50: 50, 40: 60, and 30: 70. The quantity of minced shrimp showed no difference in weight loss, shrinkage value, and sensory acceptance score. Finally, the variables of sodium chloride (NaCl) three levels; 0.5, 1.0, and 1.5 %w/w, and sodium tripolyphosphate (STPP) two levels; 0.3 and 0.4 %w/w, were investigated. The products using 1.0 % NaCl and 0.4 % STPP had the highest sensory acceptance scores. Finally, the products were processed by curing time at 4 °C, for 23 hours with a 30:70 ratio of shrimp pieces to minced shrimp, and using 1.0 % NaCl and 0.4 % STPP were evaluated. The color value of the product was  $L^* 51.83 \pm 0.78$ ,  $a^* 12.23 \pm 0.14$ , and  $b^* 14.62 \pm 0.18$ . The TBARS value was  $0.82 \pm 0.08$  mg malonaldehyde/kg sample. The proximate composition of the product includes moisture, protein, fat, ash, and carbohydrates were 74.60, 17.56, 4.97, 2.83, and 0.04 %w/w, respectively. In addition, the restructured shrimp products can be stored at -18°C for at least one month without detecting microorganisms.

**Keywords:** curing, restructured meat, shelf-life, shrimp, TBARS

### Enhanced partnerships with farmers' associations, the key in sustaining rice productivity and income

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**Abstract** Rice seed is one of the most important inputs of farmers in rice production. Each cropping season, farmers have to find ways where to get high quality seeds. The planting materials could be obtained from his previous harvest, neighbouring farmers for seed exchange, Department of Agriculture in the local municipality, purchase from a seed grower, and other sources. Farmers in remote and other areas have no access to high quality seeds. Usually, they practice seed exchange with other farmers so they normally get old and impure seeds. In order to help farmers in seed requirement, KOPIA-PhilRice established partnership with three farmers' associations/cooperatives in Nueva Ecija, Bohol, and Iloilo. Initially, an FGD (focus group discussion) was conducted to layout plans and logistics. Foundation seeds of the rice varieties that farmers' prefer were produced at PhilRice Central Experiment Station. After harvest, the seeds were given free of charge to farmer members of the association for planting. During the cropping season, trainings on rice production and management, meetings, and field days were conducted. After the season, farmers are required to return the amount of seeds they got but in the form of *seed fund*. The payment will be channeled to their association as income. This strategy was very successful because 12 more farmers' associations have joined the project and have increased their yield and income. Through this partnership, KOPIA has provided to the associations irrigation pumps in rainfed areas, direct-seeding machine (riding-type), transplanting machines (riding-type and walk-behind), automatic seeder for riding-type transplanter, seed trays, milling machines, soil kits, and farm implements. Each farmer group and representatives were sent to South Korea for a week-long training and observation on Korea's modern agriculture practices. The associations have generated substantial amount and income as *seed fund* to sustain their farming operations.

**Keywords:** Cooperative, High quality seeds, Rice

## Influence of Organic Fertilizer on the growth of Arrowroot

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**Abstract** The effect of organic fertilizer on the growth and yield of Arrowroot (*Maranta arundinacea L.*) in the field was tested to compared with chemical fertilizer which performed using Randomized Complete Block Design (RCBD) with 3 replications and 6 treatments as follows: 1) no application of fertilizer, 2) chemical fertilizer 13-13-21 at the rate of 50 kg/rai, 3) organic fertilizer at the rate of 400 kg/rai, 4) organic fertilizer at the rate of 400 kg/rai combined with chemical fertilizer at the rate of 50 kg/rai, 5) cow manure at the rate of 400 kg/rai, and 6) chicken manure pellets at the rate of 400 kg/rai. Data collected as follows: height, number of plants per clump, number of leaves per plant, basal stem circumference, the length, width, color and fresh weight of leaves, tuber weight per clump, number of tubers per clump, diameter and length of tubers and starch content. The results found that the application of chemical fertilizer at the rate of 50 kg/rai and organic fertilizer at the rate of 400 kg/rai combined with chemical fertilizer at the rate of 50 kg/rai at 3 and 6 months after planting, were significantly when compared to the control highest growth of Arrowroot. The yields of Arrowroot showed that chicken manure pellets gave the highest yield in the number of tubers per clump and starch content (1000 g), and followed by cow manure at the rate of 400 kg/rai, organic fertilizer at the rate of 400 kg/rai combined with chemical fertilizer at the rate of 50 kg/rai and organic fertilizer at the rate of 400 kg/rai. Whereas, treated with chemical fertilizer at the rate of 50 kg/rai and no fertilizer application (control) had the lowest in tubers and starch content. Thai Arrowroot at 12 months after planting revealed that chemical fertilizer, organic fertilizer at the rate of 400 kg/rai combined with chemical fertilizer, chicken manure pellets at the rate of 400 kg/rai were not significantly differed in tuber weight per clump as 2101, 2620, 2575, 2300 and 2737 g respectively whereas significantly differed when compared to the control, the tuber weight per clump was 1303 g. Application of organic fertilizer combined with chemical fertilizer showed significantly highest in length of tubers when compared to the other treatments. But it found that chicken manure pellets treatment gave the highest in starch content of 169 g and followed by chemical fertilizer, organic fertilizer, organic fertilizer combined with chemical fertilizer and cow manure treatments which the starch contents were 138, 147, 148, and 140 g, respectively which significantly differed from the control of 112 g. All treatments for cultivation of Thai Arrowroot at 12 months after planting showed similar trend to get yield and starch contents when compared to the non-treated control. However, the treatments which contained organic fertilizer treatments gave the reasonable yield and starch content

## Cost and return analysis of organic potato in Gasa District, Bhutan

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**Abstract** Gasa District became the first district in Bhutan to fully embrace organic farming in 2004. The Government has been assertive to increase farmers' household earnings and alleviate poverty. The study's objectives were to examine the cost and return of organic potatoes (*Solanum tuberosum* L.) in the Gasa District. Purposive sampling was employed to select 43 organic potato farmers from Goenkhatoe Gewog (a group of villages in Bhutan) in the Gasa District. Primary data for the 2019 production and marketing cycle were gathered from September to October 2020, using a semi-structured questionnaire through face-to-face interviews. Descriptive statistics and cost-and-return analysis were used to analyze the data. According to the findings, the total production cost was 339,462.80 Ngultrum per hectare (Nu/ha) (1Nu=0.014 USD). The total variable cost was 338,211.89 Nu/ha, and the total fixed cost was 2,559.28 Nu/ha, comprising 99.63% and 0.75% of the total production cost, respectively. Within the variable costs, the total input cost was 142,427.99 Nu/ha, and the total labour cost was 195,783.89 Nu/ha, which made up 41.96% and 57.67% of the total production cost, respectively. The depreciation cost was the highest contributor within the fixed costs with 2,528.75 Nu/ha, comprising meagre 0.74% of the total production cost. The average yield of potato tuber was 7.48 metric tons per hectare (MT/ha). The average Gross margin (profit) was -202,708.47 Nu/ha. The break-even yield and price were 18.63 MT/ha and 45.58 Nu/ha, respectively. The benefit-cost ratio (B:C ratio) was 0.40, and Return on Investment (ROI) stood at -59.71. The Gross margin over cash and variable cost were 1,082.43 and -201,457.56 Nu/ha, respectively. Considering the lesser B:C ratio (<1), it indicated that organic potato farming is not a profitable venture in the current situation. For a profitable venture, the farmers either need to increase their yield or obtain a farm-gate price greater than the respective break-evens.

**Keywords:** farm household income; farm-gate price; potato production; production cost; profit.



## Disease Incidence and Molecular Diversity of Tungro Virus on Rice (*Oryza sativa*) in Bengkulu, Indonesia

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**Abstract** There has been no updating of the data on the incidence of viral diseases that attack rice plants in Bengkulu. Updating data on viral disease distribution status is an initial step to prevent disease outbreaks. This research aims to report disease incidence and molecular characterization of the tungro virus in Bengkulu, Indonesia. Detection of viruses from field samples was able to amplify Rice Tungro Spherical Virus (RTSV) from Bengkulu city but could not amplify RTSV from other field samples. Specific DNA fragments of  $\pm 787$  bp were successfully amplified from Bengkulu city using specific primers for the coat protein gene of RTSV. Specific DNA fragments of 1400 bp were successfully amplified from Rejang Lebong, Bengkulu Tengah, Bengkulu Utara, and Bengkulu city using Rice Tungro Bacciliform Virus (RTBV) specific primers DAF and DAR. The results showed that the RTBV rice isolates from Bengkulu Utara and Rejang Lebong were closely related to the RTBV Seberang Perai isolates from Malaysia (MK552377).

**Keywords:** *Nephotettix virescens*; tungro disease; polymerase chain reaction; Rice Tungro Spherical Virus; Rice Tungro Bacciliform Virus; Reverse Transcription-Polymerase Chain Reaction (RT-PCR).

## Biological activity of rhizobacteria isolated from rhizosphere *Acacia crassicarpa* A. Cunn ex Benth. in timber plantations

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**Abstract** *Acacia crassicarpa* is widely planted in timber plantations for pulp and paper industry. However, *A. crassicarpa* is relatively susceptible to diseases. Consequently, it affects its growth rate. To control diseases and promote the growth of *A. crassicarpa*, one of the efforts that can be made is utilizing rhizobacteria or is known as plant growth-promoting rhizobacteria (PGPR). This study analyzed the biological activity of 27 isolated from the rhizosphere of *A. crassicarpa*. This study explored the ability of isolates to produce siderophores, hydrogen cyanide (HCN), indole acetic acid (IAA), and

antagonism assays. The ability of isolates to produce siderophores and HCN was determined qualitatively by inoculation of the isolates on iron-free chrome azurol S agar and King's B medium, respectively. IAA production was estimated colorimetrically by culturing the isolate on nutrient broth containing L-tryptophan as a precursor. The characteristic of the isolates capable of producing IAA is the color change of the culture after the addition of Salkowski's reagent. Antagonisms assay on pathogens that cause leaf blight and wilt were performed by using a cross-streaking method and dual culture method, respectively. It was found that 23 isolates showed the ability to produce siderophores as indicated by the formation of orange halo around colonies. According to the color change of the filter paper to light brown and dark brown, five isolates were found to produce weak and moderate HCN. Seven isolates produced IAA with a concentration in the range of 108.07-73.78 ppm. Isolate 010B performed the best ability to inhibit the growth of *Fusarium* sp. (61.10%) and *Xanthomonas* sp. (28.14%). The study results it can be concluded that there were two isolates with potential as biocontrol and growth promoter agents.

**Keywords:** Acacia, HCN, IAA, Rhizobacteria, Siderophores

## Session 7: ENVIRONMENTAL SCIENCE, AGRICULTURAL EDUCATION AND DEVELOPMENT

### Farmer's Learning Hub for Organic Agriculture Education

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**Abstract** The Farmer's Learning Hub for Organic Agriculture Education is situated in the lowland areas of Midsayap, Cotabato in Mindanao, Philippines. The Daniaya Farm and Ventures as it is known, was established in 2016 to showcase a productive and profitable bioenterprise through a viable technologies for the limited resource farms. The technologies are designed to increase productivity, lower farmer's production cost and provide appropriate production and management prerogatives and use of biodynamic principles. It operates differently from the usual monocropping scheme of a typical rice farms. It features a Diversified –Integrated farming system for self-reliance and food sufficiency of small land holders. In its 2 –acre areas, several crops, livestock and aqua culture components are in it. The crops cover the orchard, cereals and vegetables. The livestock are small ruminants and native chickens, ducks, geese and turkeys as poultry components. It also has a fish component with *T. nilotica* species grown in ponds. The integration of the different components includes the goat and poultry manures as the sources of organic fertilizer for the crops and the fish ponds. In turn, water from the pond is used to irrigate the rice fields. Synthetic chemicals fertilizers and pesticides are not used in the area. Presently, the hub serves as a venue model farm for skills and development activities of Agriculture students and farmers in the nearby Universities and region. In the last 3 years, graduate and undergraduate students of Mindanao State University-Maguindanao and General Santos frequent the farm in the conduct of field trips, research, farm system analysis and assessment studies. Likewise, extension activities like farmers training and hands-on workshop conducted by these

Universities are held in the area. Several farmers in the area have already adopted the technologies observed and learned from the farm.

**Keywords:** Viable Technology, Diversified-Integrated Farming Systems, Profitable Bioenterprise, biodynamic farming

## Agricultural Skills for the Promotion of Future Careers of Special Students at Phrae Panyanukul School, Phrae Province

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**Abstract** Finding showed that the agricultural teaching modules on laying hen farming, catfish farming, vegetable growing, quail farming and agricultural yield processing could develop agricultural skills of the students at a moderate up to a highest level. According to data collected in the past 5 years, it was found that the student preferred and developed the agricultural skills in activities on laying hen farming most (65.00%). As a whole, about 40.00 percent of the students had a highest level of agricultural skills ( $\bar{x}$ = 4.75). Only 7.01 percent needed teacher suggestions and prompting about agricultural practice ( $\bar{x}$ = 4.05). It was found that the student learning achievement after the promotion was higher than before with a statistically significant difference level at 0.05. Most of the students (80.28%) could well do farming with their parent, only 8.45 percent could do farming independently. Parents of the students were satisfied with agricultural skill development of the student at a highest level ( $\bar{x}$ = 4.80). For problems encountered after graduation, most of the students lacked continuity in agricultural careers and agricultural development (65.50%). For suggestions about agricultural skill development, teaching and learning activities should be small. Besides, diverse agricultural skills should be promoted for benefits of daily life activities of the students (90.00%).

**Keywords:** agricultural skills, special students, learning achievement

## Effect of Black Soldier Fly, *Hermetia Illucens* (Linnaeus), Larvae on Production Performance, Egg Quality, and Nutrient Digestibility in Post-Peak Chicken Layers,

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**Abstract** Three studies were conducted to determine the effects of feeding Black Soldier Fly larvae meal (BSFLM) on production performance, acceptability of eggs through sensory evaluation, energy, fat, and protein digestibility of layer diets and economics in post-peak Bobcock white chicken layers. A total of 192 54-week old Babcock white chicken layers were randomly allocated into one of four dietary treatments (T1 – control, T2 – 3% PM, T3- 1.5% PM + 1.5% BSFLM, T4- 3% BSFLM) with 16 replicates each, using randomized complete block design with location of cages as blocking factor. There were no significant differences observed on hen-day egg production but the average egg weight and size were significantly greater ( $P < 0.05$ ) on birds fed with 3% BSFLM and control over T2 and T3. Significant improvements ( $P < .0001$ ) in albumen height, egg yolk color, and Haugh unit were observed with increasing levels of BSFLM compared to T1 and T2. Diets with BSFLM significantly increased feed cost per bird but did not have significant effect on efficiency based on cost of feed per kilogram of eggs produced per bird. BSFLM supplementation at 3% did not have any significant effects on albumen texture, yolk color, yolk flavour, and overall acceptability of eggs. Study 2 suggests that BSFLM can be included in the diet without any negative effect on overall acceptability at 3% inclusion. Limited inclusion of BSFLM did not have a significant effect ATTD of gross energy but significantly increased the ATTD of protein ( $P < .0114$ ) and fat ( $P < .0001$ ).

**Keywords:** Black soldier fly larvae meal, Production performance, Nutrient digestibility, post-peak layers

## The carbon footprint Assessment from Electricity in Amnatcharoen Province of Northeastern Thailand

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**Abstract** The carbon footprint Assessment dioxide equivalent emissions per year resulted to assess the population for a total of carbon dioxide emissions at 3,663 ton CO<sub>2</sub>/Capital, with an average of 1.85 ton CO<sub>2</sub> /Capital/person. The consideration by sex of study found that sex with highest amount of carbon dioxide equivalent emissions was female which averaged 1,896 ton CO<sub>2</sub>/Capital. by age range of study found that age range with highest amount of carbon dioxide

equivalent emissions was 31-45 year 892 ton CO<sub>2</sub>/Capital. The knowledge on electrical energy usage of the population showed the most of aware in “items in the refrigerator with a lot of ice formed in the icebox take long time to be cold or are not cold much”, and followed by the knowledge that “maintenance of electrical appliances helps to save energy”, and “electrical appliances with a lot of wattage consume a lot of energy”. The behavioral aspect found that the electrical energy usage behavior of population was recorded at often level consume. The information obtained from this research is expected to be a guideline for creating a policy to conserve electrical energy and reduce carbon dioxide emissions in Amnatcharoen Province of Northeastern Thailand.

**Keywords:** Carbon footprint, electricity usage behavior, greenhouse gas

## Chemical Intensive Rice Production vs. System of Rice Intensification (SRI): Which Direction shall Cambodian Rice Agriculture be?

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**Abstract** In Cambodia, rice is grown using different establishment methods; intensive chemical practices such as direct-seeded rice (DSR) and transplanted rice (TPR), and System of Rice Intensification (SRI). Energy is used to grow rice and released as the energy footprint. This study aimed to estimate the various energy footprint (CO<sub>2</sub>e eq.) under three methods, namely: direct-seeded rice (DSR), transplanted rice (TPR), and System of Rice Intensification (SRI). One hundred sixty-one farmers were interviewed. Results revealed that the total energy footprint in the field production were in the following order: TPR, DSR, and SRI at 1845.73 CO<sub>2</sub>e kg ha<sup>-1</sup>, 1850.20 kg ha<sup>-1</sup>, 780.02 kg ha<sup>-1</sup>, respectively. The energy footprint to produce a kilogram of paddy rice was highest in DSR (0.61 CO<sub>2</sub>e) and lowest in SRI (0.23 CO<sub>2</sub>e). The SRI footprint is significantly lower by 62% than DSR and TPR. Nitrogen was the energy hotspot at 40-50% of the total energy footprint in TPR and DSR but not in SRI since no nitrogen fertilizer was applied in SRI. Likewise, highest grain yields and monetary net returns was obtained in SRI (3.4 t ha<sup>-1</sup>, 447.76 US\$ ha<sup>-1</sup>) compared to the intensive chemical practices in DSR (3.02 t ha<sup>-1</sup>, 427.82 US\$ ha<sup>-1</sup>) or TPR (3.13 t ha<sup>-1</sup>, 316.60 US\$ ha<sup>-1</sup>). Which direction shall Cambodian rice agriculture be? As oil prices increased, all energy-based inputs will also increase. Reducing the use of energy-based inputs, mainly nitrogen fertilizer would reduce the energy footprint and at the same time, would also increase the energy productivity. SRI had shown the beneficial trend of simultaneously improving grain yield while reducing the energy inputs and the energy footprint. Small as it may be, Cambodian carbon dioxide emissions is small relative to global or total emissions. Though this is the case, there is an imperative need to adopt rice production practices or strategies to reduce rice energy footprint. The Cambodian government should redirect its rice production policies by providing incentives or rewards for farmers to practice organic – SRI in their fields for sustainable and climate resilience rice agriculture systems.

**Keywords:** Chemical intensive rice production, energy inputs, direct-seeded rice, transplanted rice, System of Rice Intensification, energy footprint, climate resilience

## **Farmers' Economic Status and Acceptability of Goat Farm Management Technology: A Case Study in the Lower Central and Upper Southern Regions of Thailand**

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**Abstract** The objectives of this study were to study, 1) some economic background of goat farmers in the lower central and the upper southern regions of Thailand; 2) the acceptability of farm management technology transfer. Data were collected from 941 farmers who owned goat farms in the year of 2020-2021. The questionnaires were accepted and analyzed for the frequency, percentage and mean. The results showed that the most farmers were male (67.12%), age between 31 to 40 years old (72.03 %) and 51.81% had high school education status, and 57.63 % of farmers had an experience of about 5 to 10 years in raising goat. Most of the farmers had an average 76 goats/ family; 89.37% of them raised semi-caged goat. About 63.45 % of the farmers did not receive consulting opportunity for farm management from experts. The total income average was 226,401 THB/year. About 86.77% of goat sales were made with dealers. The goat farm management transfer was accepted in level in terms of breed and breeding management (3.68); good level on farm management, feeding, housing, and sanitation (2.98, 3.25, 3.07, and 2.51), and medium level for marketing (2.46). In the SWOT analysis of goat farming, it was found that the sheep farming career was consistent with the way of life as well as religion and traditions of the Muslim community in the selected area as strengths; marketing problems due to lack of slaughterhouses, no clear market system, and only few marketing resources available were the weaknesses; creation of policy by the government agencies to develop a network of sheep and goat farmers as an opportunity; and lastly, smuggling from neighboring countries making the goat products vulnerable to disease control was an obstacle.

**Keywords:** Economic status, Acceptability of farm management Technology and Goat

## Soil erosion rate estimates using USLE of selected corn producing areas in Barangay Vitali, Zamboanga City, Philippines

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**Abstract** A study was conducted to estimate the rate of soil erosion using the universal soil loss equation (USLE) in seven (7) corn producing areas in Barangay Vitali, Zamboanga City, Philippines. The area is characterized as hilly with slope ranging from 20-43% and patches of banana, coconut and fruit trees where soil erosion has been a persistent problem. The corn areas and number of respondents were determined using the purposive sampling and descriptive statistics to compare the predictive variables. The USLE was used to estimate the rate of soil loss (A) measured in ton ha<sup>-1</sup> yr<sup>-1</sup> (t ha<sup>-1</sup> yr<sup>-1</sup>) by the compounding effects of various factors such as the rainfall erosivity (R), soil erodibility (K), length of slope (L), steepness of slope (S), vegetation cover (C), farming practices and management (P). Accounting all these factors, of the 7 areas, Sitio Sta. Fe obtained the highest erosion rate measured at 214.86 t ha<sup>-1</sup>yr<sup>-1</sup> followed by Sitios Pico, Camalig, Gemelina, Linduman, Tagpangi and Cansilayan with respective rate at 176.0, 111.51, 92.04, 88.05, 86.20 and 67.0 t ha<sup>-1</sup>yr<sup>-1</sup>, which gave the average of 119.62 t ha<sup>-1</sup>yr<sup>-1</sup>. Rainfall erosivity, length and slope gradient are factors which contributed to high erosion rates. Suitable, ecologically sound, climate smart-soil restorative technologies should replace the soil-erosive-monoculture corn farming in the uplands of Barangay Vitali. Substantial effort has to be in placed with strong interventions from government and local communities to help curb the increasing soil erosion problem in these fragile upland ecosystems in Zamboanga City, Philippines.

**Keywords:** Soil erosion, rainfall erosivity, length slope gradient, USLE, farming practices and management.



## Environmental Awareness and the Role of Women in Environmental Preservation In Central Mindanao, Philippines

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**Abstract** Environmental awareness means being aware of the natural environment and making choices that benefit rather than hurt Mother earth. This study sought to discover the environmental awareness and roles of women in Central Mindanao, Philippines. Employing a descriptive quantitative design, 81 participants from different walks of life across the geographic location were interviewed through online survey. The study revealed that the excessive use of inorganic fertilizers, pesticides, or herbicides, unjust prices of unhusked rice, insufficient, expensive, and polluted irrigation system are among the observed environmental abuse in farming; deforestation, illegal or excessive logging, and illegal mining are the abuses in the mountains; and water pollution due to improper waste/ garbage disposal, and dynamite fishing in the waters. They acknowledged the environment as a source of livelihood, life, and natural resources, a habitat for animals, and as a protection from natural calamities. Their role in farming preservation includes not throwing garbage near the irrigation system, not using of organic chemical, and not wasting food or rice. Initiating and joining tree planting activities, informing Department of Environment and Natural Resources (DENR) officers on the illegal activities, and encouraging barangay officials to widen their monitoring on their area are among their roles in the mountains; while proper waste management, doing 3Rs – Reduce, Reuse, Recycle, teaching children at home, and encouraging the community to clean their surroundings are among their role in the preservation of waters. All their roles include their capacity to educate their fellows on the environmental issues, influencing as a mother, elder and as a peer. They also acknowledged that through cooperative endeavor (bayanihan) and self-discipline, they can fulfil their roles in environmental preservation.

**Keywords:** awareness, environmental preservation, roles, women

## Improving Production Practices to Increase Rice Grain yield in Liberia

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**Abstract** Rice is staple food for Liberia's 5.1 million people. Grain yields of rice are low, currently ranging from 0.5-1.8 tons per hectare. Annual per capita consumption of rice in Liberia is estimated at 133kg, one of the highest in Africa. The importation for rice in Liberia is however far higher than the domestic production. The Government of Liberia (GOL) developed in 2012 the Liberia National Rice Development Strategy (LNRDS) whose strategic goal was to increase local rice production by two-folds. Despite LNRDS, the yield outcomes have not been realized. To increase rice grain yields of rain fed rice, trials had been done for two seasons (rainy and dry season). The field trials were conducted on a valley low land of Wolo-thon stream in Gbawuta Town, Panta District, Bong County Liberia using Nerica L-19 rice genotype. Four planting distances were used, namely: 25 cm X 25 cm single row, 25 cm x 25 cm double row, 30 cm x 30 cm and random plant planting method (the practice of low land rice farmers in Liberia). Treatments were laid out in the Randomized Complete Block Design (RCBD) with four replicates. Agronomic data were collected on plant height; 45 days after planting; number of tillers; number of panicles; grain weight; panicle length; number of grains per plant; and straw. Results showed that there were significant differences between the random planting method and 25 cm X 25 cm single row, 25 cm X 25 cm double row, 30 cm X 30 cm for all the parameters measured. Correlation analysis was also performed to establish magnitude of association between major yield components and grain yield for the two seasons. At 45 after days planting, grain yields correlated significantly with plant height, number of tillers and number of panicles per plant. Rice planted at 25 cm x 25 cm spacing recorded the highest yield at 4.3ton/ha followed by 25 cm x 25 cm double row and 30 cm x 30 cm at 3.7ton/ha and 2.53ton/ha, respectively. The random planting method had the lowest yield 1.95 ton/ha. Nerica L-19 rice variety planted at 25 cm x 25 cm spacing increased the yield 2.4 times compared to the national average yields of 1.8 ton/ha. Using Nerica L-19 rice genotype and modifying the planting pattern at 25 cm x 25 cm spacing, the strategic goal of the Liberia National Rice Development Strategy (LNRDS) to increase local rice production by two-folds could be realized. Thus, Liberia could be self-sufficient in rice saving a lot of precious dollars (US\$200 million in 2008) . Locating where to import rice in the future as rice demand shall increase by 50% by 2050 shall be a huge challenge.

**Keywords:** Liberian rice, grain yields, planting pattern, Nerica

## Energy inputs and carbon emission equivalent of selected agroforestry systems in Zamboanga City, Philippines

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**Abstract** The study was conducted to estimate the carbon emission equivalent expressed in tCO<sub>2</sub>e ha<sup>-1</sup> derived from the individual energy inputs of the nine (9) agroforestry systems (AFSs) identified across the 16 community-based forest management (CBFM) sites located mostly in the hilly and mountainous portion of Zamboanga City, Philippines. The energy input was calculated as direct energy input (DEI), indirect energy input (IEI) and embedded energy input (EEI) determined from the various cultural and management practices such as pre-land preparation (PLP), crop establishment (CE), crop care and maintenance (CCM), harvest and postharvest (HPH) operations. The total energy input (TEI) is the sum total of DEI, IEI and EEI computed in Mcal ha<sup>-1</sup>. All Mcal units were then converted into Liter Diesel Oil Equivalent (LDOE), where 1.0 LDOE = 11.414 Mcal for the energy input, while 1.0 LDOE = 3.96 kg CO<sub>2</sub>e to account the carbon emission equivalent. The calculated CO<sub>2</sub> emission equivalent ranged from 2.01 to 4.09 tCO<sub>2</sub>e ha<sup>-1</sup> across the 9 AFSs. Of this amount, the emission from DEI contributed 1.6-5.4%, while the IEI 94.1-98.0% and EEI 0.35-0.53%, respectively. The high CO<sub>2</sub> emission equivalent of IEI was attributed to high usage of N fertilizer, pesticides and labor. The key factors associated to high CO<sub>2</sub> emissions were high plant density and number of tree crop species present within an AFS. Understanding the significant contributions of various energy-intensive inputs delineated into DEI, IEI and EEI will help local executives to initiate a 'green agriculture economy' – a food production system with reduced carbon footprints that is responsive to changing climate for the City of Zamboanga, Philippines.

**Keywords:** Agroforestry systems (AFSs), total energy inputs (TEI), indirect energy input (IEI), liter diesel oil equivalent (LDOE), carbon emission equivalent, Zamboanga City

## Management for Promoting Agriculture Subject Learning in the Elementary School Level through KLUATOD Model, Num Nao District, Phetchabun Province

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**Abstract** KLUAYTOD model was designed to develop and promote school agricultural learning and agricultural careers in the Community. This is in accordance with needs of the community which was consistent with the local context found at a highest level ( $\bar{X} = 4.68$ ). The school agricultural activities included organic vegetable gardening, egg-laying chicken rearing, frog rearing, deer rearing, herbal plant growing, native chicken rearing and catfish rearing in a circular cement pond, respectively. Meanwhile, the agricultural careers in the community promoted by the school for students, school personnel and interested people were vegetable gardening, maize growing, sweet tamarind growing, organic vegetable growing, highland temperate vegetable growing, para rubber growing, cut flower growing, and animal domestication, respectively. All of these activities were practised in Namnao district, Phetchaboon province. The integration of agricultural learning facilitations is under guidelines of the KLUAYTOD model. It comprised 7 main components as follows: courage, taking action, discipline and culture, sustainability, technology, quality organization, and good outcomes. The model was tried out for one academic year. Findings showed a statistically significant difference level at 0.05 of learning achievement before and after using the model. Therefore, it could be concluded that the 7 activities could develop learning achievement of the students effectively. As a whole, they were satisfied with the agricultural activities at a high level. This was in terms of agricultural learning activities and promoted agricultural careers in the community ( $\bar{X} = 4.00$  and 3.88). Based on its details, the sample group preferred most on the basis of organic vegetable gardening/egg-laying chicken rearing ( $\bar{X} = 4.38$  and 4.25) and herbal plant growing/maize growing ( $\bar{X} = 4.46$  and 4.32d). It was also found that the model was appropriate and possible to be adopted for sustainable school development ( $\bar{X} = 4.32$ ). Besides, the sample group was satisfied with the experiment with the stakeholders at a high level ( $\bar{X} = 3.99$ ). Based on its details, the following components were found at a highest level: courage, taking action and good outcomes ( $\bar{X} = 4.48, 4.25, \text{ and } 4.25$ , respectively).

**Keywords:** Agriculture subject, agricultural learning development, KLUATOD Model, school managerial administration

## Promotion of Vegetable Gardening for Household Food Storage during Covid-19 Pandemic of Farmers in Praibueang District, Srisaket Province

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**Abstract** With or without the Covid19 pandemic, growing vegetables for the households is important. Results of the study showed that most of the guardians (95%) of the students grew more than 5 kinds of vegetable. All of the guardians (100%) chose to grow organic vegetables and they could perform well in terms of vegetable growing methods and taking care by with their children. These vegetables were used for household consumption and it helped reduce food expenses for 30%. The promotion of vegetables gardening truly reduced household expenses with a statistical significance level at 0.05. Findings showed a statistically significant difference level at 0.01 by student learning achievement before and after the promotion. The farmers were satisfied with online suggestions of the teachers at a highest level ( $\bar{x}=4.65$ ). Learning together and attitude inspiration were also found at a highest level ( $\bar{x}=4.38$  and  $4.25$ , respectively). Besides, the promotion process by using online media technology stimulated actual practice and created skills in the management of vegetable gardening. The promotion of vegetable gardening also created pride of local value, participatory learning, learning society (online social media), value added of yields, and food security of farmer households.

**Keywords:** vegetable gardening, farmer household, online media, food security

## Composting of boiler-ash and biogas-sludge from the palm oil industry for use as plantlet growing media

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**Abstract** Agricultural organic waste is increasing yearly. In Thailand, the palm oil industry generates high amounts of waste that have reached 13.71 million ton/year, mainly as boiler-ash and biogas-sludge. This study focused on the basic properties of boiler-ash and biogas-sludge from the palm oil industry after composting and their possible use as growing media for lettuce. Boiler-ash and biogas-sludge from the palm oil industry were pre-treated (composting) and after that evaluated as growing media in comparison with peatmoss under pot experiment conditions. Under the pre-treatment experiment, the results showed that the type of material affected the pH, EC, OM, total N and the C:N ratio ( $P<0.05$ ). The pre-treatment method affected the pH and EC ( $P<0.05$ ). Interaction between the type of material and the pre-treatment

method affected EC, OM, and the C:N ratio ( $P < 0.05$ ). The use of treated materials as growing media with two types of porous material showed that the type of growing media affected germination percentage, germination index, shoot length, and shoot fresh and dry weight ( $P < 0.01$ ). The type of porous material affected germination percentage, germination index, shoot length, root length, and shoot fresh and dry weight ( $P < 0.01$ ). Interaction between the type of treated material and porous material affected germination percentage, germination index, shoot length, root length, and shoot fresh and dry weight ( $P < 0.05$ ). The best material was boiler-ash compost with perlite as the porous material which gave 92.6% germination, 23.05 germination index, 39.10 mm in shoot length, 28.67 mm in root length, 0.2 g shoot fw/plant, and 0.0397 g shoot dw/plant but these results were not statistically different from undisturbed boiler-ash with perlite as the porous material. Therefore, boiler-ash compost and boiler-ash left for 90 days were recommended to be used as growing media.

**Keywords:** boiler-ash, biogas-sludge, oil palm industry, growing media

### Importance of marketing mix factors on consumer purchase decision towards organic rice of a community enterprise

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**Abstract** Although rice production community enterprises have seen an improved growth in past years, they still faced several problems in promoting and developing organic rice package in response to modern consumers' demand. This study investigated the community enterprise consumers through examining their demographic characteristics and importance to marketing mix factors in purchasing organic rice. Data were collected using a questionnaire survey to 400 organic rice consumers of Ban Nong Saeng community enterprise in different distribution channels in Chachoengsao province, Thailand. Data were analyzed through descriptive (means and percentages) and inferential (one-way ANOVA) statistics. The results revealed the marketing mix factors, consumers had very important ratings for product (mean = 4.23) and price (mean = 4.30), and important ratings for place and promotion factors, which both have a mean of 4.10. Overall, these 4Ps of organic rice marketing were rated as important (mean = 4.19). As for the product factors, results show that consumers' top three considerations in purchasing organic rice are that: safety certification standards (mean = 4.42), clean product packaging (mean = 4.40), and rice softness (mean = 4.37). In developing farmer community enterprises that ventures into the production and sale of organic products, study results of the marketing factors provide critical insights. Product design such as packaging and labelling of organic products should be integrated with safety certification.

**Keywords:** Marketing Mix Factor; Organic Rice; Consumers, community enterprise, organic labelling

## Factors Affecting Farmers' Decision in Using Subsidized and Non-Subsidized Seeds in Hybrid Corn Farming in Seluma Regency, Bengkulu Province

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**Abstract** This study aimed to analyze the factors that influence farmers to use subsidized or non-subsidized seeds in hybrid corn farming. The research area is Seluma Regency, Bengkulu Province, with samples taken from Air Periukan District, Sukaraja District, and South Seluma District. The research time is from December 2020 to January 2021. The sample size is 61 farmers and the sampling method is cluster random sampling. The data analysis method used descriptive analysis and logit model regression analysis. The results showed that the price of corn seeds, productivity, and farmers' education had a chance in farmers' decisions to use subsidized corn seeds or unsubsidized corn seeds.

**Keywords:** subsidized corn seed price, hybrid corn, descriptive, logit model, productivity.

## The Comparison of Cost and Return from Raw and Ripe Namdokmai Mango Planting of Large Plots in Bang Phli District, Samutprakarn Province

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**Abstract** The objective was to compare the cost and returned in growing nam dok mai mango for raw and ripe sales done in large agricultural and plot of farmers in Bang Phli district, Samut Prakan province. The Structured Interview was used as tool in collecting data from 23 members of Cultivation Large Agricultural Land Plot. The result found that most of the agriculturists are females with the ages of more than 60 years old as, helping in their households are 4 people members in each family and they have their own budgets. However, when considering for the cost, it was found that planting for raw mango sales comprising for the cost amount of 8,148 baht/Rai, profit was 6,174 baht/Rai. The planting for mango ripe sales with the totals of 12,836 baht/Rai, profit was 17,584 baht/Rai. It was found that the planting for ripe mango sales gave more benefits than the planting for raw mango. In addition, the ripe mango selling had the low level of Break Even Point to gain the quick pay back and high return value (NPV and IRR).

**Keywords:** Cost and Return, Nam Dok Mai Mango, Cultivation Large Agricultural Land Plot



## Assessment of socio-economic aspects of farmers under Social Forestry program and its environment: Study Case at Tanjung Alam Village, Kepahiang, Bengkulu, Indonesia

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**Abstract** Social forestry program (SFP) was intended to solve problems on land tenurial-system and to alleviate economic of people within and surrounding forest. The SFP aims to develop capacity and provide access to local communities to manage forest areas in a sustainable manner, to create jobs and reduce poverty and to solve social problems. The program has been implemented at Kepahiang District and has its legality since 2010. This research was conducted at SFP Unit at Tanjung Alam, Kepahiang. Aims of this research is to evaluate socio-economical aspect of farmers under scheme of social forestry program and to assess environmental aspect of areas within SFP Unit. Selected farmer groups were interviewed and land assessment using approach of land use and water availability. The results showed that SFP provides a large contribution to farmers' income, up to 93% with an average income of IDR 28.758.829 (equal to US\$ 1.997) per year. Even though almost half of farmers in the SFP program still in subsistence condition, half of farmers considered to be more prosperous. It means that farmers were very dependent on the existence of SFP. The environment of SFP Unit are also better in term of forest cover. The forest cover were increased. In 2010 mixed garden covered by 121.5 ha and agricultural land covered only 43.47 ha, whereas in 2020 showed that land use for mixed gardens become 146,944 Ha and agricultural land decrease to only 18.056 Ha.

**Keywords:** social Forestry, Kepahiang, Indonesia, economics

## Management of organic sweet potato from production to markets

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**Abstract** Currently, purple sweet potatoes are very popular in Thailand. The consumption of fresh tubers was done by roasted tubers, boiling and using them as part of the main menu, including processing into powder for components of confectionery and beverages. Purple sweet potatoes are highly nutrition and are of a great source of carbohydrates for health lovers. In terms of the purple sweet potato production, it is still not meet standard in term of food safety for consumers both in quantity and quality. Farmers have been grown purple sweet potato using the conventional method including agrochemicals which toxic chemical residues in products, Therefore, the method of growing purple sweet potatoes is

proposed by using organic production which the markets demand. The organic growing method is introduced to the farmers which starting from the appropriated soil and good water supply, the average temperature of 25 degrees Celsius. The selected planting area must be cleaned toxic chemicals. The planting space is recommended to be 30-40 cm X 1 meter. There are several methods for controlling disease and insects including biopesticides eg. *Chaetomium*, *Trichoderma*, *Bacillus* for disease control, natural elicitor for plant immunity, bionutrients etc. In general, after planting for 1 month, it is suggested to apply natural nutrition to stimulate the roots and tuber formation and bioinsecticide is also suggested to apply after 2 months. When the purple sweet potato planting is reached to 2.5 months, the shoots are trimmed off to stimulate the size and taste of purple sweet potatoes, and harvesting at 100-110 days after planting. The quality of the products are controlled to be non toxic chemical residue, the average sweetness is 15.5 brix, the average weight is 200 grams per tuber. Organic certification is recommended for famers and needed for delivering to the acceptable markets. Organic purple sweet potatoes have more demanded from consumers, then the markets are growing up which it is suggesting that organic purple sweet potatoes will be needed in the near future.

## Session 8 Advanced Research in Agricultural and Biological Sciences for Sustainable development goals (SDGs)

### Exploring Medicinal Plant Associated Mycoendophytes: Phytochemistry and Bioactivity

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**Abstract** Fungal endophytes play a vital ecological role in terms of plant defense from different environmental stresses. Fungal communities in the healthy leaves of kown Philippine medicinal plants, *Ocimum sanctum* and *Plectranthus amboinicus* were isolated and identified morphologically through agar-block method. Active mycochemical properties were also determined qualitatively subjecting each isolate to mycelial mat production and ethanolic extraction. Presence of lapachol, a natural naphthoquinone was also evaluated. Fungal isolates positive for lapachol were subjected to antibacterial assay using standard microbiological procedures. Eight endophytic fungal species belonging to four different families were isolated and identified from *O. sanctum* leaves namely *Lasiopodia sp.*, *Cladosporium cladosporioides*, *Aspergillus terreus*, *Aspergillus ustus*, *Alternaria alternata*, *Fusarium vertillioides*, *Penicillium chrysogenum*, and *Mycelia sterila*. On the other hand, three species belonging to a single family were isolated and identified from *P. amboinicus* leaves including *Aspergillus tamarii*, *Aspergillus terreus*, *Aspergillus niger*, *Penicillium oxalicum*, and *Mycelia sterila*. Qualitative mycochemical analyses exhibited that ethanolic extracts of each fungal isolates contain active biochemical compounds like anthraquinone, tannins, saponins, flavonoids, glycosides, alkaloids, terpenes, and sterols which can further be utilized for

therapeutic and cosmeceutical development. It was recorded that the mycochemical properties exhibited by *A. terreus* differ from each plant species. Lapachol was detected positive among *A. alternata*, *A. niger* and *A. terreus* both from *O. sanctum* and *P. amboinicus*. Antibacterial assay showed potential inhibitory activities against *E. coli* and *S. aureus*. This current study shows the potential of these endophytic fungi for pharmacologic evaluations.

**Keywords:** endophyte, fungi, lapachol, Philippines, plants, secondary metabolites

## Effect of Carboxymethylcellulose and Xanthan Gum on the Physicochemical and Sensory Properties of Passion Fruit Topping Sauces

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**Abstract** In food industry, hydrocolloid is the food additive that widely used in food product as a stabilizer, thickener, emulsifier, or gelling agent to improve the properties of food products. Over the last year, the food industry has begun to apply more than one type of hydrocolloid into food products to obtain benefits in various fields, whether to develop a formula, enhance nutrition, enhance values, or reduce production costs. This research studied on effect of use of some hydrocolloids alone or in combinations on the quality of passion fruit topping sauces that was acceptable to consumers. The research determined the effects of carboxymethylcellulose (CMC) and xanthan gum in various ratios (1.00:0.00, 0.75:0.25, 0.50:0.50, 0.25:0.75 and 0.00:1.00) on the quality of passion fruit topping sauces. The result showed that increasing the ratio of xanthan gum and decreasing the ratio of CMC tended to increase the apparent viscosity, firmness, consistency, index of viscosity, and color parameter ( $L^*$ ,  $a^*$ , and  $b^*$ ) of passion fruit topping sauce, but decreased in pH values. In terms of sensory, from the quantitative descriptive analysis showed that increasing the ratio of xanthan gum resulting in increased intensity score of viscosity in mouthfeel and decreased intensity score of passion fruit flavor, and smoothness of passion fruit topping sauce. In addition, the consumer preference test founded that ratio of CMC and xanthan gum at 0.50:0.50 had a highest overall liking score and just about right in terms of viscosity of passion fruit topping sauce. In general, these hydrocolloids gave a good quality of topping sauces in terms of texture properties when they were used with combinations rather than being used individually. The using of CMC combination with xanthan gum would be the interesting ingredient for improvement viscosity and consistency of the topping sauce product or other sauce products.

**Keywords:** Passion fruit, Topping sauce, Quantitative Descriptive Analysis, Xanthan gum, and CMC

## Yield stability of new elite lines of yardlong bean (*Vigna unguiculata* (L.) Walp. ssp. *sesquipedalis* Verdc.)

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**Abstract** The yield trials of new elite lines of yardlong bean under nine environments revealed that they responded differently to multi-environments for horticultural traits and yield. Genotype-environment interactions were found significantly ( $P < 0.01$ ) for days to first anthesis, pod length, seeds per pod, pod weight and yield per hectare. Significant differences ( $P < 0.01$ ) of yield were observed for genotypes, environments, and genotype-environment interaction. Stability analysis after Eberhart and Russell's model suggested that non-linear component was more important than linear component for determining the yield stability. Based on stability parameters, line No.30 was identified as stable for yield since it gave high yield (14.17 t/ha), high positive phenotypic index ( $P_i > 0$ ), regression coefficient around unity ( $b_i = 1$ ), and deviation from regression value around zero ( $S^2_{di} = 0$ ). Bangpra2 and No.25 lines also gave high yield but their deviations from regression were significantly high, it became clear that these 2 lines were unpredictable by linear regression. However, considering their yields from various environments, they were suitable for highly favorable environments but under poor environments they rather failed. Environmental index which directly reflected the poor and rich environment in terms of negative and positive of yield revealed that environments 1 and 2 were rich environments, and environments 6 and 9 were poor environments.

**Keywords:** asparagus bean, environments, elite lines, yield stability

## Allelopathy for Sustainable Weeds Management

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**Abstract** Plant productivity is dependent on a number of factors, including weed control. At least there are four methods for controlling weeds, including cultural, physical/mechanical, biological, and chemical. The application of chemical pesticides is strictly prohibited in organic farming. Using synthetic pesticides might sound like a good decision for the short term; however, there are substantial long-term disadvantages to using toxic chemicals. In the end, pesticides are poisons – toxic chemicals that don't just harm the “bugs” attacking plants, but the consumer, producer (farmer), and the environment. Due to the negative impact of using the chemical product, some producers move to an environmentally friendly method for controlling weeds such as biopesticides. The advantages of using biopesticides are less harmful, designed to affect only

one specific pest or, in some cases, a few target organisms, and decompose quickly. Bioherbicides means compounds or secondary metabolites derived from microbes such as fungi, bacteria, plant residues, or extracts from plant species (allelopathy). The source of allelopathy can be originated from plant parts such as leaves, root, stem, bark, etc. Allelopathy plays an essential role in the control of weeds. Allelochemicals can act as environmentally friendly herbicides, fungicides, insecticides, and plant growth regulators. The use of this compound is of great value to sustainable agriculture, mainly organic farming practices. Allelopathy requires further study for widespread application in agricultural production worldwide.

**Keywords:** allelopathy, bioherbicides, organic farming, sustainable agriculture, weed control

### Nanoparticles from *Neosartorya hiratsukae* against brown leaf spot of rice caused by *Drechslera oryzae*.

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**Abstract** Nano-particles constructed from active metabolite of *Neosartorya hiratsukae* was proved to control *Drechslera oryzae* causing brown leaf spot of rice var. RD47. Bi-culture evaluation showed that *N. hiratsukae* inhibited the colony growth of 31.67% and inhibited conidial production of 33.50% in 15 days. Moreover, Nano-Neo-H, nano-Neo-E and nano-Neo-M were significantly expressed antifungal activity against *D. oryzae* which the ED50 values of 5.8, 7.4 and 5.9 ppm., respectively. It is firstly noted that natural products of nano-particles constructed from active metabolites of *N. hiratsukae* significantly inhibited brown leaf spot of rice var, RD 47. Further investigations are being tested in pot experiment to induce immunity in rice.

**Keywords:** *Neosartorya*, biological control, rice disease, nanotechnology

## Natural product nano-particles from *Chaetomium* for resistant of Durian *Phytophthora* rot

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**Abstract** *Phytophthora palmivora* DD01 was isolated from root rot of durian var Monthong and proved to be pathogenic isolate. *P. palmivora* DD01 including the antagonistic fungi, *Chaetomium cupreum* CC3003 and *Chaetomium cochliodes* CTh02 were confirmed species level using morphological and molecular phylogenetic identification. Testing those antagonistic fungi to control *P. palmivora* DD01 causing root rot of durian were done by dual culture method. Crude extracts and nano particles tests were expressed antifungal activities. Dual culture test showed that *Ch. cochliodes* CTh02 gave significantly highest inhibition against *P. palmivora* DD01. The crude extracts from antagonistic fungi with crude hexane, ethyl acetate and methanol were tested to inhibit *P. palmivora* DD01. Crude methanol from *Ch. cupreum* CC3003 gave significantly highest inhibition of the tested pathogen which the ED50 of 60 ppm and followed by crude methanol extract from *Ch. cochliodes* CTh02 of 25 ppm. Antifungal bioactivities of nano particles from antagonistic fungi were found that nano particles from *Ch. cupreum* CC3003 expressed antifungal activity against *P. palmivora* DD01 at the concentration of 15 ppm which the ED50 of 11 ppm, and followed by nano particles from *Ch. cochliodes* CTh02 which the ED50 values of 13 ppm. The nano particles from *Chaetomium* spp were tested for their efficiency to induce plant immunity for durian root rot caused by *P. palmivora* DD01 resulted to produce scopoletin which appeared a fluorescent blue compound in TLC as same as the standard which the  $R_f$  0.75.

**Keywords:** Biological control, *Phytophthora palmivora*, durian root rot, *Ch. cupreum*, *Ch. cochliodes*

## Agricultural nanotechnology for plant immunity

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**Abstract** Current issues like climate change, urbanization, sustainable use of natural resources, and runoff and accumulation of toxic pesticides, herbicides, and fertilizers need to be addressed immediately. The construction and characterization of copolymer nanoparticles loaded with bioactive compounds rather than toxic pesticides are needed. Some nanoparticles have been formulated to contain pesticides at the nano or micro-scale. However, a few research have reported the use of nanocarrier systems in agriculture. Some nanoparticles have been formulated to contain pesticides in colloidal suspensions or as powders, at the nano or micro scale. These preparations have advantaged, such as increasing the stability

of active organic compounds, systemic activity, synergism, and specificity, and reducing foliar settling and leaching. The amount of pesticide dosage, number of applications, human exposure to pesticide, and environmental impact are reduced. Nano-formulations have been employed not only for synthetic insecticides and fungicides but also in alternative products such as natural products from herbal extracts and microbial extracts to control insects and diseases. The use of bioactive compounds from different *Chaetomium* species has been proven to be an effective antifungal strategy against several plant pathogens and induce plant immunity. The application of nano-rotiorinol constructed from *Chaetomium cupreum* CC3003, nano-trichotoxin constructed from *Trichoderma harzianum* PC01 and a spore suspension of *C. cupreum* reduced anthracnose incidence of 46.23, 42.71 and 18.59 %, respectively while the inoculated control had high anthracnose disease. The application of bio- formulation of *C. cupreum* in powder form, nano- rotiorinol, and nano-trichotoxin to reduce coffee anthracnose was reported for the first time in Lao PDR. Nanoelicitor for disease immunity is investigated which consists of pure metabolites of chaetoglobisin C derived from *Chaetomium elatum*, chaetomanone derived from *Chaetomium lucknowense* and rotiorins derived from *C. cupreum* formulating with potent microorganism, *Rhodopsedomonas* sp. Its properties are proved to induce disease immunity in plants, stimulated phytoalexin production against plant diseases, stimulated new root growth, revitalized soil and made available plant nutrients and increased plant ability to absorb nutrients, and increased yield. Those nanoelicitors proved to induce plant immunity to diseases in rice, coffee, citrus, durian, dragon fruits, tomato, chilli and papaya etc. Application rate is 5-10 cc per 20 litres of water and spraying over the plant and around basal stem. The annual crop suggests spraying at every 10 days until harvest and perennial crops recommend spraying at every 30 days. It is contributed to test and use in Russia, Vietnam, Cambodia, Indonesia and China.

**Keywords:** Nanoelicitors, Plant immunity, Phytoalexins, *Chaetomium*

## Molecular Divergence Analysis for Pre-Harvest Sprouting Resistance in Rice (*Oryza Sativa* L.) genotypes

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**Abstract** Seed dormancy is an important trait in cereal crops because lack of seed dormancy causes pre-harvest sprouting. Pre-harvest sprouting often occurs in hot, humid, conditions at maturity and results in reduced grain quality. In this investigation, 24 SSR markers reported in public domain present on different chromosomes were used to reveal molecular diversity for pre-harvest sprouting resistance among which only five markers viz., RM252, RM17, RM564, RM480 and RM346, showed considerable polymorphism. The Polymorphic Information Content (PIC) value calculated to estimate the informativeness of each markers RM17, RM564, RM480 and RM346 recorded the values of 0.72, 0.78, 0.67 and 0.78, respectively. The seed of 32 rice genotypes for phenotyping were collected at 35th day after 50% flowering and dried at 50°C in oven for 3 days and then germination tests were conducted at 3, 5, 7, 10 and 12 days after harvesting. The genotyping results of five markers among 32 genotypes were compared with the phenotypic germination patterns of 32



genotypes at different intervals using MapDisto method of analysis. The test of goodness of fit ( $\chi^2$  test) revealed that out of five markers two markers *i.e.*, RM252 and RM17 only exhibited significance. Cluster analysis was done using DARWIN version 6 software. Dendrogram obtained from analysis grouped the 32 genotypes into two major clusters and one minor cluster. The major clusters are A and B. Cluster A is again divided into A1 and A2. Subcluster A1 contains 12 genotypes and four genotypes were clustered into A2. Similarly, cluster B is again subclustered into B1 and B2. B1 contains eight genotypes and B2 contains single genotype, the cluster C contains seven genotypes. Majority of the genotypes grouped in cluster B possess PHS resistance and contains the QTLs linked to marker RM252 and RM17. Majority of the genotypes grouped in cluster C possess QTLs linked to RM564 marker. Based on the results of variability among the genotypes for seed dormancy, MTU 1001, MTU 1064, MTU 5249, MTU 2077, MTU 1010 and BPT 2658 could be recommended for cultivation in coastal areas as they possess less than 10% germination even after one week after harvest.

### Antimicrobial Enhancement of Red Onion Crude Extract using Epsilon-polylysine

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**Abstract** This research aimed to investigate the antimicrobial activities of red onion extracts by using 50% ethanol solution and combination with epsilon-polylysine against 5 strains of foodborne microorganisms. The Minimum Inhibitory Concentration (MIC) and Minimum Bactericidal Concentration (MBC) were determined using Macrobroth dilution method against selected test organism including *Bacillus cereus*, *Staphylococcus aureus*, *Listeria monocytogenes*, *Salmonella* Typhimurium and *Escherichia coli* O157:H7. The MIC of red onion crude extract (ROE) ranged from 15.00 to 19.00 % (w/v) and the MBC from 25.00 to 35.00 % (w/v). For epsilon-polylysine (EPL), the MIC ranged from 0.0150 to 0.0400 % (w/v) and the MBC from 0.0300 to 0.0650 % (w/v). In addition, the results from the determination of Fractional Inhibitory Concentration Index (FICindex) of the combination between red onion crude extract and epsilon-polylysine using Checkerboard assay against *Bacillus cereus*, *Staphylococcus aureus*, *Listeria monocytogenes*, *Salmonella* Typhimurium and *Escherichia coli* O157:H7 were 0.50, 0.50, 0.50, 0.50 and 0.75, respectively. These FICindex values indicated the synergistic activity. The study on the efficacy of the combination system were also determined by Time Killing analysis without interfering substances. The result indicated that the antimicrobial activity of combination system depended on the concentration of red crude extract and epsilon-polylysine. Therefore, synergistic effect of red crude extract and epsilon-polylysine potentially enhances their antimicrobial activities and could be used as an alternative natural antimicrobial material for food preservative.

**Keywords:** Antimicrobial activity, epsilon-polylysine, red onion extract, isobolograms and synergistic effect

## Effect of Different Planting Materials Ratios on the Growth of Foliage Plants

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**Abstract** Growing foliage plants in the containers using soil-based growing media should be a good alternative for the home garden, especially where land is limited. This research focused to investigate the impact of different types of soil-based growing media on the growth of foliage plants: *Philodendron burle-marxii* G.M.Barroso, *Monstera adansonii*, *Epipremnum aureum* 'Bunting Lime', *Ctenanthe burle-marxii* and *Polyscias guilfoylei* (W. Bull) L. H. Bailey 'Quinquefolia'. The experiment was in a completely randomized design (CRD) consisting of six treatments with three replications. The growing media mixtures comprised of 1) commercial soil mixed 2) mixed consists of leaf compost: coconut husk chips: coconut coir: sand ratio 1:1:1:1 3) mixed consists of leaf compost: coconut husk chips: coconut coir: sand ratio 1:2:1:1 4) mixed consists of leaf compost: coconut husk chips: coconut coir: sand ratio 1:1:2:1 5) mixed consists of leaf compost: coconut husk chips: coconut coir: sand ratio 1:1:1:2 and 6) mixed consists of leaf compost: coconut husk chips: coconut coir: sand ratio 2:1:1:1 The results revealed that the plant height, the leaf number, the leaf width, and the leaf length of five types of plants in the growing media mixtures of leaf compost: coconut husk chips: coconut coir: sand ratio 2:1:1:1 were higher than other treatments. Therefore, it could be suitable to use the planting media to reduce the production cost of foliage plants and apply the leaf waste as a benefit.

**Keywords:** Indoor Plants, Soil Mixed, Leaf Compost

## Technical Efficiency of Rice Production in Klong Suan Sub-District, Bang Bo District, Samut Prakan Province, Thailand

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**Abstract** This study investigates rice farmers' technical efficiency in Khlong Suan, Bang Bo, Samut Prakan, Province, Thailand, and explores the factors affecting their production performance. Data were collected through household interviews of 178 rice farmers using a structured questionnaire. Data were analysed using a two-stage data envelopment analysis (DEA) approach, which measured rice farmers' level of technical efficiency (TE) and the factors affecting production efficiency using Tobit regression analysis. The results revealed that rice farmers' TE levels ranged from 0.53

to 1.00, with an overall mean value of 0.84, indicating a considerable potential to enhance TE to improve rice production relative to the efficient production frontier. Most farmers had very high (0.80 to 1.00, 60%) and high (0.60 to 0.80, 37%) levels of TE, while only approximately 3% of the rice farmers had a moderate level of TE (0.40 to 0.60). Moreover, Tobit regression analysis showed that farmers' cultivated area, education level, and rice farming experience significantly affected rice production efficiency. The study suggests improving TE levels through more substantial policy support and programmes that focus on strengthening technical knowledge related to rice farming.

**Keywords:** rice production efficiency, technical efficiency level, rice farmers, rice cultivation experience, rice farmer education.

## Naglected useful crops of africa

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**Abstract** Underutilized plants are those whose potential has not been fully realized. They are well adapted to various weather conditions in different locations, in particular, drought and low nutrient. These plants have great potential to enhance food security and nutrition, climate change, preserve cultural heritage and improved income for the rural poor. They are also used as food, fiber, fodder, oil or medicinal purposes. They include; Bambara groundnut (*Vigna subterranean* (L.) Verdc.), Fonio (*Digitaria exilis* (Kippist), Soursop (*Annona muricata* (L), Finger millet (*Eleusine coracana* (L.) and *Ziziphus mauritiana* (Lam.). In Africa, many plant species are underutilized. However, this report shows that underutilized plants are limited by loss of local knowledge, lack of research, lack of communication and limited market opportunities. Hence, creating awareness, market opportunities, research and new knowledge will enhance their utilization. Therefore, improved development on these plant species is essential to retain the agricultural diversity, which is important for a changing world that is increasingly dominated by few plants.

**Keywords:** Food Security, nutrition, scarce, medicinal, Africa

## Development of Inulin Beads from Jerusalem Artichoke by spherification and reverse spherification techniques

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**Abstract** The objective of this research was to develop Jerusalem artichoke-inulin beads by spherification and reverse spherification techniques. Hot water extraction was applied to extract inulin from Jerusalem artichoke powder. The inulin was extracted two times. Inulin content of one time extraction sample was 11 times (67.79 mg/ml) higher than two times extracted sample (6.65 mg/ml). Three types of fruit juices were mixed with concentrated inulin in order to improve taste of inulin extract before gel bead formation. It was found that orange juice and honey lemon juice were suitable juices for adding to spherification and reverse spherification beads, respectively. The juice-inulin beads made from both techniques received high hedonic liking scores in overall acceptability (6.65 – 7.00) and inulin content of spherification and reverse spherification beads were  $111.18 \pm 13.19$  mg/ml and  $174.53 \pm 17.93$  mg/ml, correspondingly. The conditions of inulin gel bead formation for each technique were examined to create spherical shape and unbroken beads. A suitable production process of juice-inulin mixture beads by spherification method were to mix orange juice with concentrated inulin, adjust pH of mixture with 0.75% citric acid and add sodium alginate solution to inulin mixture in a ratio of 2:1 for bead formation. The process of reverse spherification method, a mixture of honey lemon juice with concentrated inulin was dropped into 0.3% sodium alginate solution and gently stirred for 2.5 min then immersed in 0.1% calcium lactate solution for 10 min.

**Keywords:** Gel beads, Inulin, Jerusalem Artichoke, Reverse spherification, Spherification

## *In vitro* effect of *Callistemon viminalis* and *Melaleuca cajuputi* ethanolic extracts as botanical fungicide and insecticide

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**Abstract** The effects of ethanolic extracts of *Callistemon viminalis* (EECV) and *Melaleuca cajuputi* (EEMC) leaves were evaluated in laboratory against plant pathogenic fungus (*Alternaria* sp.) and plant insect pests (*Aphis craccivora* and *Phenacoccus manihoti*). Regarding the study on botanical fungicide, the combined formulas of EECV and EEMC (5000 ppm) in ratios of 100:0, 75:25, 50:50, 25:75 and 0:100 were tested on mycelial growth and spore germination of tested fungus. The results revealed that all tested formulas of plant extracts gave significant inhibition on mycelial growth and

spore germination in the ranges of 27.5-92.7% and 75-100%, respectively. However, the EEMC itself was unexpectedly found highly effective than the combined formulas. In the case of insecticidal activity, the preliminary experiment of EECV and EEMC (2000, 10000 and 20000 ppm) was performed on aphid and mealybug. The results presented that all concentrations of EECV and EEMC significantly showed the mortality effect on aphid and mealybug about 5-100%. In addition, the EECV and EEMC at 2000 and 10000 ppm showed a repellency of about 5-55%. Then, both plant extracts at 2500, 5000, 10000 and 20000 ppm concentrations were tested to those insects. The 100% mortality of aphid and mealybug was found in the highest concentration of EECV and EEMC while 2500-10000 ppm concentrations showed in the range of 38-98%. The 100% repellency capacity was observed at 10000 ppm concentration. Therefore, two Myrtaceae ethanolic extracts are promising to be used as a natural pesticide in controlling *Alternaria* and insect pests in laboratory.

**Keywords:** Myrtaceae ethanolic extract; botanical fungicide; botanical insecticide; *Callistemon viminalis*; *Melaleuca cajuputi*

## Application of organic soybean tempeh in raisin purple sweet potato cookie

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**Abstract** Organic soybean tempeh or tempeh kedelai made by fermentation with *Rhizopus oligosporus* for applied to the produce cookie product as a plant-based protein snack. In this experiment, tempeh from organic soybean was prepared to be used to produce cookies. But in this study had four samples of the cookie (Purple sweet potato cookie = A, raisin purple sweet potato cookie = B, tempeh purple sweet potato cookie = C and tempeh raisin purple sweet potato cookie = D) were to determine the physicochemical features and sensory. The chemical analysis result found that the tempeh raisin purple sweet potato cookie has the highest % moisture (18.27%) and % total proteins (28.93%). But for tempeh, purple sweet potato cookies showed the highest of % ashes (2%) and % total lipids (28.89%). The physic analysis of the tempeh raisin purple sweet potato cookie presented the highest hardness (60.67 N). Including the tempeh raisin purple sweet potato cookie obtained the highest scores of the food acceptability of all qualities (Appearance, texture, aroma, color, taste and general acceptability) by using a 9-point hedonic scale method that like slightly (score 6) to like very much (score 8). Therefore, the organic soybean tempeh applied in a cookie as the tempeh raisin purple sweet potato cookie can be accepted as a new snack that includes that increast protein appropriate as a healthy food alternative. Including the packaged products can content claims indicate labels identify are "Made with organic" (>72% Organic ingredient).

**Keywords:** Tempeh, Organic soybean, Purple sweet potato cookie

## Influence of perceived risks in farmer's decision towards sustainable farm practices: Evidence from Northern Thailand

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**Abstract** Under the sustainable development goals, nations worldwide are enjoined to take immediate action through sustainable adaption to mitigate climate variability and change. At the same time, agriculture is both a victim and a contributor to climate change. The situation prompted Thailand's agriculture to explore sustainable practices for food security and deliver environmental services. Using a binary logit model, we investigated the potential effects of farmers' perceived risks on adopting sustainable farming practices. The study revealed that farmers are somewhat hesitant to radically shift from their usual practices due to associated costs or potential risks. In addition, factors affecting adoption are site-specific. Therefore, government actions should be flexible enough to be tailored to a local level while still aligning with the national policy goals. For this, inter-agency coordination at the local, provincial and central levels is needed for agricultural support and enable farmers to make necessary changes to successfully adapt to emerging risks.

**Keywords:** risk, sustainable farming, adoption

## Improvement of wool dyeing quality and antimicrobial activity using nano forms of silver

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**Abstract** In conjunction with the increasing public awareness of the infectious diseases, the textile industry and scientists have developed hygienic fabrics by the addition of various antimicrobial compounds. The current investigation was carried out using nano-silver applied to wool fibers for studying its effect on wool quality and antimicrobial resistance. Antimicrobial activity has been investigated against a broad range of microorganisms including bacteria, yeast and fungi. Moreover, dyeing of wool fibers treated with silver nitrate with extracted dye from the filamentous fungus *Penicillium purpogenum* by using innovation technique to save energy and time. In order to obtain color of aimed specific red hue, the influence of certain dyeing process conditions namely dyestuff concentration, pH, temperature, and duration of the dyeing process were studied. Antimicrobial effect is derived from nanosilver particles (diameter between 1 and 100 nm) which are adhered to the fibers. The fibers treated with silver particles was dyed by the investigated dye, the antimicrobial activity was then measured. The wool materials showed antimicrobial effects by killing and/or suppressing growth of a broad spectrum of microbes such as *Staphylococcus aureus* and *Aspergillus niger* depending on the surface structure of the wool sample. The results indicated that nano-silver application was reflected positively on the zones of growth inhibition

of wool fibers *Escherichia coli* gave the highest diameter of the inhibition zone. On the hand, *Staphylococcus aureus* gave the lowest zone.

**Keywords:** Dyeing, Antimicrobial, natural pigment, nano-silver nitrate, penicillium

## Session 9     Advanced Research in Biological Agriculture

### Diversity of fungal spores in the canopy of two mangrove tree species of southwest India

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**Abstract** This study designed to assess the fungal spores present in throughfall, stemflow and water-filled tree holes (dendrotelmata) of two mangrove tree species (*Avicennia officinalis* and *Rhizophora mucronata*) in the Nethravathi mangroves of southwest India. Water samples were filtered through Millipore filters and stained immediately after filtration. The filters were scanned using a high power microscope for identification and enumeration of fungal spores. Physicochemical parameters of canopy region (air temperature and humidity) and water samples (temperature, pH, conductivity, salinity, dissolved oxygen and total dissolved solids) were assessed. Spores of 39 fungal species were recorded in the canopy water samples with 34 and 20 species in *R. mucronata* and *A. officinalis*, respectively. Spores of 15 species were common, while 19 and 5 species were confined to *R. mucronata* and *A. officinalis*, respectively. Fungal species with  $\geq 5\%$  contribution were the highest in *R. mucronata* than *A. officinalis* (12 vs. 10 spp.), while seven species of them were common to both trees. The number of fungal species were highest in the stemflow of both trees with the highest species richness as well as diversity. The spores in canopy waters composed of a blend of terrestrial, freshwater and marine fungi representing staurospores, scolecospores and helicospores. Owing to diverse known and unknown fungi in the mangrove canopies, further studies might facilitate to fill the gap of global fungal biodiversity pool.

**Keywords:** *Avicennia officinalis*, Dendrotelmata, *Rhizophora mucronata*, Stemflow, Throughfall, Tree holes



## Macronutrients (NPK) and other soil properties influenced by long term organic and conventional potato farming in West-Central Bhutan

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**Abstract** There have been reports about the overuse of chemical fertilizers by some conventional potato farmers in Bhutan. On the other hand, over the years, there have been some farmers growing potatoes organically. Therefore, the objective of this research was to examine the macronutrients (NPK) and other soil properties influenced by long term organic and conventional potato (*Solanum tuberosum* L.) farming in Gasa and Wangdue Phodrang Districts in West-Central Bhutan. Systematic sampling was employed to gather 30 soil samples, 15 from organic potato farmers in Goenkhatod Gewog (a group of villages in Bhutan), Gasa District, and 15 from conventional potato farmers in Phobjikha Gewog, Wangdue Phodrang District. Soil samples were collected in August-September 2020. The descriptive statistics, independent sample t-test, and Pearson Correlation were used to analyze the data. The total nitrogen (N)% in organic potato soil (0.38%) was significantly higher than in conventional soil (0.26%) at  $p < 0.01$ . Available phosphorus (P) was significantly higher in conventional potato soil (8.87 mg/kg) than in organic soil (4.87 mg/kg) at  $p < 0.05$ . There was no significant difference in exchangeable potassium (K) between organic and conventional soil. The pH of conventionally cultivated soil (4.99) was significantly lower than that of organic soil (5.57) at  $p < 0.01$ . There was a positive correlation (0.883) between total N% and soil organic matter in conventional soil at  $p < 0.01$ . However, no significant difference was observed in the organic matter% content between these farming systems. Further, the Carbon: Nitrogen (C: N) ratio was significantly lower in organic (9.99) than conventional soil (11.52) at  $p < 0.01$ , the cation exchange capacity (CEC) was significantly higher in organic (22.26) than in conventional soils (19.45) at  $p < 0.05$ . The study revealed that organic farming led to higher residual N and CEC than conventional one. It also lowered the soil's C:N ratio, whereas conventional farming led to higher P build-up but lowered its pH.

**Keywords:** farming system, long term farming, soil analysis, soil physicochemical properties, soil sampling.

## Ectoparasite Species Attacking Chicken in Eastern Area of Bangkok, Thailand

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**Abstract** Ectoparasites of chickens are important for poultry farming and other types of poultry rearing by ways of causing nuisance and being as transmitter of various diseases to poultry resulting in poor-quality and quantity products. The objective of this study was to survey ectoparasite species found in chicken from various farms located in eastern area of Bangkok. The ectoparasite samples from 10 chicken varieties or rearing types, namely Silkie, hens reared in free cage, laying hens in a cage, Japan bantam, Polish, Rhode Island red, Brahma, Phuphan black bone, Serama bantam and Sebright were randomly collected. Amount of 10 samples per chicken were investigated. There were two methods of those sample collections: 1) survey on the chicken feather and 2) suction on the skin by using aspirator. Each object area was about 5 square centimeters. From the direct survey result, it was found that there was *Megninia cubitalis* that mostly attacked laying hens reared in a cage at neck, wing, chest, back and buttock with the average number of 52.1- 204.9 mites per chicken, followed by injured on Rhode Island red with 85.0 mites, abundantly at buttock. And the louse, *Lipeurus caponis* was found in Polish chicken with 100.5 insects that mostly appeared at back of chicken, followed by the appearance in Rhode Island red with 70.0 insects, abundantly at chest. This insect preferred to live at wing and chest. Whereas, result from suction method showed that *Megninia cubitalis* was also found in laying hen reared in a cage with the average number of 71.4- 168.3 mites per chicken. It lived everywhere on the body as neck, head and buttock. Besides, *Cuclotogaster heterogoraphus* was observed on the body area equal to 43.8 insects, where the louse, *Menopon gallinae* was monitored in Polish chickens with totally, 22.5 insects, plenty at the buttock area.

**Keywords:** ectoparasites, chicken, mites, louse

## Supply chain structure and constraints of a rice production community enterprise: Evidence from rural Thailand

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**Abstract** Supply chain involves actively streamlining a business's supply-side activities to maximize customer value and gain a competitive advantage in the marketplace. In rice production, the concept of supply chain has been explored in several studies across Thailand; however, its current supply chain structure has not been updated to keep up with the emerging constraints in production and marketing, particularly at the level of community enterprises. This paper aims to

examine the supply chain structure and constraints of Baan Nong Saeng community enterprise in Chachoengsao province, Thailand. This study applied a qualitative approach through in-depth interviews and focus group discussion (FGD) with the enterprise leader, committee members and farmers, respectively. The supply chain structure was drawn from the interview results, and constraints were identified at each level of the supply chain. Results revealed a chain of five major channels through which the Ban Nong Saeng community enterprise's rice moves from the farm to final consumers – farmers, primary and final processors, dealers, and local retailers. Farmers produced rice according to Organic Thailand standards. Processors create added value to rice products through product handling, packaging, and branding. Meanwhile, distributors supply packed rice to various local outlets such as Sanam Chai Khet hospital market, Wat Phra That Wayo market, and community farmers' market. However, among the identified constraints were inadequate postharvest management skills at the farmers' level, lack of rice mill certification at the processor's level, and poor product packaging, and inadequate consumer information at the marketers' level. This paper provides insights into how the supply chain of a rice production community enterprise works and what improvements are needed to address existing constraints. Future studies are recommended to formulate strategic guidelines to address each of the problems identified. This will guide future programs and policies by the government and private sectors.

**Keywords:** Community enterprise, supply chain structure, rice production, rural Thailand

### ***In vitro* Study of Antioxidant and Antimicrobial Activities of Soybean Tempeh and Split Gill Mushroom (*Schizophyllum commune*) as Plant-Based Diets**

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**Abstract** Plant-based diets that reduce or eliminate animal product intake are known to ameliorate the incidence and clinical course of several illnesses. Soybean tempeh and split gill mushroom (*Schizophyllum commune*) have long been consumed as plant-based diet choices. Total phenolic content (TPC), antioxidant and antimicrobial activities of soybean tempeh and *S. commune* extracts were investigated using water for extraction. The aqueous extract of fresh *S. commune* had the highest TPC at 1191.81 mg GAE/100g. Three methods were used to evaluate antioxidant activity as the diphenyl picrylhydrazyl radical scavenging test (DPPH), radical cation decolorization assay (ABTS) and reducing power. The IC<sub>50</sub> values of fresh *S. commune* using DPPH and ABTS+ assays were 0.2812% and 0.5761%, respectively whereas the reducing power assay gave EC<sub>50</sub> value at 0.3606%. Crude extracts of fresh tempeh and fresh *S. commune* exhibited antimicrobial activity against *Staphylococcus aureus* TISTR 746 at concentrations of 25 and 50 mg/ml, respectively. Two times the minimum inhibitory

concentration (MIC) of fresh tempeh and fresh *S. commune* effectively reduced viable cells of *S. aureus* TISTR 746 of 5 log CFU/ml at 12 h. Both fresh tempeh and *S. commune* extracts showed promise as natural antioxidants for utilization as plant-based food.

**Keywords:** plant-based diet, antioxidant, antimicrobial activity, *Schizophyllum commune*, soybean tempeh

## Mitochondrial DNA Analysis Revealed Genetic Diversity of Captive-Bred Hog Deer (*Axis porcinus*) Population in Thailand

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**Abstract** Hog deer (*Axis porcinus*) is an endangered member of the Cervidae family native to South and Southeast Asia. Over the past century, hog deer nearly went extinct in Thailand due to unsustainable harvesting and deforestation. Recent captive breeding program was able to bring the population back to sustainable level, and a number of hog deer was reintroduced back into the wild. However, due to the small starting number used at the beginning of the breeding program, there is a risk of bottleneck effect, inbreeding, and loss of genetic diversity. Moreover, two possible subspecies of hog deer exist: *Axis porcinus porcinus* and *Axis porcinus annamiticus*, and it was unclear which species is the one currently being used for captive breeding effort. This study aims to investigate the genetic diversity of captive-bred hog deer at nucleotide level, using the control region of mitochondrial DNA sequences. We identified 11 haplotypes from 30 individual hog deer at Huaisai Wildlife Breeding Station in Phetchaburi Province, which is one of the original sites of hog deer breeding programs in Thailand. The population still retains some nucleotide diversity and haplotype diversity, and Tajima's D test indicated that the population was indeed recently expanded. Additionally, phylogenetic analysis revealed that all individuals were members of the *Axis porcinus annamiticus*, which is the prevalent subspecies in Southeast Asia. The results of this study provide a starting point for further genetic analysis for hog deer conservation programs.

**Keywords:** hog deer, genetic diversity, mitochondrial DNA, subspecies

## Distribution and Management of Total and Available Sulfur under Durian Orchard Soils in the Eastern Thailand

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**Abstract** Sulfur is necessary plant nutrient, but is rarely determined on a routine basis because of interpretive and analytical problems resulting in the lack of consistent identification of S sufficiency or deficiency in soils. The aim of this study was to assess the sulfur status of durian orchard soils in the Eastern Thailand and to evaluate its plant availability. The soil samples (topsoil and subsoil) and durian leaf samples were collected from 4 orchards for analysis. The results indicated that total S ranged from 315 to 1340 mg/kg (average 813 mg/kg) where 93-99% was in organic form and relatively the same comparison between topsoil and subsoil. Total S was significantly correlated with C ( $r = 0.41^{**}$ ), N ( $r = 0.36^{**}$ ), pH ( $r = -0.52^{**}$ ) and SOM ( $r = 0.51^{**}$ ). The C:S and N:S ratios varied from 7.8-54.8 and 0.74-4.67, respectively, indicating the dominance of the mineralization process toward sulfur nutrition. C:N:S was 20:2:1 due to heavy S fertilizer application. Extractable S (available S) varied from high to very high range depending on soil standard, of which about 75% of soil samples were classified as no response to S application. Out of the average available S of 24.2 mg/kg the topsoil (28.2 mg/kg) was higher than that of subsoil (25.6 mg/kg). Available S showed very close correlation to total S ( $r = 0.72^{**}$ ), C ( $r = 0.61^{**}$ ), N ( $r = 0.57^{**}$ ), pH ( $r = -0.29^{**}$ ) and SOM ( $r = 0.61^{**}$ ). Stepwise multiple regression showed that approximately 73.0% variation in the extractable or available S could be explained in terms of several soil parameters.

**Keywords:** *Durio zibethinus* Murr., Plant-available sulfur, Soil and plant analysis

## Developing an International Cooperation Training Program and Designing Sustainable Agriculture Systems under the Climate Crisis Era

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**Abstract** The results of the study were as follows: 1) Developed training program based on climate crisis as systemically and holistically had improved student's environmental literacy, 2) Students centered curriculum implemented by student's reflection and statement, improved student's awareness, knowledge skill, and attitude and participation after they finished the course, 3) Place based learning also enlarged students' skills and increase awareness and sensitivity which led them to

see the whole picture, and 4) The relationship between philosophy of training center and curriculum can make synergy when it has same goal. On the results of the pre and post-test shows that the 100 percent of the student's awareness, skill reached the highest level after the class. On knowledge, 94.12 percent of the students were at high level after the class. The comparison of the students' attitudes and participation were higher than before with a statistical significance level at 0.05.

**Keywords:** International training program, sustainable agriculture, environmental education, climate crisis Era

## Survival of contaminated pathogenic bacteria in Thai fruit and Vegetable juice

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**Abstract** Fresh squeezed fruit and vegetable juices are at a high risk of contamination by pathogens that are harmful to consumers. The purpose of this research was to determine the survival and behavior of microorganisms contaminating guava and coriander juice during 7-day storage. There were two types of microbial monitoring: natural contamination (Standard plate count) and pathogenic contamination (*Escherichia coli* O157: H7, *Listeria monocytogenes*, and *Staphylococcus aureus*). The results showed that the number of naturally contaminated microorganisms was approximately 4.0 and 6.0 log CFU/ml of guava and coriander juice, respectively and microbials could survive in all juices throughout the storage period. While the number of inoculated pathogenic contaminated bacteria was approximately 3.0-4.0 and 6.5-8.0 of logCFU/ml of low and high contamination monitoring, respectively. For coriander juice, the number of *S. aureus* decreased because of abundant bioactive compounds, while the number of *E. coli* O157: H7 and *L. monocytogenes* remained unchanged during 7-day storage. The number of *S. aureus* in guava juice had rapidly decreased as well, but it was only found in low inoculated contamination monitoring.

**Keywords:** Contamination, Coriander, Fresh juice, Guava, Shelf-life time

## Research and Development of the Healthy Ready-to-eat Strip Chinese Sausage

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**Abstract** This research has studied the development of healthy ready-to-eat strip Chinese sausage products. Firstly, the investigation of the effect of fat replacer (cellulose gel) and their content (25 and 50 % w/w of fat) with humectant (glycerine) and their content (50 and 60 % w/w of sucrose) on Chinese sausage qualities in comparison with the control

sample without fat replacer and additional humectant. The results showed that the cellulose gel with 25 % w/w of fat and glycerine with 60 % w/w of sucrose has no significant differences in redness ( $a^*$ ), yellowness ( $b^*$ ), texture (firmness and toughness), and sensory score (appearance, color, taste, flavor and overall liking) compared to the control sample ( $p \geq 0.05$ ). However, the product texture score was lower than the control sample ( $p < 0.05$ ). Secondly, the product shelf life in the vacuum-packed was studied with accelerated shelf-life testing (AST) at 35 and 45 °C for four weeks. Throughout the storage period, the water activity was 0.66-0.68, and the TBARS value was 0.13-0.21 mg malonaldehyde/kg sample. The results suggested that the product with 25 % cellulose gel (w/w of fat) and 60 % (w/w of sucrose) glycerine, vacuum packed in a nylon bag (per piece) and topped with a polyethylene bag (5 pieces/pack) stored at room temperature ( $28 \pm 2$  °C) for two months form Q10 calculation. Finally, the final product has shown high sensory scores in all attributes. In addition, 76.47 % of a consumer decided to purchase the product.

**Keywords:** accelerated shelf life testing, Chinese sausage, fat replacer, humectant, TBARS

## Effects of Chicken Manure and Chemical Fertilizer on Growth and Yield of Japonica Rice

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**Abstract** Organic and inorganic nitrogen fertilizers are normally used in *Indica* rice (*Oryza sativa* L.) production system, but information on the effects of chicken manure on *Japonica* rice is limited. The objective of this study was to determine the effects of chicken manure and chemical fertilizers on growth and yield of Japonica rice. A 2x4 factorial experiment was set up in a completely randomized design with four replications. Two Japonica rice varieties consisting of DOA1 and DOA2 were assigned as factor A, and four fertilizer treatments including un-fertilized (control), chemical fertilizer, chicken manure and chemical fertilizer together with chicken manure were assigned as factor B. Data were recorded for crop growth rate (CGR), number of spikelet per plant, number of grains per spikelet, percentage of filled and un-filled grain, 1,000 grain weight, biomass, grain yield and harvest index (HI). Data were subjected to analysis of variance, and means were separated by Duncan's multiple range test at 0.05 probability level. Rice varieties were significantly different for most traits including plant height, crop growth rate (CGR), biomass, percentage of filled and un-filled grain, number of grains per spikelet and harvest index (HI) except for grain yield. Chemical fertilizer had the highest grain yield followed by chicken manure, un-fertilized control and chemical fertilizer together with chicken manure, respectively. The interactions between fertilizer treatments and rice variety were not significant for all characters under study. These rice varieties seemed to have better response to chemical fertilizer than other types of fertilizer treatments

**Keywords:** Chemical fertilizer, Crop growth rate, Organic fertilizer, Rice production system



## Improvement of Threadfin bream (*Nemipterus spp.*) surimi gel properties by electron beam irradiation

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**Abstract** The surimi gel of Threadfin bream (*Nemipterus spp.*) was irradiated with electrons from 0 to 5 kGy. When compared to the non-irradiated gel, the gel treated at 5 kGy showed significant maximum textural qualities (breaking force, deformation, and gel strength) as well as minimal expressible water content ( $p < 0.05$ ), resulting in smaller voids and a denser and compact network structure. The trichloroacetic acid-soluble peptide content of surimi gels were reduced after irradiation. The protein pattern from sodium dodecyl sulfate-polyacrylamide gel electrophoresis (SDS-PAGE) revealed no significant changes in myosin heavy chain (MHC) intensity.

**Keywords:** E-beam, microstructure, protein gelation, SDS-PAGE, Threadfin bream surimi

## Effects of calcium sources on physiological traits related to pod and seed yield of peanut

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**Abstract** Gypsum is an important calcium source in peanut production system as calcium is required for pod and seed filling to attain acceptable pod yield. Other sources of calcium may be used as gypsum substitutes in case they are available at low cost or free available. The objective of this study was to compare the effects of calcium sources including gypsum, phosphogypsum, fuel gas desulfurization gypsum (FGD) and eggshell waste on physiological traits related to pod and seed yield of peanut. Four sources of calcium and no calcium control were assigned in a randomized complete block design with four replications. Chemical fertilizer formula 15-15-15 was applied as a basal dose before planting. Data were recorded for important physiological traits at 65 and 92 days after planting (DAP) and for pod yield and seed yield at 125 DAP. Calcium sources were significantly different for crop growth rate (CGR), pod growth rate (PGR), total dry matter at 65 and 92 DAP, and seed yield at harvest. Crop growth rate during planting to 65 DAP was significantly related to pod yield with  $R^2=0.56^{**}$ . Pod growth rates during 65 to 92 DAP and 92 to 125 DAP were significantly related to pod yield with  $R^2 = 0.35^{**}$  and  $0.54^{**}$ , and also related to seed yield with  $R^2 = 0.29^*$  and  $0.57^{**}$ , respectively.

**Keywords:** Eggshell waste, FGD gypsum, Phosphogypsum, Pod growth rate (PGR)

## Isolation and Optimization of Enhanced Anti-*Streptococcus suis* Bacteriocin Production by *Lactobacillus plantarum* RB01-SO

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**Abstract** One hundred and twenty lactic acid bacteria (LAB) isolated from traditional Thai fermented vegetable products were tested against *Streptococcus suis* an important food borne pathogen causing severe disease in pig farming and consumers. Only one isolate designated as “RB01-SO” inhibited *S. suis*, and also *Bacillus subtilis*, *Enterococcus faecalis*, *Lactobacillus sakei*, *Lactococcus lactis*, *Listeria innocua*, *Listeria monocytogenes*, *Micrococcus luteus*, *Staphylococcus aureus*, *Streptococcus agalactiae*, *Aeromonas veronii*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Salmonella* Typhimurium and *Vibrio harveyi*. Inhibitory activities of RB01-SO cell free supernatant (CFS) were completely destroyed by various proteolytic enzymes including trypsin,  $\alpha$ -chymotrypsin and pepsin, indicative of the proteinaceous or bacteriocin nature of the antimicrobial substance of RB01-SO. Bacteriocin production was highest when strain RB01-SO was cultured in MRS broth supplemented with 1% NaCl and initial pH of 7.0. Highest anti-*S. suis* activity of 400 AU/mL was obtained from the CFS after the bacterium was incubated at 30°C for 12 h at the above mentioned condition. Anti-*S. suis* activity of the CFS still remained after freeze-drying, suggesting its stability under the drying process. LAB that produced anti-*S. suis* agent with promising characteristics were successfully screened and isolated and showed potential for use in the food and feed industries.

**Keywords:** Bacteriocin, *Streptococcus suis*, Fermented vegetable products, Bacteriocin production

## Effect of ingredients, storage temperature and time on texture properties and retrogradation rate of butter cake

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**Abstract** This research aimed to study the effect of ingredients, storage temperature and time on texture properties and retrogradation rate of butter cake. It revealed that butter cakes made of different ratio of ingredients (butter, margarine and

eggs), when kept at 25°C and 40°C had effect on texture properties and retrogradation rate. When the storage time increased, the values of hardness, gumminess and chewiness of butter cakes in each storage temperature at 25°C and 40°C increased, but the values of springiness, cohesiveness and resilience of butter cakes in each storage temperature at 25°C and 40°C decreased significantly ( $p \leq 0.05$ ). The butter cakes with high ratio of butter, margarine and eggs (BHMHEH), when stored at 40°C for 18 days had more values of hardness and chewiness than butter cakes stored at 25°C for 6 days, and butter cake stored at 40°C for 18 days had less values of resilience than butter cakes stored at 25°C for 6 days. The butter cakes with low ratio of butter, margarine and eggs (BLMLEL), when stored at 40°C for 18 days had more values of hardness than butter cakes stored at 25°C for 6 days, and butter cake stored at 40°C for 18 days had less values of cohesiveness, springiness and resilience than butter cakes stored at 25°C for 6 days. The retrogradation rate of butter cakes increased, when the storage time increased significantly ( $p \leq 0.05$ ). The butter cakes with high ratio of butter, margarine and eggs (BHMHEH), when stored at 40°C for 18 days had more values of retrogradation rate than butter cakes stored at 25°C for 6 days. Whereas, the butter cakes with low ratio of butter, margarine and eggs (BLMLEL), when stored at 25°C for 6 days had more values of retrogradation rate than butter cakes stored at 40°C for 18 days.

**Keywords:** butter cake, ingredients, storage, texture properties, retrogradation rate

### Determination of biological activities of *Dendrobium* spp.

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**Abstract** The objective of this research was to study the biological activity of antioxidants free radicals and phytochemical in 4 species of *Dendrobium* orchids; *Dendrobium Sonia* Earsakul, *Dendrobium* Small pink, *Dendrobium* Pink Nagarindra and *Dendrobium* Khao Sanan. From the determination of the properties of bioactive compounds in *Dendrobium* flowers by FRAP and DPPH, it was found that all 4 types of *Dendrobium* flower extracts were able to resist free radicals. *Dendrobium* Small pink showed that FRAP had significantly highest result which was  $12.81 \pm 0.29$  µg/g extract while the amount of the DPPH was significantly highest in *Dendrobium* Pink Nagarindra which was  $17.25 \pm 0.32$  µg/g extract. *Dendrobium* Khao Sanan had the lowest FRAP and DPPH radical scavenging activity. *Dendrobium* Small pink showed the highest total flavonoids content and phenolic compounds ( $68.07 \pm 4.49$  and  $8.66 \pm 0.24$  µg/g extract). The result of phytochemical analysis showed that *Dendrobium Sonia* Earsakul showed the highest tannin (+++) and *Dendrobium Sonia* Earsakul, *Dendrobium* Small pink and *Dendrobium* Pink Nagarindra was found to have alkaloid content (+). These results could be used in developing healthy products in the future.

**Keywords:** Dendrobium, biological activity, phytochemical, antioxidant activity

## Growth of diatom *Amphora* sp. cultured on agar plates by streak plate technique

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**Abstract** Agar plate culturing is critical in a wide variety of scientific research, yet growing diatoms is challenging. The optimal agar concentration for *Amphora* sp. growth on f/2 medium and the duration of *Amphora* sp. survival on agar plates was identified. This study tested the simple approach for detecting cell colony growth on an agar plate by growing *Amphora* sp. in an F/2 medium with varying agar concentrations (0,4 percent, 0,6 percent, 0,7 percent). Following the discovery of the optimal agar concentration for *Amphora* sp. growth, the research continued with the regeneration of *Amphora* sp. from the old stock agar plate to the new plate of agar using the streak plate method. After *Amphora* sp. was cultured for four weeks, six weeks and eight weeks, regeneration was carried out on the new plates. *Amphora* sp. grew well on F/2 medium with a 0,4% agar concentration compared with other agar concentrations. The colony that appears became an indicator. *Amphora* sp. regeneration also showed that *Amphora* sp. was still growing well in new plates, all *Amphora* sp. from stock that was four weeks, six weeks, and eight weeks old, as indicated by the existence of multiple colonies and no contamination.

**Keywords:** Diatom, Plate culture, Agar concentrations, Streak method, Colony

## Session 10 Advanced Development in Agricultural Sciences

### Control mechanism of nano-Chaetoglobosin-C constructed from *Chaetomium globosum* 0805 against root rot of papaya caused by *Phytophthora palmivora*

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**Abstract** A control mechanism of nano-chaetoglobosin C is proved and it lysed the hyphae, mycelia, antheridium and oogonia of the tested pathogen. It implies lysis reaction. It is noticed that the non-treated one showing normal characters of the tested pathogen. The effect of nano-chaetoglobosin-C at 5 ppm showed abnormal mycelia as swollen and plugs of protoplast inside the hypha. The oogonia was abnormal characters as plugs of protoplast and the oogonia wall lysed at low degree of lysis in 3 days and 10 ppm showed moderate degree of lysis and 15 ppm showed the highest degree of lysis in 3 days. It is reported for the first time as new discovery of microbial nano-elicitor for plant immunity. Nano-chaetoglobosin-C is being investigated to apply papaya plants var holland and searching for phytoalexin production against papaya root rot in pots and field trials.

**Keywords:** Phytoalexin, papaya, nano-particles, root rot

### Kinetic Reduction of UV-C against *Salmonella* Typhimurium Contaminated on Radish sprouts (*Raphanus sativus* L.)

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**Abstract** Consumer demand for fresh, healthy and nutritious products had significantly increased minimally processed ready-to-eat (RTE) vegetable. Sprouts are primary recognized as RTE. Even with the reports about foodborne outbreaks, sprouts consumption had dramatically increased. Interventions were highly required to minimize the contamination. This study presented the kinetic reduction of *Salmonella* Typhimurium contaminated on Radish sprouts using UV-C at 3.2 to 12.8 W/m<sup>2</sup> under different washing systems. The reduction of *S. Typhimurium* dramatically increased when the intensity of UV-C increased. UV-C at 12.8 W/m<sup>2</sup> for 30 min in dynamic washing system reduced the population of *S. Typhimurium* on Radish sprouts around 2.0 Log<sub>10</sub>CFU/g-1 with different statistical significance (p≤0.05). In addition, the kinetic reduction of *S. Typhimurium* on Radish sprouts was studied. The highest intensity of UV-C at 12.8 W/m<sup>2</sup> demonstrated

the highest rate of reduction (k-value) against *S. Typhimurium*. The highest k-value was  $6.7 \times 10^{-3} \ln \text{CFU.g}^{-1} \cdot \text{min}^{-1}$  under dynamic washing system. However, the study about the effect of low temperature indicated that the reduction rate was not depended on the change of temperature. Conclusively, the reduction effect of UV-C was increased when the intensity of UV-C and contact time increased. Moreover, the temperature had an ineffectiveness on the reduction of *S. Typhimurium* contaminated on Radish sprouts. UV-C with different washing systems could be used for safe Radish sprouts process.

**Keywords:** UV-C, Radish sprouts, *Salmonella Typhimurium*, Kinetics reduction, minimally process

## Effects of Paclobutrazol on yield and quality of Mao Luang (*Antidesma thwaitesianum* Müll. Arg.) Cultivar

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**Abstract** Mao Luang (*Antidesma thwaitesianum* Müll. Arg.) Industry has been well established in Sakon Nakhon province in the Northeast of Thailand, generating important income for farmers and its related industries. Mao Luang is a wild plant which was domesticated for some decades but its production to obtain high yield and high quality fruits is difficult. Raw material shortage and short production season cause low efficiency of the industry. The objectives of this study were to compare the effects of paclobutrazol at different concentrations on flowering, fruit and quality of Mao Luang and to investigate the residue of the chemical in soil and its products. Uniform plants of Fah Prathan variety with 6 years old were selected in the farmer plantation. Five concentrations of paclobutrazol consisting of 0, 100, 200, 400 and 600 ppm were assigned in a randomized complete block design with four replications. The treatments were significantly different for flowering development, inflorescence per branch, inflorescence length percentage of fruit maturity and yield per plant. Paclobutrazol at 200 ppm concentration had the highest flower induction, fruiting and quality of Mao Luang fruits, which showed good physical characteristics, and chemical compositions of fruits. This concentration also had the highest total flavonoid content in fruits. Paclobutrazol residues in soil, leaf and fruits were lower than the maximum limit residues. The results indicated that application of paclobutrazol on Mao Luang is safe for consumers.

**Keywords:** Chemical compositions, flowering induction, fruit quality, maximum limit, soil chemical residue, value-added products

## Study of Biochar on Growth and Yield of Choy Sum (*Brassica chinensis* L.var *parachinensis*)

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**Abstract** The study aimed to evaluate the effect of biochar on the growth and yield of choy sum harvested 8 weeks after sowing in a pot experiment. The research was carried out in order to evaluate the effect of biochar on the growth and yield of vegetables and the effects of biochar on the physiochemical properties of the soil. Pots were filled with 5 kg of soil and biochar was thoroughly mixed with the soil and seven treatments were applied (1. control (T1), 2. wood biochar 2 t/ha (T2), 3. wood biochar 4 t/ha (T3), 4. wood biochar 6 t/ha (T4), 5. bamboo biochar 2 t/ha (T5), 6. bamboo biochar 4 t/ha (T6) and 7. bamboo biochar 6 t/ha (T7)). The treatments were replicated four times. The experiments were laid out in a complete randomized design (CRD). Data on growth parameters such as plant height, number of leaves, leaf width, chlorophyll content, fresh weight, dry weight, fresh root weight, dry root weight were collected. Soil samples incorporated with biochar were collected before planting and after harvest for determination of physiochemical properties of the samples. The application of 4 t/ha produced significantly ( $P < 0.01$ ) higher plant height (23.0 cm), number of leaves (15.2), chlorophyll content (74.2 SPAD) and fresh weight (288.4 g).

**Keywords:** biochar, choy sum, growth.

## Effect of Seed Coating with Fluorescent Compound on Quality and Fluorescence of Cucumber seeds

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**Abstract** This research was aimed to study the quality and fluorescence of seed after coating with fluorescent compound on cucumber. The experiment was conducted at the Seed Technology Laboratory, Chao Khun Thahan Building, Department of Plant Production Technology, Faculty of Agricultural Technology, King Mongkut's Institute of Technology Ladkrabang. The research was designed as Completely Randomized Design (CRD) with 4 replicates were planned for 50 seeds each, the cucumber seeds were coated with 5 different types of fluorescent compound which were including the coated seeds with coating substance only, the coated seeds with coating substance mixed with fluorescent compound at the types of Safranin, Riboflavin, Chlorophyll, Rhodamine and Curcumin, the non-coated seed was as a control. The cucumber seeds were coated by centri-coater machine model RRC-150 at the rate of coating was 140 milliliters per 1 kilogram of seed. Then, the coated seeds were dry by using a hot air oven at 35 degrees Celsius until the moisture content after coating was close to initial moisture content. The non-coated and all treatments of coated seeds were divided into two parts. The



first part was examined for seed fluorescence by using SPECTRORINE® Hand-UV light (Model CM-10;  $\lambda = 365$  nm) and SHIMADZU Spectro fluorophotometer (model RF-5301PC). The second part was tested for seed quality in different ways including seed germination and germination index. The results showed that the coated seed with all types of fluorescent compound had a fluorescence, the coated seed with coating substance mixed with Rhodamine had the clearest fluorescence. All the coated seed with coating substance mixed with fluorescence compound were specifically emissions spectra observed from a spectrofluorophotometer. There were also not affect germination and germination index of seed.

**Keywords:** Seed coating, fluorescent compound, Seed quality

### Acclimatization of Micropropagated *Dendrobium* sp with the Application of Organic Fertilizer

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**Abstract** Acclimatization is an important process in increasing the adaptability of *Dendrobium* sp. from in vitro culture. The objectives of the study were to determine the concentration and frequency of organic fertilizer application to promote the growth of *Dendrobium* sp. at the acclimatization stage. The study was arranged in a completely randomized design with three replications. The concentration of organic fertilizer was given in 4 levels, namely (0, 1, 2, and 3 ml/L), with the frequency of application (every 2, 3, and 4 days). Plantlets of 4 months cultured were uses as planting material. Each plantlet was surface sterilized with fungicide solution 1 g/L and rinsed under running tap water. Plantlets were planted individually in plastic pots with moss sphagnum media. After planting, the pot is closed to reduce evaporation. Plant maintenance was carried out by spraying organic fertilizer solution according to treatment. The results showed that there was an interaction between concentration and frequency of organic fertilizer application on plant height and leaf length variables of *Dendrobium* sp. The application of 1 ml/L organic fertilizer with a frequency of every 2 days showed an increase in height of 6.66 cm and leaf length of 5.28 cm. Treatment without giving organic fertilizers showed the lowest growth due to the lack of nutrients received by orchid plants during the acclimatization period. Thus, the application of organic fertilizers in low concentrations repeatedly can increase the growth of *Dendrobium* sp. Application the organic fertilizer improve plant adaptability in an *ex vitro* environment.

**Keywords:** *Dendrobium* sp, micropropagation, fertilizer application, shoot growth

## Antimicrobial Susceptibility of Chili Extract against Foodborne Pathogens and Food Related Bacteria

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**Abstract** This study aimed to investigate the comparative evaluation of antimicrobial activities of chili crude extract using aqueous, 50 and 95% (v/v) ethanol. Chili crude extract demonstrated inhibitory potential against 25 test organisms, including foodborne pathogens and food-related bacteria. The chili crude extract using 95% (v/v) ethanol solution had the highest efficacy on microbial inhibition. Time-killing analysis were evaluated. The lowest MIC and MBC of 25 bacterial strains was found in *V. cholerae* DMST 9700 at 0.5% and 1.0% respectively. According to the Time killing analysis, the results indicated that the completed destruction phenomenon of bacterial mixture was detected at the concentration of more than 10.0%w/v of chili crude extract.

**Keywords:** Antimicrobial, Foodborne, Chili, Extract, Soxhlet, Time kill, MIC, MBC

## Application of nano-Chaetoglobosin-C from *Chaetomium globosum* to control of tomato wilt caused by *Fusarium oxysporum* f.sp. *lycopersici*

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**Abstract** Testing nano-Chaetoglobosin-c to inhibit *Fusarium oxysporum* f. sp. *lycopersici* causing wilt of tomato was investigated. *Chaetomium globosum* is reported to produce active secondary metabolites eg chaetoglobosin-C which suppressed human and plant pathogens. Chaetoglobosin-C is an active pure compound from *Ch. globosum* strain 0805. It is constructed to be nanoparticles by electron spinning method. Nano-chaetoglobosin-C was inhibited tomato wilt pathogen. It showed that nano-chaetoglobosin-C treatment caused the pathogen to be abnormal structures when compared to the control with normal structures. Result showed nano-chaetoglobosin-C at 3, 5, and 15 ppm inhibited spore production of 57, 49, and 57 per cent, respectively. Nano-chaetoglobosin-C gave very good result to inhibit *Fusarium* wilt pathogen at ED50 of 0.1 ppm. With this, nano-chaetoglobosin-C from *Ch. globosum* proved a control mechanism as lysis. It can destroy the pathogen to be abnormal structures. The next experiment is being studied on phytoalexin production by apply nano-chaetoglobosin-C as elicitor. This is reported for the first time to discover nano-chaetoglobosin-C as Elicitor.

**Keywords:** Phytoalexin, tomato, nano-particles, anthracnose

## Application of nano-Chaetoglobosin-C from *Chaetomium globosum* to control anthracnose of chilli caused by *Colletotrichum gloeosporioides*

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**Abstract** *Chaetomium globosum* isolate 0805 is reported to produce the natural product of active pure compound namely chaetoglobosin C which expressed antimicrobial activities against human and plant pathogens. Result showed that nano-chaetoglobosin C gave significantly inhibited *Colletotrichum gloeosporioides* causing chilli anthracnose which the ED 50 was 4.22 ppm. The conidia were destroyed by nano-chaetoglobosin-C at different concentrations compared to control. The mycelia were destroyed by nano-chaetoglobosin-C at different concentrations compared to control. It inhibited spore production of anthracnose pathogen as 31, 61, 80, 87 percent at 3, 5, 10, 15 ppm., respectively. Nano-chaetoglobosin-C proved to be a control mechanism as lysis. It lysed the conidia and mycelia of *C. gloeosporioides*. The next research findings will be tested nano-chaetoglobosin-C to elicit phytoalexin in Chilli against anthracnose. It is reported to be the first time to apply nano-chaetoglobosin-C against Chilli anthracnose.

**Keywords:** Phytoalexin, tomato, nano-particles, anthracnose

## Application of nano-Chaetoglobosin-C from *Chaetomium globosum* to control brown leaf spot of rice caused by *Drechslera oryzae*

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**Abstract** *Drechslera oryzae* causing brown leaf spot of rice is isolated and morphological identified. Rice seedlings were inoculated with spore suspension of pathogen at  $1 \times 10^5$  spores per ml by spraying into whole rice seedlings of 2 weeks old. It is proved to be pathogenic isolate by Koch's Postulate method. Crude hexane, crude ethyl acetate and crude methanol from *Chaetomium globosum* 0805 significantly inhibited colony growth and spore production of *D. oryzae*. It showed that crude hexane, crude ethyl acetate and crude methanol at 1000 ppm extracted from *Ch. globosum* 0805 significantly inhibited the colony growth and spore production of tested pathogen which the ED50 were 3.20, 3.72 and 0.81 ppm,

respectively. Nano-Chaetoglobosin-c is constructed from chaetoglobosin C which it is an active compound derived from *Ch. globosum* 0805 by electron spinning method which significantly inhibited *D. oryzae* causing brown leaf spot of rice. It is interesting that that nano-chaetoglobosin C at the highest concentration of 15 ppm gave significantly inhibited the tested pathogen which the ED50 was 0.9 ppm. These research finding is a new discovery and be the first report of applying nano-chaetoglobosin C derived from *Ch. globosum* 0805 gave a good control brown leaf spot of rice. Further experiment is being conducted in pot experiment. Phytoalexin induction by nano-chaetoglobosin C is also being investigated as natural product elicitor to induce plant immunity in rice.

**Keywords:** Phytoalexin, rice, nano-particles, brown leaf spot

### Extraction and antioxidant activities of broken *Ganoderma lucidum* spore

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**Abstract** This study aimed to evaluate the effects of different extraction techniques (soxhlet extraction, maceration extraction, microwave-assisted extraction (MAE), and ultrasound-assisted extraction (UE)) on the yield and total phenolic content of extracts from broken *G. lucidum* spores. Soxhlet and MAE methods showed the highest extraction yield and total phenolic content of extract from broken *G. lucidum* spores ( $p < 0.05$ ). However, the extraction time of MAE method was shorter than that of soxhlet extraction method. When broken *G. lucidum* spores was extracted using different solvent types (water, ethanol, methanol, hexane and acetyl-acetate) with MAE method, their yield, total phenolic content and antioxidant activity were also investigated. Ethanol extraction rendered extract with the highest total phenolic content ( $p < 0.05$ ). Thus, the use of appropriate extraction method and solvent type rendered extract with high total phenolic content and antioxidant activities.

**Keywords:** *Ganoderma lucidum*, broken spores, microwave-assisted extraction, antioxidant activity

## Genetic Characterization of *Rhizobium* Bacteria Isolated from Bean Nodules and Its Effect on Soil Quality

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**Abstract** The *Rhizobium* bacteria were isolated from common bean (*Phaseolus vulgaris* L.) nodule samples from ten different common bean growing areas in Konya Derebucak, Turkey. A total of 10 isolates were obtained and purified. Firstly morphological and metabolic characterizations of the isolates were conducted. Out of 10 isolates, 8 isolates were acid producers and fast growers, two isolates (F4DC, F6DC) were not turned BTB color so indicated as slow grower and were not grown on glucose peptone agar. For molecular identification universal 16S primers are used and according to the phylogeny of 16S rRNA genes, one group belonging to the genera *Rhizobium* and the other one is belonging to the genera *Agrobacterium*. Preserved region of the *nifH* gene fragment was amplified and the strains F4DC and F6DC were positive for *nifH* gene amplification. In the field experiment, the effect of inoculation with *Rhizobium gallicum* F4DC (MZ156852) on common bean was studied. F4DC strain induced a significant increase in grain yield, number of pods and plant height compared to the control and also induced a significant increase in number of nodule both compared to the control chemical fertilizer treatments.

## Status of Arbuscular Mycorrhizal Fungi Populations in Some Pastures of Ankara Region, Turkey

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**Abstract** The status of arbuscular mycorrhizal fungal populations in soil and root samples collected from different pastures of Turkey was studied. Soil physicochemical parameters as well as AM fungal population parameters including spore density (SD), frequency of mycorrhization (F%) and intensity of mycorrhization (M%) were measured and compared in soil and root samples. The correlation between these parameters was also determined. The fungal spores from soils with the highest population indices were propagated, purified and morphologically identified. The significant differences were observed on physicochemical parameters as well as AM fungal population indices among different soil samples and regions. The maximum and minimum averages of fungal spore density, mycorrhizal frequency and intensity of mycorrhization were observed in Sinop and Aydın soils, respectively. Also, a positive correlation was observed between fungal spore density and intensity of mycorrhization in different sampling regions. The results showed that there is a negative correlation between AM fungal indices (spore density and mycorrhizal colonization intensity) with soil EC, pH, available P, and available K. On the other hand, a positive correlation could be observed between AM fungal indices and soil organic matter. Based on morphological methods, 4 definite and 2 indefinite AMF species were identified after fungal

propagation. The definite fungal species were *Funneliformis caledonius*, *Rhizophagus fasciculatus*, *Rhizophagus intraradices* and *Glomus versiforme*. The indefinite species were *Glomus* sp. and *Paraglomus* sp.

## Potential use of extracts and an active constituent from *Desmodium sequax* to control fungal plant diseases

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**Abstract** The methanol extract of the whole plant parts of *Desmodium sequax* was found to suppress efficiently fungal plant diseases. Especially, it remarkably controlled rice blast (RCB), tomato grey mold (TGM), and red pepper anthracnose (PAN) *in vivo*. Out of separated fractions, Hex-soluble fraction showed potent control values against RCB (93.75%), TGM (87.5%), wheat leaf rust (WLR) (80%) and PAN (95%) at 3000 µg/mL, respectively. Through bioassay-guided fractionation, compound 1 was isolated from the Hex-soluble fraction and this compound was identified as lupeol on the basis of NMR and ESI-MS data analysis. The *in vivo* and *in vitro* antifungal activity of 1 was evaluated against various fungal phytopathogens. Lupeol displayed a moderate inhibition against the mycelial growths of *Rhizoctonia solani*, *Colletotrichum orbiculare*, and *Magnaporthe grisea* *in vitro*. Besides, *in vivo* antifungal efficacy of 1 against TGM and tomato late blight (TLB) over the concentration range of 125–500 µg/mL was described for the first time. The content of lupeol (2.94%) in Hex-soluble fraction was qualified by HPLC analysis. Our study demonstrated *D. sequax* is a promising plant resource, contains lupeol as antifungal constituent and possess a potential application to control fungal plant pathogens.

**Keywords:** *Desmodium sequax*, antifungal activity, lupeol, triterpenoid, plant diseases

## Simultaneous and sensitive detection of CVB, CChMVd and CSVd mixed infections in chrysanthemum using multiplex nested RT-PCR

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**Abstract** Chrysanthemum plants are susceptible to infection by virus and viroid diseases. Early detection of these pathogens helps prevent disease spread. Multiplex RT-PCR can simultaneously detect many viruses and viroids in a single reaction, and applying multiplex nested PCR can improve the sensitivity of the detection. Chrysanthemum leaves were collected from cultivation areas in Northern Thailand. Multiplex nested RT-PCR using specific outer and inner primer pairs for detection of *Chrysanthemum virus B* (CVB), *Chrysanthemum chlorotic mottle viroid* (CChMVd), and *Chrysanthemum stunt viroid* (CSVd) were used for simultaneous detection. Among 15 randomly selected samples, one sample showed co-infections of CVB and CChMVd, and two samples showed multiple infections of all pathogens. Furthermore, multiplex nested RT-PCR detected amplicons of CChMVd and CSVd that were not detected by the first-round PCR. Also, sequence analysis was used to confirm the correction of amplified fragments and revealed that all amplicons were more than 93% identical compared to corresponding sequences deposited in the GenBank. Therefore, multiplex nested RT-PCR can be used for routine detection and diagnosis of virus and viroid diseases. To our knowledge, this is the first detection of mixed infections between virus and viroids in the chrysanthemum of Thailand.

**Keywords:** chrysanthemum, virus, viroid, multiplex nested PCR

## The role of *Lumbricus rubellus* for improving the quality of various animal manures through vermicomposting

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**Abstract** The potential for large amounts of livestock waste needs to be balanced with an increase in quality. This quality improvement can be made with the bioconversion process, which is the vermicomposting method. This study aims to determine the effect of vermicomposting on improving the quality of livestock waste. The study was conducted by utilizing the activity of the *Lumbricus rubellus* in bioconversion of livestock waste into compost (vermicompost). The parameters of livestock waste quality improvement observed were macronutrient content, N, P and K, C/N ratio, pH, and physical



properties (texture, color, and odor) adjusted to the Vermicompost Organoleptic Score Standard (SNI 19-7030-2004). Data analysis showed that the process of composting livestock waste in the usual way by farmers showed lower parameter values when compared to vermicompost. Levels of N-total, available K, C-Organic, and pH in vermicompost show higher values. A decrease in the C/N ratio to a value of 18.22 is followed by an increase in the levels of N-total and C-organic. However, the results of the analysis showed lower P-available values. The physical quality of livestock waste that is processed by vermicomposting is better when compared to ordinary composting. This can be seen from the change in color, odor, and texture of vermicompost waste that has changed from day 21 to 30 days. While ordinary composting has not shown significant changes.

**Keywords:** Vermicompost, *Lumbricus rubellus*, livestock waste, macronutrients

### Potential of PGPR isolated from rhizosphere of pulpwood trees in stimulating the growth of *Eucalyptus pellita* F. Muell

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**Abstract** *Eucalyptus pellita* is an alternative plant for *Acacia crassiparpa* and *Acacia mangium* as raw materials for pulp and paper. *E. pellita* is a plant that easily adapts to various environmental conditions but its growth rate is lower than that of *A. crassiparpa* and *A. mangium*. The growth rate of *E. pellita* can be stimulated by applying plant growth-promoting rhizobacteria (PGPR). A study was conducted to characterize and analyze the ability of 25 PGPR isolated from rhizosphere of *E. pellita* seedlings in stimulating the growth of *E. pellita*. Characteristics of PGPR were analyzed for the isolates' ability to produce IAA, siderophores, phosphate solubilization, ability as a biocontrol, hypersensitivity test using tobacco plants, and compatibility test between isolates. Stimulating the growth of *E. pellita* seedlings was carried out with the following treatments: inoculation of a consortium of five selected isolates with or without the addition of fungicides. As a comparison, *E. pellita* seedlings were also treated without inoculation of a PGPR consortium, and some seedlings were added with fungicides, as well as fungicides and fertilizer. Five isolates were selected which were applied for stimulating the growth of *E. pellita*. The selected isolates were known to produce IAA, siderophores, phosphate solubilization, and be able to inhibit the growth of *Ralstonia solanacearum* or *Cylindrocladium* sp. In addition, the isolates were not pathogenic, because they did not cause necrotic on tobacco plants. The five isolates were employed as a consortium because the isolates were mutually compatible. The most effective treatment in stimulating the growth of *E. pellita* was the inoculation of PGPR consortium with the addition of fungicide which caused an increase in plant height of 46.92% and stem diameter of 22.88% compared to control. In contrast, treatment with the addition of fungicides actually inhibits the growth of *E. pellita*.

**Keywords:** *Eucalyptus pellita*, IAA, PGPR, Phosphate Solubilization, Siderophores

## Session 11 Advanced Development of Biological Technology

### Ectomycorrhizal communities of pine forests in south Vietnam and applying for reforestation

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**Abstract** The 25 seedlings of *Pinus kesiya* were harvested for surveying the ectomycorrhizal fungi (EMF) community. From 1194 collected ectomycorrhizal (ECM) root tips of 20/25 seedlings, the dominant EMF were recorded such as: *Cortinarius* sp., *Rhizopogon* spp., *Nothofagium* sp. and *Scleroderma sinnamariense*. Total 1277 EMF sporocarps were collected from the plot 4 ha of *P. kesiya* in rain season of 2019. All sporocarps were initially identified and the potentially edible mushrooms were selected and isolated by Modified Melin Norkrans medium. Among 109 sporocarps used to isolates, 30 ectomycorrhizal fungi (EMF) strains were succeeded to cultivate in store in in vitro condition. All 30 EMF strains and their 30 sporocarps were checked their similarity and identification by molecular analysis used ITS markers. Basing on the values of edible mushrooms, the data of sporocarps record in young *P. kesiya* forest and the growth rate of fungal mycelia in in vitro condition, two EMF strains were selected. These strains were identified by macro and micro characteristics of morphology as well as molecular analysis using ITS and LSU markers. All indicated that they were *Suillus luteus* and *Scleroderma sinnamariense*. The in vitro condition for culturing these EMF strains were investigated. Both strains grew well in Ohta medium, optimum pH 5.0 and 25°C. The ECM formation model was set up by co-culturing the 2 weeks old EMF strains with 7 weeks old *P. kesiya* seedlings in glass jar on the substrate combined by Popper ceramic balls and MMN medium without Glucose. After 12 weeks co-culturing, all 30 seedlings co-cultured with each EMF strain showed ECM formation. All ECM seedlings grew better than the control seedlings without EMF strains with higher stem, longer root system and heavier dried seedling biomass. ECM of both *Suillus luteus* and *Scleroderma sinnamariense* formed with *P. kesiya* seedlings were separated, described macro and micro characteristics, and confirmed EMF strain by molecular analysis. The results of this study show the potential to apply both EMF strains for *P. kesiya* reforestation.

**Keywords:** ectomycorrhiza, ectomycorrhizal fungi, reforestation, pine

## Potential of *Trichoderma asperellum* as a bio-control agent against citrus diseases caused by *Penicillium digitatum* and *Colletotrichum gloeosporioides*

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**Abstract** *Colletotrichum gloeosporioides* is the main cause of citrus post-bloom and pre-harvest fruit drops, resulting in up to 65% and 22% of citrus crop loss, respectively, while *Penicillium digitatum* primarily causes green mold on postharvest citrus fruits accounting for 90% of total citrus fruit loss due to postharvest decay. Biocontrol agents are considered as eco-friendly and bio-safe alternatives of fungicides, and hence, being actively sought for. Previously, several *T. asperellum* strains have been demonstrated to effectively inhibit either *P. digitatum* or *C. gloeosporioides* growths. We investigated whether our *Trichoderma* isolates could simultaneously inactivate *P. digitatum* and *C. gloeosporioides* *in vitro* and protect citrus crops from green mold and anthracnose. We found that three *T. asperellum* strains inhibited *P. digitatum* and *C. gloeosporioides* extension by around 99% and 77%, respectively. Single factor experiments showed that a medium containing 2% of sucrose and 1% of peptone on rice husks cultivated at 28°C for 15 days was the best condition for these strains to produce conidia. Additionally, supplement of conidial suspension with 10% glycerol, 0.2% CMC, and 0.3% Tween 80 preserved spore viability by 80% after 2 months of storage. The development of citrus green mold and anthracnose was also inhibited in the presence of *T. asperellum* formulated conidia. Overall, these data indicated a potential application of the formulated conidia as a biocontrol agent in preventing citrus crop loss caused by both preharvest and postharvest diseases.

**Keywords:** Anthracnose, bio-control, *Colletotrichum gloeosporioides*, green mold, *Penicillium digitatum*, *Trichoderma asperellum*.

## Effects of Hydrocolloid Addition on the Quality of Cookies Substituted Wheat Flour with Sinin Rice Flour

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**Abstract** The objective of this study was to determine the effects of hydrocolloid addition on physical properties and organoleptic properties of wheat flour cookies substituted with Sinin rice flour. Hydrocolloids were added in cookies substituted wheat flour with Sinin rice flour (xanthan gum, inulin, guar gum, locust bean gum and glucomannan). Seven cookies (5 hydrocolloids W:S cookies, W:S cookie without hydrocolloid and wheat flour cookie) were evaluated for sensory descriptive and physical properties; geometric (diameter, thickness, spread ratio), texture profile analysis (Hardness) and 3-point bending (Fracture strength). Hardness and Fracture strength of cookie with added inulin were higher than other hydrocolloids cookies and W:S cookie without hydrocolloid, but lower than wheat flour cookie. Results from sensory descriptive analysis of cookies with added hydrocolloids using trained panel indicated that cookies had slick mouthfeel. The relationship between physical properties and sensory descriptive data were correlated by using Principal Component Analysis and Preference Mapping. The physical properties of cookies were closely linked with the texture ratings from the descriptive analysis. The consumer acceptance was evaluated for appearance, color, flavor, taste, texture and overall liking by 100 untrained-panelists. The 9-point hedonic scale was used to evaluated (1 = extremely dislike, 9 = extremely like). Results showed that sensory data (flavour, taste, texture and overall liking) of cookies which added xanthan gum was the highest score ( $p < 0.05$ ).

**Keywords:** Cookie, Hydrocolloid, Inulin, Preference mapping, Rice flour

## Changes in Soil Properties Affected By Rice Stubble Burning In Bangkok Soil Series

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**Abstract** Long continuous using the soil in farming without proper soil maintenance combined with improper management of crop residues resulting in soil deterioration, which is the foundation for decreasing of profitable, productive, and environment impact on agricultural systems. Residual management after rice harvesting, such as rice stubble burning is a typical practice of Thai farmers that increases air pollution and soil degradation. This research aimed to determine the

effects of burned and non-burned rice stubble on change of soil properties. Soil samples were collected in two plots of Nongchok district, Bangkok, which were non-burned rice stubble field (NC1) and burned rice stubble field (NC2) and two plots of Ladkrabang district, Bangkok were non-burned rice stubble field (NC3) and burned rice stubble field (NC4). All soil samples were collected at a 0-15 and 15-30 cm soil depth. The results indicated that the soil in four plots were a clayey soil as Bangkok soil series. Non burning the rice stubble gave significant high value of soil organic carbon (SOC), total nitrogen (TN), total sulfur (TS) and cation exchange capacity (CEC) at a depth of 0-15 cm. Although, burning rice stubble enhances soil alkalinity as influence from ash alkalinity. Exchangeable K, Mg and Na at 15-30 cm depth were higher than the topsoil caused by parent material of Bangkok soil series is a marine mixed with riverine alluvium under brackish water influence. Non-burning rice stubble gave a SOC, TN, TS and CEC higher than burned rice stubble field except soil pH. These data clearly indicated that burning rice stubble decreased soil fertility in clayey soil which tends to soil degradation.

**Keywords:** Crop residue, Burned rice stubble, Non-burned rice stubble, Soil properties

### Identification of soil insect diversity in the turtle conservation area, Bengkulu university

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**Abstract** This study aims to determine the diversity of soil insects in the Turtle Conservation Area, Bengkulu University. Soil insect sampling was carried out in the Turtle Conservation area of Bengkulu University. Based on the results of the study, 23 species, 13 families, 8 orders were found. The presence of the most soil insects was found in the *Manouria emys* conservation area at 365 individuals, while in the *Heosemys spinosa* conservation area 289 individuals were found. Soil insect diversity index in the *M. emys* conservation area is 1.97 and in the *H. spinosa* conservation area is 1.96. The highest relative abundance was found in the *M. emys* conservation area of 99.97% and in the *H. spinosa* conservation area of 99.96%. Soil insect dominance index in the *M. emys* conservation area was 0.221 and in the *H. spinosa* conservation area was 0.224. Differences in diversity were also known from the analysis of the vegetation of the two areas. The relative abundance of vegetation in the *M. emys* Conservation area was 101.3% and in the *H. spinosa* Conservation area, it was 99.93%. The vegetation diversity index in the *M. emys* Conservation area was 3.16 and in the *H. spinosa* Conservation area, it was 2.7. The vegetation dominance index in the *M. emys* Conservation area was 0.06 and in the *H. spinosa* Conservation area, it was 0.1.

**Keywords:** diversity, Soil Insecta, University of Bengkulu, Tortoise Conservation Area

## The effects of sous-vide cooking on the physicochemical, microbiological, and carbon footprint of buffalo meat at various temperatures and times

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**Abstract** This research examined the effects of temperature (55, 59, or 70°C) and time (24 or 48 h) on pH, surface color, browning index (BI), cooking loss (CL), color changes ( $\Delta$ ), muscle shrinkage, shear force (SF), toughness, textural profile analysis (TPA), microbial content, and carbon footprint in sous-vide-cooked buffalo meat. These quality parameters were measured and compared with traditional cooking (TC; 80°C for 30 min). The results showed that meat cooked by TC had higher SF, toughness, hardness, springiness, cohesiveness, gumminess, and chewiness than the other sous-vide treatments. A temperature and time combination showed a major increase in pH, a\*, b\*,  $\Delta E$ , BI, and cohesiveness but a reduction of  $\Delta a^*$ , toughness, and microbial content. The CL, transversal shrinkage (TS), SF, hardness, gumminess, and carbon footprint increased with increased temperature. Almost all instrumental texture values, particularly hardness, decreased with prolonged time. Among sous-vide treatments, the lower TS, shear tests, and almost all texture profiles were found in samples cooked at 55°C for 48 h. Compared to raw meat, there was no risk of inadequate pasteurization in cooked treatments. Thus, the results showed that sous-vide cooking had a key advantage in retaining moisture, supplying tender meat (55°C-48 h and 59°C-24 h), and minimizing carbon footprint (55- and 59°C-24h).

**Keywords:** Sous-vide, Meat quality, Tenderness, Carbon footprint, Buffalo

## Development of Soft Cookie from Pregelatinized Banana Flour and Germinated Brown Rice

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**Abstract** The soft cookie from pregelatinized banana flour and germinated brown rice was developed by studying the optimum ratio between pregelatinized banana flour and germinated brown rice. The optimum ratio between pregelatinized banana flour and germinated brown rice (80:20 by weight) was determined by pasting characteristic and solubility property. The selected ratio of mixed flour was subsequently substituted to wheat flour as 0, 50, 75 and 100 percent in soft cookie formula. The sensory evaluation was performed and the result showed that 75 percent substitution in soft cookies got the

highest overall acceptability among the others and the texture of soft cookie showed the hardness of  $0.270 \pm 0.03$  gram force. The optimum percentage of sugar was studied by varying the reduction of sugar percentage from the standard formula as 10, 20, and 30 percent. The results showed that 30 percent of sugar reduction got the highest overall acceptability from sensory evaluation. The texture of soft cookie showed the hardness of  $1.205 \pm 0.30$  gram force and specific volume of  $1.902 \text{ cm}^3/\text{g}$ . The consumer's decision purchasing and consumer acceptance test using 80 general participants were conducted and the results showed that 31.3% of consumers would buy the products. Additionally, the consumers gave the hedonic score in terms of appearance, colors, and flavor as like slightly to like moderately and in the attributes of taste, texture, and overall acceptability were scored as like very much to like extremely.

**Keywords:** Soft cookie, Banana, Germinated brown rice, Pregelatinize, Drum drying

### Combination of Humectants with Potassium Sorbate and Sodium Benzoate to Inhibit *Curvularia clavata* Contamination in Thai Fermented Fish Spicy Dip (Nam Phrik Pla Ra)

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**Abstract** Samples of Thai fermented fish spicy dip (nam phrik pla ra) had a high total viable count and high yeast and mold counts of 4.6 and 2.2 log CFU/g, respectively, that exceeded the standard values set by the Thai Industrial Standards Institute (TISI) of less than 4 and 2 log CFU/g, respectively. Sample isolation and identification revealed that *Curvularia clavata* (isolate 518) was the highest contaminating species. Glucose syrup (5%) should be used in chili paste production to reduce its aw and to extend the shelf life of nam phrik pla ra (5 days) and not to exceed the standards set by the TISI. *C. clavata* growth was inhibited by adding humectants and preservatives to the sample. The shelf life of nam phrik pla ra containing 5% glycerol with 500 mg/kg potassium sorbate was 7 days, while adding 5% glucose syrup with 500 mg/kg potassium sorbate prolonged the shelf life to more than 14 days.

**Keywords:** *Curvularia clavata*, fermented fish spicy dip, glucose syrup, potassium sorbate, sodium benzoate



## Antibacterial and anti-biofilm formation activities of high heat tolerant herbal extracts against white feces syndrome-associated *Vibrio parahaemolyticus*

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**Abstract** White feces syndrome (WFS), one of *Vibrio parahaemolyticus* outbreaks responsible for 10 to 15% loss in shrimp production, has recently been reported. To reduce the losses from WFS, farmers are forced to use expensive antibiotics or probiotics. Several herbal extracts effectively work out in the prevention and control of WFS have also been reported. However, heat or improper store may cause a deterioration of the herbal extract efficacy. High heat tolerant herbal (HHTH) extracts was therefore focused in this study. Six ethanolic herbal extracts, originated from *Caesalpinia sappan*, *Pluchea indica*, *Cinnamomum cassia*, *Alpinia galanga*, *Ocimum gratissimum*, and *Origanum vulgare*, were screened for their antibacterial activity by disc diffusion method in the forms of heat-treated (heating at 121°C for 15 min) and nonheated. Two of six, *C. sappan* and *A. galanga* could serve as the potent HHTH extract. The highest inhibitory activity expressing substance, the HHTH extract of *C. sappan*, was selected to further determine its antibacterial and anti-biofilm activities. The minimum inhibitory concentration (MIC) and minimal bactericidal concentration (MBC) against WFS-associated *V. parahaemolyticus* was the same value of 0.39 mg/ml. Treatment of the test *V. parahaemolyticus* with the HHTH extract of *C. sappan* at MIC showed 79.48±1.11% of the biofilm formation inhibition. Scanning electron microscope (SEM) images also revealed that no biofilm formation in *V. parahaemolyticus* treated with the HHTH extract of *C. sappan* compared to that of the control. This study elucidated that the HHTH extract of *C. sappan* could serve as potential antibacterial and anti-biofilm agent against WFS-associated *V. parahaemolyticus* which could be used as an alternative natural substance for bacterial control in sustainable aquaculture.

**Keywords:** *Caesalpinia sappan*, high heat tolerant herbal extract, *Vibrio parahaemolyticus*, white feces syndrome, white shrimp

## ***In vitro* shoot proliferation of Mangosteen's micro shoots using combination of 6-Benzylaminopurine and 1-Naphthaleneacetic concentrations**

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**Abstract** Mangosteen is known as “the queen of the tropical fruit” whose seeds are formed and developed from the nucellus tissue in the pistil without fertilization since the stamens of the mangosteen flower are rudimentary. 6-Benzylaminopurine (BAP) is a plant growth regulator (PGR) from the cytokinin group that plays a role in cell division and induces shoot formation *in vitro*. Meanwhile, 1-Naphthaleneacetic acid (NAA) is a PGR from the auxin group which plays a very important role in cell division and stimulates the formation of roots of several types of plants *in vitro*. The balanced combination of BAP and NAA has been found to stimulate the formation of embryogenic callus *in vitro* culture. Results from this experiment indicated that mangosteen seed explants contained of nucellus could develop directly to form micro shoots or produce callus first which would then form adventitious shoots. The highest direct proliferation of micro shoots was 40.3 plantlets per seed produced at a combination of 10 mg L<sup>-1</sup> BAP and 2.5 mg L<sup>-1</sup> NAA concentrations. Nucellus proliferation indirectly take places through nucellus development forms callus which then develops into adventitious shoots resulting from the combination of 5 mg L<sup>-1</sup> BAP with 2.5 mg L<sup>-1</sup> NAA treatment. The highest number of adventitious shoots around 82.6 adventitious shoots per seed, was produced at this treatment. Callus was generally formed at a lower concentration of about 5 mg L<sup>-1</sup> BAP, while at high concentrations up to 10 mg L<sup>-1</sup> BAP, generally nucellus will immediately form micro shoots. Concentration more than 10 mg L<sup>-1</sup> BAP inhibited the proliferation of mangosteen micro shoots and generally only one shoot was formed which would develop directly into plantlets.

**Keywords:** Mangosteen, *Garcinia mangostana*, Cytokinin, Auxin, *in vitro*, plant growth regulator

## **Application of nano-Trichotoxin A50 from *Trichoderma harzianum* PC01 to control Anthracnose of papaya cause by *Colletotrichum gloeosporioides***

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**Abstract** Our isolates PC 01 of *Trichoderma harzianum* is reported to produce antibiotic polypeptides, Trichotoxin A mixture. This compound proved to inhibit many plant pathogens and stimulate plant growth. Trichotoxin A50 is an active pure compound derived from *T. harzianum* PC01. Trichotoxin A50 is constructed to be nano-particles by electron spinning

method. Nano-Trichotoxin A50 was tested to inhibit the anthracnose pathogen, *Colletotrichum gloeosporioides*. Result showed that nano-Trichotoxin A50 inhibited the anthracnose pathogen which ED 50 was 2.60 ppm. It inhibited spore production of 51, 62, 70, 81 percent at concentration of 3, 5, 10, 15 ppm., respectively. It concluded that nano-Trichotoxin A50 from *T. harzianum* PC 01 proved to inhibit the anthracnose pathogen of papaya which ED50 was 2.60 ppm. It inhibited spore production of 51, 62, 70, 81 per cent at concentrations of 3, 5, 10, 15 ppm., respectively. Our going on experiment is being tested phytoalexin production after treated with Nano-Trichotoxin A50. This is reported to be the first time to apply Nano-Trichotoxin A50 for phytoalexin production in Papaya and to induce plant immunity.

**Keywords:** Phytoalexin, Papaya, nano-particles, anthracnose

### Biological control of *Colletotrichum gloeosporioides* causal agent of citrus anthracnose by using *Trichoderma hamatum* K01

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**Abstract** *Colletotrichum gloeosporioides* is isolated from citrus anthracnose. The results revealed that the isolate of the pathogen was referred to *C. gloeosporioides* based on morphology and molecular identification. The pathogenicity of *C. gloeosporioides* was proved to be a pathogenic isolate by the detached leave method. *Trichoderma hamatum* K01 inhibited colony growth and sporulation by 70.55% and 79.07%, respectively. In addition, crude metabolites from *T. hamatum* K01 were extracted to yield crude TK01-Hexane, TK01-EtOAc and, TK01-MeOH. All crude extracts showed a broad spectrum to inhibit mycelial growth which were 37.60, 44.60, and 78.60%, respectively. Furthermore, these crude metabolites reduced conidia production by 45.96, 63.32 and 73.23 %, respectively at concentration 1000 ppm, compared to non-treat control. Crude TK01-EtOAc gave the ED50 value of 607.43 ppm on sporulation and crude TK01-MeOH was strongly inhibited the colony growth and conidia production, which the ED50 values was 273.38 and 355.28 ppm, respectively.

**Keywords:** biocontrol, Citrus anthracnose, antifungal metabolites.

## Isolation and Characterization of Actinobacteria with Antibacterial and Plant Growth-Promoting Activities from Maoberry Cultivated Soil in Northeast Thailand

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**Abstract** In this study, 20 soil samples were collected from Maoberry cultivated soil in Sakon Nakhon province, Northeast Thailand. The isolates were screened and identified by microscopic observations based on their morphological characters particularly pigment production on Gause's No.1 medium. Five isolates namely SM-11, SM-31, SM-51, SM-52, and SM-53 were chosen and tested for their antibacterial and plant growth-promoting activities. The antibacterial activity of the selected isolates was performed by paper disk diffusion method on oatmeal agar. The ethyl acetate and ethanolic extracts of the isolate SM-31 both exhibited excellent bacterial activities against *Salmonella typhi* and *Staphylococcus aureus*. Similar results were observed for the ethanolic extract of SM-31. On the other hand, the isolates SM-11 and SM-31 displayed the best plant growth-promoting activities compared to the other isolates. Based on 16s rRNA gene and phylogenetic tree, the potential isolates belonged to *Streptomyces* (SM-11 and SM-31) and *Amycolatopsis* (SM-51) genera. The isolate SM-11 showed 99.66% similarity to *Streptomyces roietensis* strain WES2, *Streptomyces xylanilyticus* strain SR2-123 and *Streptomyces mexicanus* strain NBRC 100915. Meanwhile, the isolate SM-31 displayed 99.83% similarity to *S. tibetensis* strain XZ 46, *S. hawaiiensis* strain ISP 5042, and *S. coeruleofuscus* strain CSSP429. Moreover, the isolate SM-51 is mostly related to *Amycolatopsis rhabdoformis* strain SB026 with 99.51% similarity. Overall, the results revealed that the selected actinobacteria recovered from Maoberry cultivated soil served as a good candidate to be explored as a source of bioactive compounds.

**Keywords:** Actinobacteria, *Oryza sativa*, Pathogenic bacteria, PCR, Cultivated soil

## Karyological Analysis on Wheat Tir (*Triticum aestivum* L. ssp. *vulgare* Vill. v. *leucospermum* Körn.) Populations in Lake Van Basin, Turkey

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**Abstract** Karyotypic studies within populations of a species are important since different populations may show specific genomic adaptation with their environmental growing conditions. This study aimed to define chromosome karyotype and morphology in wheat Tir by analyzing five populations (collected from Ahlat, Ercis, Muradiye, Patnos and central part of Van). The results of this study would be useful for finding the optimum method for cytogenetic studies and chromosome analysis in this species. For this purpose, the pre-treatment with %1 alpha-bromo naphthalene, fixation in karnoy 1, hydrolysis in NaOH and staining by %2 Aceto-Orcein were conducted using root meristem followed by observation of prepared microscopic slides. The results showed that in all studied cells of each population, the basic chromosome number was X=42, and hexaploid. Karyotype analysis of each population was conducted separately. Several indices (TL: Total Length, LA: Long Arm, SA: Short Arm, CI: Centromere Index, AR: Arm Ratio and R-value) were determined. The length of chromosomes in all populations was calculated 4.63-15.9 µm. The longest chromosome was observed in chromosome number 1 from population 3 belongs to Muradiye, and the shortest one was related to chromosome number 21 from population 4, which belongs to Patnos region.

## Partial Sequence Analysis of Cellulose Synthase *OsCESA4* and *OsCESA9* Genes in Native Upland Rice, Thailand

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**Abstract** Cellulose is a major component of plant cell which found in both primary and secondary cell wall and synthesized by cellulose synthase (CESA) complexes. This study was conducted to determine the partial sequences of *OsCESA4* and *OsCESA9* genes in seven varieties of native upland rice, Thailand. The results found that *OsCESA4* sequences showed the similarities to *Oryza sativa* Japonica (98.7-99.5%) and *Oryza sativa* Indica (97.5-99.5%). All seven *OsCESA9* sequences revealed the same identity to both *Oryza sativa* Japonica (98.46%) and *Oryza sativa* Indica (98.46%). Lodging problems in the native upland rice cultivated in Prachuap Khiri Khan Province (Pala U village) remained unsolved. The analysis of cellulose synthase genes of these varieties will be used to fulfill the genetic information for further upland rice breeding improvement.

**Keywords:** Cellulose Synthase, *OsCESA4*, *OsCESA9*, upland rice