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TRƯỜNG ĐẠI HỌC NÔNG LÂM TP. HCM  
Nong Lam University - Ho Chi Minh City



岡山大学  
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TRIER



NLU - 2024  
BOOK OF ABSTRACTS

# The 5<sup>th</sup> International Conference on Sustainable Agriculture and Environment

Green Agricultural Transition to Achieve Sustainable Development Goals

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Nong Lam University - Ho Chi Minh City, Viet Nam  
December 05 - 07, 2024

# SAE 2024

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## BOOK OF ABSTRACTS

# The 5<sup>th</sup> International Conference on Sustainable Agriculture and Environment

**Green Agricultural Transition to Achieve Sustainable Development Goals**

**Nong Lam University Ho Chi Minh City, Vietnam**

**December 05 - 07, 2024**

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**Organized by:**



**TRƯỜNG ĐẠI HỌC NÔNG LÂM TP. HCM**  
Nong Lam University - Ho Chi Minh City



**岡山大学**  
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# ORGANIZING COMMITTEE



## ORGANIZERS



**TRƯỜNG ĐẠI HỌC NÔNG LÂM TP.HCM**  
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17	Prof. Dr. Nguyen Huy Bich	Faculty of Engineering and Technology Nong Lam University Ho Chi Minh City, Vietnam	Member
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No	Name	Office	In board
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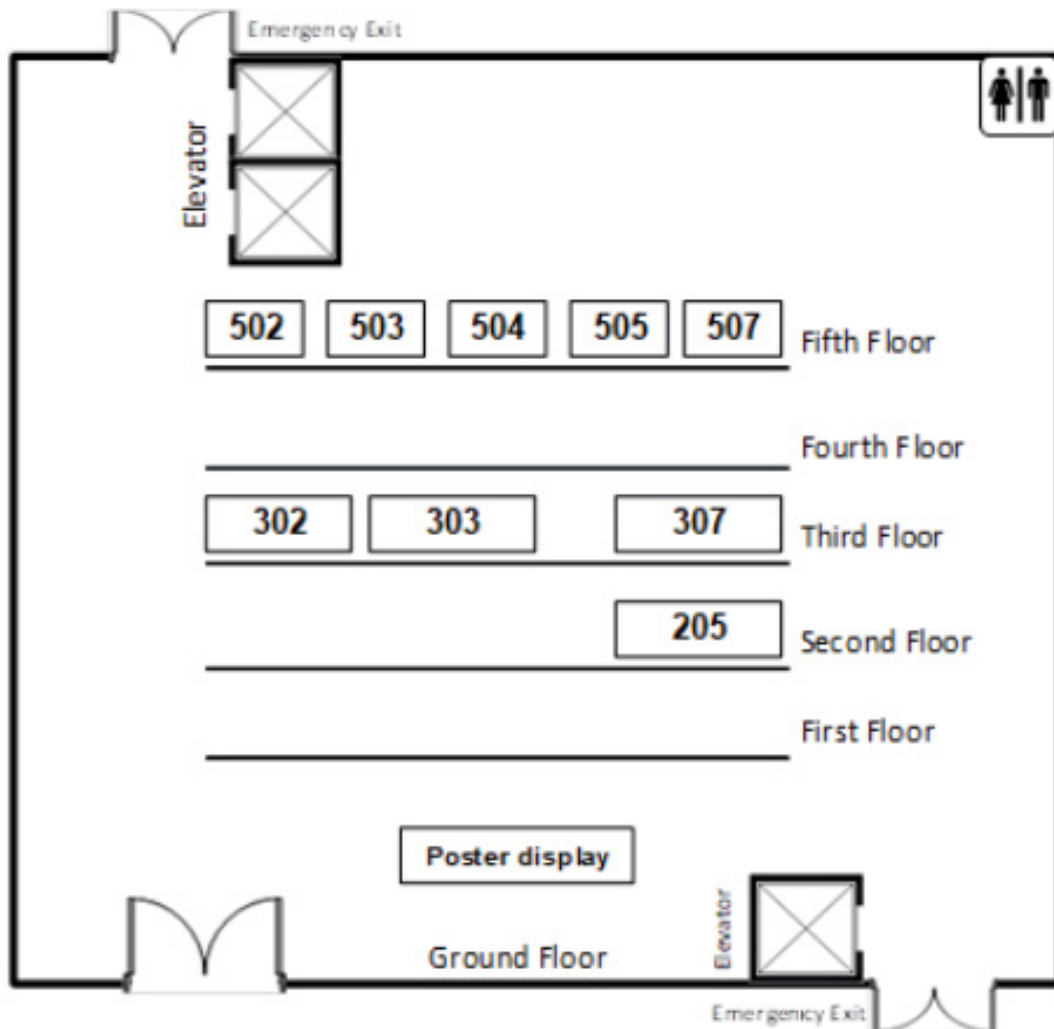
# PROGRAM

**Opening ceremony and Plenary session:** Hall PV100, Phuong Vy Building

**Parallel scientific sessions:** Thien Ly Building

**Poster display:** Thien Ly Building

**December 5 - 7, 2024**



**ORGANIZERS**



TRƯỜNG ĐẠI HỌC NÔNG LÂM TP. HCM  
Ho Chi Minh University - Ho Chi Minh City



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**DIRECTION MAP**

**The 5<sup>th</sup> International Conference on Sustainable Agriculture and Environment (SAE 2024)**



**PARTNER UNIVERSITIES**



The 5<sup>th</sup> International Conference on Sustainable Agriculture and Environment  
Ho Chi Minh City, Vietnam  
December 05, 2024





## PROGRAM AT A GLANCE

**Venue (onsite):** Nong Lam University HCMC  
*Quarter 22, Linh Trung Ward, Thu Duc City, HCMC, Vietnam*  
**Conference date: December 5 – 7, 2024**

Date	Time	Program
<b>DAY 1</b> December 5, 2024 THURSDAY	13:30 – 16:00	Pre-conference activities: Networking Discussion [Room 303, Thien Ly Building]
	16:00 – 16:30	Pre-conference activities: Co-organizers’ meeting [Room 303, Thien Ly Building]
<b>DAY 2</b> December 6, 2024 FRIDAY	07:30 – 08:15	Onsite Registration [Hall PV100, Phuong Vy Building]
	<b>08:15 – 08:45</b>	<b>Opening ceremony</b> [Hall PV100, Phuong Vy Building]
	<b>08:45 – 09:45</b>	<b>Plenary with keynote lectures</b>
	09:45 – 10:15	Tea/coffee break
	<b>10:15 – 11:00</b>	<b>Panel Discussion</b>
	<b>11:00 – 12:00</b>	<b>Poster display and presentation</b> [Ground Floor, Thien Ly Building]
	12:00 – 13:00	Lunch time [NLU Hoi Quan Restaurant]
	13:00 – 14:50	<b>Parallel with 7 scientific sessions [1<sup>st</sup> turn]</b> Session 1: [2 <sup>nd</sup> Floor, Thien Ly Building: Room 205] Session 2A, 2B, 3A, 3B: [5 <sup>th</sup> Floor, Thien Ly Building: Room 502, Room 503, Room 504, Room 505] Session 4A,4B: [3 <sup>rd</sup> Floor, Thien Ly Building: Room 303, Room 307]
	14:50 – 15:20	Tea/coffee break Poster display and presentation [Ground Floor, Thien Ly Building]
	15:20 – 16:40	<b>Parallel with 7 scientific sessions [2<sup>nd</sup> turn]</b> Session 1: [2 <sup>nd</sup> Floor, Thien Ly Building: Room 205] Session 2A, 2B, 3A, 3B: [5 <sup>th</sup> Floor, Thien Ly Building: Room 502, Room 503, Room 504, Room 505] Session 4A,4B: [3 <sup>rd</sup> Floor, Thien Ly Building: Room 303, Room 307]
	<b>17:00 – 18:00</b>	<b>Closing ceremony</b> [Room 303, Thien Ly Building]
18:30 – 20:30	Gala dinner	
<b>DAY 3</b> December 7, 2024 SATURDAY	08:30 – 16:30	Field trip to The Can Gio Mangrove Biosphere Reserve, Ho Chi Minh City [ <i>For paid registered delegates only</i> ]



# CHAIRS AND CO-CHAIRS



## PLENARY

**Professor. Dr. Sören Thiele-Bruhn**  
Trier University, Germany  
*the transition to circular and sustainable agriculture in response to climate change - a soil perspective*

**Professor. Dr. Gunjan Saxena**  
Faculty of Business, Law and Politics  
University of Hull, United Kingdom  
*Sustainable Development Goals from a Gender perspective*

## CHAI & CO-CHAIR

**Assoc Prof. Dr. Phan Tai Huan**  
Vice President  
Nong Lam University - Ho Chi Minh City, Viet Nam  
**Chair**

**Prof. Dr. Naoki NISHINO**  
Okayama University, Japan  
**Co-Chair**

## 1 Social Economics In Sustainable Agriculture

CHAIR & CO-CHAIR

**Assoc Prof. Katsutoshi OHNAKA**  
Faculty of Environmental, Life and Natural Sciences  
Okayama University, Japan  
**Chair, Reviewer**

**Assoc Prof. Dr. Dang Thanh Ma**  
Faculty of Economics  
Nong Lam University - Ho Chi Minh City, Vietnam  
**Co-chair, Reviewer**

## 2 Adapting Agricultural and Forestry Production to Climate Change

### 2A: ADAPTING FORESTRY PRODUCTION TO CLIMATE CHANGE

CHAIR & CO-CHAIR

**Dr. Vo Thai Dan**  
Faculty of Agronomy  
Nong Lam University - Ho Chi Minh City, Vietnam  
**Chair, Reviewer, editor**

**Professor. Dr. Sören Thiele-Bruhn**  
Department of Soil Science Trier University, Germany  
**Keynotes, Co-chair, Reviewer**

### 2B: ADAPTING AGRICULTURAL PRODUCTION TO CLIMATE

CHAIR & CO-CHAIR

**Dr. Nguyen Duy Nang**  
Faculty of Agronomy  
Nong Lam University - Ho Chi Minh City, Vietnam  
**Chair, Reviewer, Editor**

**Dr. Raimund Schneider**  
Department of Soil Science Trier University, Germany  
**Co-chair, Reviewer**

## 3 Innovative Technology in Sustainable Agriculture

### 3A: FOOD SCIENCE AND POST-HARVEST TECHNOLOGY

CHAIR & CO-CHAIR

**Professor Dr. Glenn M. Young**  
Department of Food Science and Technology  
University of California, Davis  
**Chair, Invited speaker, Reviewer**

**Assoc Prof. Dr. Kha Chan Tuyen**  
Deputy Dean of Faculty of Chemical Engineering & Food Technology  
Nong Lam University - Ho Chi Minh City, Vietnam  
**Chair, Reviewer, Editor**

**Assoc Prof. Dr. Hiroaki SOMURA**  
Faculty of Environmental, Life and Natural Sciences  
Okayama University, Japan  
**Co-chair, Invited speaker, Reviewer**

### 3B: INNOVATIVE TECHNOLOGY IN AGRICULTURE

CHAIR & CO-CHAIR

**Professor. Dr. Nguyen Hay**  
Faculty of Engineering and Technology  
Nong Lam University - Ho Chi Minh City, Vietnam  
**Chair, Reviewer, Editor**

**Professor. Dr. Nguyen Huy Bich**  
Faculty of Engineering and Technology  
Nong Lam University - Ho Chi Minh City, Vietnam  
**Chair, Reviewer, Editor**

**Assoc Prof. Dr. Le Anh Duc**  
Head of Department of Processing and Postharvest Machinery  
Faculty of Engineering and Technology  
Nong Lam University - Ho Chi Minh City, Vietnam  
**Co-chair, Reviewer, Editor**

**Dr. Nguyen Duc Khuyen**  
Deputy Dean of Faculty of Engineering and Technology  
Nong Lam University - Ho Chi Minh City, Vietnam  
**Reviewer, Editor**

## 4 Recent advances in Animal Bioscience and Sustainability

### 4A: RECENT ADVANCES IN ANIMAL BIOSCIENCE AND SUSTAINABILITY

CHAIR & CO-CHAIR

**Professor. Dr. Naoki NISHINO**  
Graduate School of Life and Environmental Science  
Okayama University, Okayama, Japan  
**Chair, Reviewer**

**Assoc Prof. Dr. Nguyen Quang Thieu**  
Deputy Dean of Faculty of Animal Science and Veterinary Medicine  
Nong Lam University - Ho Chi Minh City, Vietnam  
**Co-chair, Reviewer, Editor**

**Professor. Dr. Duong Nguyen Khang**  
Director of Center for Research and Technology Transfer  
Nong Lam University - Ho Chi Minh City, Vietnam  
**Invited speaker**

### 4B: RECENT ADVANCES IN VETERINARY SCIENCE AND SUSTAINABILITY

CHAIR & CO-CHAIR

**Assoc Prof. Dr. Le Quang Thong**  
Dean of Faculty of Animal Science and Veterinary Medicine  
Nong Lam University - Ho Chi Minh City, Vietnam  
**Chair, Reviewer, Editor**

**Assoc Prof. Dr. Nguyen Nhu Tri**  
Dean of Faculty of Fisheries  
Nong Lam University - Ho Chi Minh City, Vietnam  
**Co-chair, Reviewer, Editor**

**Dr. Dinh Xuan Phat**  
Dean of Faculty of Biological Sciences,  
Nong Lam University - Ho Chi Minh City, Vietnam  
**Co-chair, Reviewer**



## DETAILED PROGRAM

**Venue (onsite):** Nong Lam University HCMC  
*Quarter 22, Linh Trung Ward, Thu Duc City, HCMC, Vietnam*  
 Conference date: **December 5 – 7, 2024**

### PRE-CONFERENCE ACTIVITIES

DAY 1: December 5, 2024; THURSDAY [Pre-conference activities]		
<b>13:30 – 16:00</b>	Pre-conference activities: <b>NETWORKING DISCUSSION:                      Fostering dialogue between                      science, policy and practice                      toward Net Zero emission</b> [Room 303, Thien Ly Building]	Assoc. Prof. Dr. <b>Phan Tai Huan</b> Vice President, Nong Lam University, Ho Chi Minh City, Vietnam Dr. <b>Nguyen Ngoc Thuy</b> Nong Lam University, Ho Chi Minh City, Vietnam
<b>16:00 – 16:30</b>	Pre-conference activities: Co- organizers' meeting [Room 303, Thien Ly Building]	Assoc. Prof. Dr. <b>Phan Tai Huan</b> Vice President, Nong Lam University, Ho Chi Minh City, Vietnam Assoc Prof. Dr. <b>Do Tien Duy</b> Deputy Head, Scientific Research Management Office, Nong Lam University, Ho Chi Minh City, Vietnam





## DETAILED PROGRAM

**Venue (onsite):** Nong Lam University HCMC  
 Quarter 22, Linh Trung Ward, Thu Duc City, HCMC, Vietnam  
 Conference date: **December 5 – 7, 2024**

### OPENING CEREMONY AND PLENARY SESSION

DAY 2: December 6, 2024; FRIDAY MORNING [Opening ceremony, Plenary sessions]		
07:30 – 08:30	Onsite Registration	[Hall 100, Phuong Vy Building]
<b>08:30 – 08:45</b>	<b>Opening ceremony</b>	[Hall 100, Phuong Vy Building]
<b>Plenary with keynote lectures</b> <b>Chair:</b> Assoc Prof. Dr. <b>Phan Tai Huan</b> - Vice President, Nong Lam University HCMC, Vietnam <b>Co-chair:</b> Prof. Dr. <b>Naoki NISHINO</b> - Okayama University, Japan		
08:45 – 09:15	<b>Keynote 1</b> <i>Topic:</i> <b>Biodiversity in crop production for sustainable agriculture in times of climate change - a soil perspective</b>	Professor. Dr. <b>Sören Thiele-Bruhn</b> Department of Soil Science, Trier University, Germany
09:15 – 09:45	<b>Keynote 2</b> <i>Topic:</i> <b>Sustainable Development Goals and gender influences on women entrepreneurs in farming and tourism: Case insights from Thailand and Vietnam</b>	Professor. Dr. <b>Gunjan Saxena</b> Faculty of Business, Law and Politics, University of Hull, United Kingdom
09:45 – 10:15	Tea/coffee break	[Hall 100, Phuong Vy Building]
<b>PANEL DISCUSSION</b> <b>Chair:</b> Assoc Prof. Dr. <b>Phan Tai Huan</b> , Vice President, Nong Lam University, Ho Chi Minh City, Vietnam <b>Co-chair:</b> Prof. Dr. <b>Naoki NISHINO</b> , Okayama University, Japan		
10:15 – 11:00	<b>Green agricultural transition to achieve Sustainable Development Goals</b>	Professor. Dr. <b>Sören Thiele-Bruhn</b> Trier University, Germany Professor. Dr. <b>Gunjan Saxena</b> Faculty of Business, Law and Politics, University of Hull, United Kingdom And invited gues
11:00 – 12:00	<b>Poster display and presentation</b> [Ground Floor, Thien Ly Building]	Assoc Prof. Dr. <b>Nguyen Phu Hoa</b> Head, Scientific Research Management Office, Nong Lam University Ho Chi Minh City, Vietnam
12:00 – 13:00	Lunch time [Hoi Quan Restaurant]	





## DETAILED PROGRAM

**Venue (onsite):** Nong Lam University HCMC  
 Quarter 22, Linh Trung Ward, Thu Duc City, HCMC, Vietnam  
 Conference date: **December 5 – 7, 2024**

### PARALLEL SESSIONS - SESSION 1

**DAY 2:** December 6, 2024; FRIDAY AFTERNOON [Parallel sessions]

#### SESSION 1: Social Economics in Sustainable Agriculture

[1<sup>st</sup> turn]: 13:00 – 14:50

**Chair:** Assoc Prof. **Katsutoshi OHNAKA**, Faculty of Environmental, Life and Natural Sciences, Okayama University, Japan

**Co-chair:** Assoc Prof. Dr. **Dang Thanh Ha**, Faculty of Economics, Nong Lam University Ho Chi Minh City, Vietnam

13:00 – 13:30	<p><b>Invited lecture</b></p> <p>Flexible immigration and reverse migration: policies to overcome middle-income trap in Vietnam</p> <p><b>Professor. Nguyen Trong Hoai</b>          Chief editor, Journal of Asian Business and Economics Study, UEH, Ho Chi Minh City, Vietnam</p>
13:30 – 13:50	<p>ORAL 1: [O-101]</p> <p>The role of rice production in sustainable agricultural development in Soc Trang province</p> <p><i>Nguyen V. My, Dang K. Nhan and Nguyen T. Tam</i></p>
13:50 – 14:10	<p>ORAL 2: [O-102]</p> <p>Assessing factors affecting the choice of eco-tourism destination in Binh Chau Phuoc Buu nature reserve, Ba Ria -Vung Tau province</p> <p><i>Pham T. Dung</i></p>
14:10 – 14:30	<p>ORAL 3: [O-103]</p> <p>Corporate governance factors affecting financial information transparency of listed agricultural companies in Vietnam</p> <p><i>Le Na, Nguyen L. Quyen, Nguyen T. T. Linh and Nguyen V. Cuong</i></p>
14:30 – 14:50	<p>ORAL 4: [O-104]</p> <p>Factors influencing farmers’ decision to postpone selling coffee bean: a case study in Dak Ha district, Kon Tum province</p> <p><i>Nguyen V. Cuong, Mai D. Quy, Nguyen N. Dat, and Le Na</i></p>

**14:50 – 15:20**

**POSTER DISPLAY AND PRESENTATION 2** [Ground Floor, Thien Ly Building]

Tea/coffee break





<b>[2<sup>nd</sup> turn]: 15:20 – 16:40</b>	
<b>Chair:</b> Assoc Prof. <b>Katsutoshi OHNAKA</b> , Faculty of Environmental, Life and Natural Sciences, Okayama University, Japan	
<b>Co-chair:</b> Assoc Prof. Dr. <b>Dang Thanh Ha</b> , Faculty of Economics, Nong Lam University, Ho Chi Minh City, Vietnam	
15:20 – 15:40	ORAL 5: [ <b>O-105</b> ] Assessment of groundwater resource pressure according to the Water Poverty Index (Wpi) <i>Bui V. Hung, Phan T. M. Duyen and Nguyen N. Diep</i>
15:40 – 16:00	ORAL 6: [ <b>O-106</b> ] Current situation and solutions to enhance agricultural land-use efficiency in Cai Be district, Tien Giang province <i>Huynh T. Hien and Tran V. Minh</i>
16:00 – 16:20	ORAL 7: [ <b>O-107</b> ] Analyzing the current status of straw mushroom production in Go Cong Tay district, Tien Giang province <i>Phuong T. T. Ha, Nguyen H. Thu and Nguyen N. Thuy</i>
16:20 – 16:40	ORAL 8: [ <b>O-108</b> ] Analysis of farmers' agriculture land ownership policy in Indonesia towards Sustainable Green Agriculture <i>Sri Wahyu Handayani, Tawang Gendewa and Hany Setyo Prastowo</i>
<b>17:00 – 18:00</b>	<b>Closing ceremony [Room 303, Thien Ly Building]</b>



## DETAILED PROGRAM

**Venue (onsite):** Nong Lam University HCMC  
 Quarter 22, Linh Trung Ward, Thu Duc City, HCMC, Vietnam  
 Conference date: **December 5 – 7, 2024**

### PARALLEL SESSIONS - SESSION 2

<b>DAY 2: December 6, 2024; FRIDAY AFTERNOON [Parallel sessions]</b>	
<b>SESSION 2: Adapting Agricultural and Forestry Production to Climate Change</b>	
<b>SESSION 2A: Adapting Forestry Production to Climate Change</b>	
[1 <sup>st</sup> turn]: <b>13:00 – 14:50</b>	
<b>Chair:</b> Dr. <b>Vo Thai Dan</b> , Faculty of Agronomy, Nong Lam University Ho Chi Minh City, Vietnam	
<b>Co-chair:</b> Professor. Dr. <b>Sören Thiele-Bruhn</b> , Department of Soil Science, Trier University, Germany	
13:00 – 13:30	<b>Invited lecture</b> <b>Molecular mechanisms underlying the biocontrol activity of <i>Allorhizobium vitis</i> var03-1 against grapevine crown gall</b> <b>Prof. Yoshiteru Noutoshi</b> Faculty of Environmental, Life and Natural Sciences, Okayama University, Japan
13:30 – 13:50	ORAL 1: [ <b>O-201</b> ] A preliminary study on the benefits of urban parks in Ho Chi Minh city using I-Tree <i>Ho L. Tuan, Truong V. Vinh, Pham C. Cuong, La V. H. Ha, Dang H. Phuong, Nguyen T. K. Nuong and Tran H. Hieu</i>
13:50 – 14:10	ORAL 2: [ <b>O-202</b> ] Potential roles of mangroves in the Greener shipping transition <i>Pham H. Tinh, Ngo V. Thao, Pham T. Thuy, Bui T. Thu, Nguyen T. L. Giang</i>
14:10 – 14:30	ORAL 3: [ <b>O-203</b> ] Assessing the suitability of coffee area in a warming climate over the central highland of Vietnam <i>Do X. Hong, Le H. Tu, Tran H. Thanh and Nguyen N. T. Quyen</i>
14:30 – 14:50	ORAL 4: [ <b>O-204</b> ] The spread, damage and control of black-head caterpillar <i>Opisina arenosella</i> walker in Vietnam <i>Nguyen T. Dat, Nguyen T. M. Thi, Pham P. Duc, Nong H. Quan and Le K. Hoang</i>
<b>14:50 – 15:20</b>	
<b>POSTER DISPLAY AND PRESENTATION 2 [Ground Floor, Thien Ly Building]</b>	
Tea/coffee break	

<b>[2<sup>nd</sup> turn]: 15:20 – 16:40</b>	
<b>Chair:</b> Professor. Dr. <b>Sören Thiele-Bruhn</b> , Department of Soil Science, Trier University, Germany	
<b>Co-chair:</b> Dr. <b>Vo Thai Dan</b> , Faculty of Agronomy, Nong Lam University Ho Chi Minh City, Vietnam	
15:20 – 15:40	ORAL 5: [ <b>O-205</b> ] Assessing surface water quality of Vam Co Dong river flowing through Long An province from 2018 to 2023 <i>Dang A. N. Thuy, Ngo V. Thao, Do X. Hong</i>
15:40 – 16:00	ORAL 6: [ <b>O-206</b> ] CO <sub>2</sub> and CH <sub>4</sub> Fluxes at the rice paddy field in Long An province, Mekong delta <i>Vu H. N. Khue, Le. D. A. Vu, Le T. Son, Bui T. An, Ho Q. Bang and Pham Q. Huong</i>
16:00 – 16:20	ORAL 7: [ <b>O-207</b> ] Effect of land use, land cover change on land surface temperature in Lac Duong mountainous district, Lam Dong province, Vietnam <i>Nguyen T. Phuong, Trinh K. Vuong, Tran T. D. Hien, Ton N. T. Trinh, Nguyen T. T. Lan and Nguyen N. Anh</i>
<b>17:00 – 18:00</b>	<b>Closing ceremony [Room 303, Thien Ly Building]</b>



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### PARALLEL SESSIONS - SESSION 2

<b>DAY 2:</b> December 6, 2024; FRIDAY AFTERNOON [Parallel sessions]	
<b>SESSION 2: Adapting Agricultural and Forestry Production to Climate Change</b>	
<b>SESSION 2B: Adapting Agricultural Production to Climate</b>	
<b>[1<sup>st</sup> turn]: 13:00 – 14:50</b>	
<b>Chair:</b> Dr. <b>Nguyen Duy Nang</b> , Faculty of Agronomy, Nong Lam University, Ho Chi Minh City, Vietnam	
<b>Co-chair:</b> Dr. <b>Raimund Schneider</b> , Department of Soil Science, Trier University, Germany	
13:00 – 13:30	<b>Invited lecture</b> <b>Can we apply active silviculture for support of forest's role in climate change mitigation?</b> <i>Michal V. Marek, Manuel Acosta, Marian Pavelka, Khue Vu Hoang Ngo</i> <b>Prof. Michal V. Marek</b> Global Change Research Institute, Czech Academy of Sciences, Czech Republic
13:30 – 13:50	<b>ORAL 1: [O-208]</b> Effects of growing conditions on some indicators related to growth and productivity of super dwarf tomato plants <i>Le T. Thuy, Dinh N. H. Quynh and Tran K. Van</i>
13:50 – 14:10	<b>ORAL 2: [O-209]</b> Detection and application of plant virus vaccine to control papaya ringspot virus w isolate from South Vietnam <i>Tran T. N. Bich, Nguyen T. T. Nghi, Doan N. Nam, Nguyen T. H. Trang, Bui V. Huong, Nguyen T. N. Thuan and Chung N. Y. Lam</i>
14:10 – 14:30	<b>ORAL 3: [O-210]</b> Composting of vegetable waste using in-vessel systems and compost application trial to lettuce ( <i>Lactuca sativa</i> l.) <i>Nguyen T. Binh, Le H. Tu, Tran D. Tien, Nguyen P. H. Lan, Ho T. Quoc and Tran V. Thinh</i>
14:30 – 14:50	<b>ORAL 4: [O-211]</b> Innovation technique in soil testing <i>Nguyen Q. Chon, Jan A. Reijneveld, Oene Oenema and Pham T. Nhan</i>



<b>14:50 – 15:20</b>	
<b>POSTER DISPLAY AND PRESENTATION 2</b> [Ground Floor, Thien Ly Building]	
Tea/coffee break	
<b>[2<sup>nd</sup> turn]: 15:20 – 16:40</b>	
<b>Chair:</b> Dr. <b>Raimund Schneider</b> , Department of Soil Science, Trier University, Germany	
<b>Co-chair:</b> Dr. <b>Nguyen Duy Nang</b> , Faculty of Agronomy, Nong Lam University, Ho Chi Minh City, Vietnam	
15:20 – 15:40	<b>ORAL 5: [O-212]</b> Identification of genetic region controlling anthocyanin accumulation in the sweetpotato storage root and sequence analysis of the candidate gene <i>Nozomi Horita, Yoshihiro Okada, Hiroshi Kanzaki, Miyu Kurihara, Kazusa Nishimura, Hidetaka Nishida, Kenji Kato, Yuki Monden</i>
15:40 – 16:00	<b>ORAL 6: [O-213]</b> Biomass allometric equation for ( <i>Melaleuca cajuputi</i> ) in the Mekong delta, South Viet Nam <i>Vien N. Nam, Vien N. T. Anh, Tran V. K. Linh, Bui N. T. Kiet and Nguyen T. K. Nuong</i>
<b>17:00 – 18:00</b> <b>Closing ceremony</b> [Room 303, Thien Ly Building]	



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### PARALLEL SESSIONS - SESSION 3

<b>DAY 2:</b> December 6, 2024; FRIDAY AFTERNOON [Parallel sessions]	
<b>SESSION 3: Innovative Technology in Sustainable Agriculture</b>	
<b>Session 3A: Food Science and Post-harvest Technology</b>	
<b>[1<sup>st</sup> turn]: 13:00 – 14:50</b>	
<b>Chair:</b> Assoc Prof. Dr. <b>Kha Chan Tuyen</b> , Acting Dean of Faculty of Chemical Engineering & Food Technology, Nong Lam University, Ho Chi Minh City, Vietnam	
<b>Co-chair:</b> Professor Dr. <b>Glenn M. Young</b> , Department of Food Science and Technology, University of California, Davis	
13:00 – 13:30	<b>Invited lecture</b> <b>Farmers' shared interests can advance sustainable safe food systems</b> Professor Dr. <b>Glenn M. Young</b> Department of Food Science and Technology, University of California, Davis
13:30 – 13:50	ORAL 1: [O-301] Study on extraction and identification of chemical components of perilla essential (l.) britt oil using gas chromatography-mass spectrometry (gc-ms) <i>Phung V. C. Hong, Nguyen T. N. Lan</i>
13:50 – 14:10	ORAL 2: [O-302] Optimizing the extraction and purifying process of piperine from pepper in vietnam ( <i>Piper nigrum</i> ) <i>Nguyen P. T. Nhan, Nguyen T. Pho, Mai H. Cang</i>
14:10 – 14:30	ORAL 3: [O-303] Preparation and characterization of bacterial cellulose films from pineapple peel incorporated with carboxymethyl cellulose <i>Tran T. Xuan, Doan N. D. Trinh, Nguyen V. Hien, Le H. Trinh and Nguyen T. T. Thuy</i>
14:30 – 14:50	ORAL 4: [O-304] Optimization of the extraction bioactive compounds from red cardinal grape pomace using deep eutectic solvents <i>Nguyen T. T. Thao, Nguyen B. Viet and Kha C. Tuyen</i>

<b>14:50 – 15:20</b>	
<b>POSTER DISPLAY AND PRESENTATION 2</b> [Ground Floor, Thien Ly Building]	
Tea/coffee break	
<b>[2<sup>nd</sup> turn]: 15:20 – 16:40</b>	
<b>Chair:</b> Assoc Prof. Dr. <b>Hiroaki SOMURA</b> , Faculty of Environmental, Life and Natural Sciences, Okayama University, Japan	
<b>Co-chair:</b> Assoc Prof. Dr. <b>Kha Chan Tuyen</b> , Acting Dean of Faculty of Chemical Engineering & Food Technology, Nong Lam University, Ho Chi Minh City, Vietnam	
15:20 – 15:40	ORAL 5: [ <b>O-305</b> ] A low external input towards sustainable agro-ecology for small cocoa farms <i>Nguyen D. X. Chuong, Nguyen H. Truc, Truong M. Loc and Duong N. Khang</i>
15:40 – 16:00	ORAL 6: [ <b>O-306</b> ] The effect of vitamin d3 ( <i>cholecalciferol</i> ) supplementation in feed on egg production and egg quality of arabian chickens ( <i>gallus turcicus</i> ) <i>Elly Tugiyanti</i>
16:00 – 16:20	ORAL 7: [ <b>O-307</b> ] Identification of a yet-to-be discovered gene associated with southern root-knot nematode resistance and producing transformants for functional analysis <i>Makoto Izumitani, Motoyasu Otani, Hiroaki Tabuchi, Senri Nakamura, Shinichiro Ohata, Osamu Nakayachi, Kazusa Nishimura, Hidetaka Nishida, Kenji Kato, Yuki Monden</i>
16:20 – 16:40	ORAL 8: [ <b>O-308</b> ] Application of <i>Saccharomyces boulardii</i> cells in yogurt <i>Duong T.N. Diep, Nguyen T.T. Tuyet and Phan T. Huan</i>
<b>17:00 – 18:00</b> <b>Closing ceremony</b> [Room 303, Thien Ly Building]	



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### PARALLEL SESSIONS - SESSION 3

<b>DAY 2:</b> December 6, 2024; FRIDAY AFTERNOON [Parallel sessions]	
<b>SESSION 3: Innovative Technology in Sustainable Agriculture</b>	
<b>Session 3B: Innovative Technology in Agriculture</b>	
[1 <sup>st</sup> turn]: <b>13:00 – 14:50</b>	
<b>Chair:</b> Professor. Dr. <b>Nguyen Hay</b> , Faculty of Engineering and Technology of the Nong Lam University, Ho Chi Minh City, Vietnam <b>Co-chair:</b> Assoc Prof. Dr. <b>Le Anh Duc</b> , Head of Department of Processing and Postharvest Machinery, Faculty of Engineering and Technology, Nong Lam University, Ho Chi Minh City, Vietnam	
13:00 – 13:30	<b>Invited lecture</b> <b>An overview of Japanese trends in smart agriculture</b> Assoc Prof. Dr. <b>Hiroaki SOMURA</b> Faculty of Environmental, Life and Natural Sciences, Okayama University, Japan
13:30 – 13:50	<b>ORAL 1: [O-309]</b> Assessment of combine harvesters used in rice production in Mekong delta, Vietnam <i>Nguyen T. Nghi, Nguyen V. Hieu, Joseph Sandro and Nguyen V. Hung</i>
13:50 – 14:10	<b>ORAL 2: [O-310]</b> Utilizing agricultural residues for renewable energy and environmental remediation in developing countries <i>Le T. Phuong, Nguyen Nam Hong, Dinh T. M. Thanh, Nguyen T. Phuong</i>
14:10 – 14:30	<b>ORAL 3: [O-311]</b> Optimization of technological parameters of automatic quail eggs peeling machine <i>Nguyen T. Phong, Le A. Duc</i>
14:30 – 14:50	<b>ORAL 4: [O-312]</b> Enhancing agricultural predictive modeling through data augmentation and advanced deep learning techniques <i>Dang Tien and Phan D. Long</i>
<b>14:50 – 15:20</b>	
<b>POSTER DISPLAY AND PRESENTATION 2</b> [Ground Floor, Thien Ly Building]	
Tea/coffee break	



<b>[2<sup>nd</sup> turn]: 15:20 – 16:40</b>	
<b>Chair:</b> Professor. Dr. <b>Nguyen Huy Bich</b> , Faculty of Engineering and Technology of the Nong Lam University, Ho Chi Minh City, Vietnam	
<b>Co-chair:</b> Dr. <b>Nguyen Duc Khuyen</b> , Vice Dean, Faculty of Engineering and Technology, Nong Lam University, Ho Chi Minh City, Vietnam	
15:20 – 15:40	ORAL 5: [ <b>O-313</b> ] Modelling research on fresh paddy aeration on transporting barges in Mekong delta, Vietnam <i>Nguyen V. Hieu, Nguyen T. Nghi, Truong T. Qui, Vo H. Phuong and Nguyen T. Vi</i>
15:40 – 16:00	ORAL 6: [ <b>O-314</b> ] Viet Nam agricultural engineering towards the smart agriculture <i>Nguyen H. Bich, Nguyen T. Nghi, Dao D. Vinh</i>
16:00 – 16:20	ORAL 7: [ <b>O-315</b> ] Development of sugarcane transplanter for the sustainable agricultural mechanization <i>Nguyen H. T. Gia, Nguyen N. Long, Phan T. Phat, Nguyen Q. Thang, and Nguyen. D. Khuyen</i>
16:20 – 16:40	ORAL 8: [ <b>O-316</b> ] Effects of tempering on microstructure, mechanical properties and appearance in non fermented cocoa in Viet Nam <i>Nguyen V. Lanh, Pham D. Lam, Nguyen T. Cuong, Nguyen H. Bich</i>
16:40 – 17:00	ORAL 9: [ <b>O-317</b> ] Experimental study on drying non-fermented cacao beans using drum drying and solar greenhouse drying methods <i>Pham D. Lam, Hong C. Huy, Nguyen D. Khuyen</i>
<b>17:00 – 18:00</b>	<b>Closing ceremony [Room 303, Thien Ly Building]</b>



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### PARALLEL SESSIONS - SESSION 4

<b>DAY 2:</b> December 6, 2024; FRIDAY AFTERNOON [Parallel sessions]	
<b>SESSION 4: Recent advances in Animal Bioscience and Sustainability</b>	
<b>Session 4A: Recent advances in Animal Bioscience and Sustainability</b>	
<b>[1<sup>st</sup> turn]: 13:00 – 14:50</b>	
<b>Chair:</b> Professor. Dr. <b>Naoki NISHINO</b> , Graduate School of Life and Environmental Science Okayama University, Okayama, Japan	
<b>Co-chair:</b> Assoc Prof. Dr. <b>Nguyen Quang Thieu</b> , Deputy Dean of Faculty of Animal Science and Veterinary Medicine, Nong Lam University Ho Chi Minh City, Vietnam	
13:00 – 13:30	<b>Invited lecture</b> <b>Circular economy in agriculture: Current status and solution for model of low carbon footprint in Vietnam</b> Prof. <b>Duong Nguyen Khang</b> Director of Center for Research and Technology Transfer, Nong Lam University, Ho Chi Minh City, Vietnam
13:30 – 13:50	<b>ORAL 1: [O-401]</b> Fish diversity of Dau Tieng lake: An updated fish species composition and fish catch assessment with fishing gears <i>Nguyen P. Thuong, Nguyen T. Tung, Nguyen H. An, Tran T. Vy and Nguyen T. Hieu</i>
13:50 – 14:10	<b>ORAL 2: [O-402]</b> Water velocity regulation for freshwater giant prawn migration at Phuoc Hoa fish-passage <i>Vu C. Luong, Vu V. Hieu and Nguyen N. Hung</i>
14:10 – 14:30	<b>ORAL 3: [O-403]</b> Biochemical composition of the mud crab <i>Scylla paramamosain</i> (estampador, 1949) fattened in the recirculating water system <i>Ong M. Quy, Nguyen P. C. Tu, Nguyen N. Ha, Tran V. Minh and Ho T. T. Thy</i>
14:30 – 14:50	<b>ORAL 4: [O-404]</b> Antifungal potential of herbal extracts against fungal strains isolated from lichen-like structure in white-legged shrimp ponds <i>Le V. Hau, Nguyen T. T. Duong, Dao N. D. Hong, Tran P. V. Linh, Le M. Nghia, Luu T. H. Thu, Le N. Q. Nhu, Nguyen B. Khang, Vo V. Tuan, Nguyen X. Dong and Ngo H. P. Thao</i>

<b>14:50 – 15:20</b>	
<b>POSTER DISPLAY AND PRESENTATION 2</b> [Ground Floor, Thien Ly Building]	
Tea/coffee break	
<b>[2<sup>nd</sup> turn]: 15:20 – 16:40</b>	
<b>Chair:</b> Professor. Dr. <b>Naoki Nishino</b> , Graduate School of Life and Environmental Science Okayama University, Okayama, Japan	
<b>Co-chair:</b> Professor. Dr. <b>Duong Nguyen Khang</b> , Director of Center for Research and Technology Transfer, Nong Lam University, Ho Chi Minh City, Vietnam	
15:20 – 15:40	<b>ORAL 5: [O-405]</b> Total mixed ration (tmr) based on alkaline-treated rice straw improves growth rate and feed intake of sindhi cross-bred cattle <i>Nguyen T. Hai, Nguyen Q.Tien, Le T. B. Phuong, Nguyen N. Thuy and Duong N. Khang</i>
15:40 – 16:00	<b>ORAL 6: [O-406]</b> Growth performance of crossbred cattle between wagyu bull with red angus crossbred cows (red <i>Angus</i> x <i>Brahman</i> crossbred) and <i>Charolais</i> crossbred cows ( <i>Charolais</i> x <i>Brahman</i> crossbred) from birth to 12 months of age <i>Dau V. Hai, Hoang T. Ngan, Nguyen T. Thuy, Chu M. Thang and Duong N. Khang</i>
16:00 – 16:20	<b>ORAL 7: [O-407]</b> Utilizing shrimp heads and shells as protein-rich ingredients improves the growth performance and health of fattening pigs from 96 to 164 days of age <i>Dang T. N. Anh, Do T. Duong, Nguyen T. Hai, Nguyen K. Cuong, Bui T. T. Mi, Nguyen Q. Viet and Duong N. Khang</i>
16:20 – 16:40	<b>ORAL 8: [O-408]</b> The effect of local chicken lines and phytobiotics supplementation on body weight and lymphoid organs <i>Ismoyowati, Elly Tugiyanti, Diana Indrasanti, Agus Darmanto, Imam Suswoyo, and Rosidi</i>
<b>17:00 – 18:00</b> <b>Closing ceremony</b> [Room 303, Thien Ly Building]	



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<b>SESSION 4: Recent advances in Animal Bioscience and Sustainability</b>	
<b>Session 4B: Recent advances in Veterinary Science and Sustainability</b>	
<b>[1<sup>st</sup> turn]: 13:00 – 14:50</b>	
<b>Chair:</b> Assoc Prof. Dr. <b>Le Quang Thong</b> , Dean of Faculty of Animal Science and Veterinary Medicine, Nong Lam University, Ho Chi Minh City, Vietnam	
<b>Co-chair:</b> Assoc Prof. Dr. <b>Nguyen Nhu Tri</b> , Dean of Faculty of Fisheries, Nong Lam University, Ho Chi Minh City, Vietnam	
13:00 – 13:30	<b>Invited lecture</b> <b>The roles of mitochondria in in vitro embryo production</b> Assoc. Prof. <b>Takuya WAKAI</b> Okayama University, Japan
13:30 – 13:50	ORAL 1: [ <b>O-409</b> ] <b>[ONLINE]</b> The roles of macrophage on early phase of pathogenesis in <i>Eimeria tenella</i> infection <i>Dong H. Rin and Toshimitsu Hatabu</i>
13:50 – 14:10	ORAL 2: [ <b>O-410</b> ] <b>[ONLINE]</b> The influence of 5-aminolevulinic acid supplementation to cecal microbiota composition in laying hen infected with <i>Eimeria tenella</i> <i>Shota Fujino, Akihito Imasato, Shin Taniguchi, Makoto Matsubayashi, Naoki Nishino, Hidetoshi Morita and Toshimitsu Hatabu</i>
14:10 – 14:30	ORAL 3: [ <b>O-411</b> ] <b>[ONLINE]</b> Relation between pentose phosphate pathway activity according to follicle size and meiotic and developmental competence of porcine oocytes <i>Van N. Phong, Do Q. Son, Lakshitha Fonseka, Nguyen T. Hai, Takuya Wakai and Hiroaki Funahashi</i>
14:30 – 14:50	ORAL 4: [ <b>O-412</b> ] Abnormal reproductive disorders increasing in breeding pig herds with the involvement of novel pathogens <i>Ngo T. N. Tram, Nguyen M. Nam, Roongroje Thanawongnuwech, Bui T. T. Nga, Nguyen T. P. Trang, Nguyen T. T. Nam, Nguyen T. Toan and Do T. Duy</i>

<b>14:50 – 15:20</b>	
<b>POSTER DISPLAY AND PRESENTATION 2</b> [Ground Floor, Thien Ly Building]	
Tea/coffee break	
<b>[2<sup>nd</sup> turn]: 15:20 – 16:40</b>	
<b>Chair:</b> Assoc. Prof. <b>Takuya WAKAI</b> Okayama University, Japan	
<b>Co-chair:</b> Dr. <b>Dinh Xuan Phat</b> , Dean of Faculty of Biological Sciences, Nong Lam University, Ho Chi Minh City, Vietnam	
15:20 – 15:40	ORAL 5: [ <b>O-413</b> ] The change of cellular population of bovine oviductal fimbriae epithelial cells during the estrous cycle <i>Shiyao Li, Yosuke Sugino, Koji Kimura</i>
15:40 – 16:00	ORAL 6: [ <b>O-414</b> ] Porcine model of septic shock with prolonged resuscitation using <i>Pseudomonas aeruginosa</i> infusion <i>Ly H. Son, Dumargne Hugo, Hamed Abdessalem, Lac Romain, Dargent Auguste, Louzier Vanessa</i>
16:00 – 16:20	ORAL 7: [ <b>O-415</b> ] Biodegradation of polyester polyurethan (impranil) by bacteria isolated from natural environment <i>Nguyen N. T. Xuan, Vo V. H. Tham, Lu N. T. Nguyen, Nguyen M. Trung and Nguyen N. Hai</i>
16:20 – 16:40	ORAL 8: [ <b>O-416</b> ] Genetic diversity of phan rang sheep based on mitochondrial d-loop and cytochrome c oxidase subunit i sequences <i>Nguyen N. Tan, Tran T. Vu, Van L. Le, Le T. Loi and Hoang T. Thanh</i>
<b>17:00 – 18:00</b>	<b>Closing ceremony</b> [Room 303, Thien Ly Building]

## KEYNOTE SPEECHES

### KEYNOTES SPEECH 1:

#### **Biodiversity in Crop Production for Sustainable Agriculture in Times of Climate Change - a Soil Perspective**

**Prof. Dr. Sören Thiele-Bruhn**

*Department of Soil Science, Trier University, Germany*

*Email: [thiele@uni-trier.de](mailto:thiele@uni-trier.de)*

In modern, intensive agriculture, we are faced with increasing degradation of soil quality and soil health. This loss of soil ecosystem functions is further exacerbated by progressive climate change with increasing weather extremes. In agricultural systems, soil biodiversity significantly exceeds above-ground biodiversity and is a prerequisite for the stability and performance of the ecosystem. Soil biota determine nutrient cycling and nutrient storage as well as the formation and turnover of soil organic matter (SOM). The richness and community structure of soil biota depend on plant biodiversity and vice versa, whereby agriculture manipulates the soil-plant system. With agricultural intensification, the regulation of functions by biodiversity is replaced by agricultural measures. Fertilizers and agrochemicals have a strong impact on biodiversity and soil functions. The resulting changes in biological communities in turn feed back on soil functions such as carbon and nutrient cycling and pest control. Increasing biodiversity in cropping systems through crop diversification is proposed to promote ecosystem services, thereby reducing dependence on agronomic inputs while maintaining high crop yields.

This lecture will present findings from published studies as well as from the EU project DiverFarming. Among other things, the results of a study on the diversification of vine cultivation with underplanting of thyme and oregano will be presented as an example. Contrary to the often feared competition between plants for water, nutrients and light, various positive results can be observed. Depending on local conditions and the combined crops, diversification has the potential to improve biodiversity, nutrient cycling, organic matter sequestration and thus soil fertility without compromising crop yields. Additional features may include improved pollination and pest control. In many studies, diversification practices resulted in win-win support of soil services and crop yields, including spreading cultivation risks across multiple crops. Crop diversification is not free of conflicting objectives and requires a balancing of interests, taking local conditions into account. However, diversification practices have great potential for sustainable and climate-resilient agriculture at local and global level.

**Keywords:** crop diversification; soil biota; soil functions; plant yield

## KEYNOTES SPEECH 2:

### **A Study on Gender Influences on Women Entrepreneurs in Farming and Tourism: Case Insights from Thailand and Vietnam**

**Prof. Gunjan Saxena**

*Faculty of Business, Law and Politics, University of Hull, United Kingdom*

*Email: G.Saxena@hull.ac.uk*

Gender influences on women's entrepreneurial journeys in farming and sustainable tourism crystallise around the relations between men and women in patriarchal societies of Thailand and Vietnam. This implies that while women appear to be in possession of agency to plan 'a life on their own terms', the enduring gender inequities impact on how atypical rhythms, flows and fluxes in Thailand and Vietnam's markets are imagined and experientially encountered. There is a lack of research on how women entrepreneurs simultaneously (un)do gender by accepting and complying with gendered perceptions and resisting patriarchal precincts by embracing masculine traits or taking advantage of their femininity to achieve competitiveness. In this study, I aim to fill a key gap by answering the following research question: how do women entrepreneurs in Thailand and Vietnam assemble and mobilise an enriched, embodied space in the marketplace? My use of visual autoethnography opens novel spaces of comprehending women's ingenuity as I transcend the limitations of verbal discourse to engage in an intersubjective negotiation with my participants to jointly explore the intricate performances and knowledges that underlie their daily routines .

Overall, my work, funded by the EU project GOLF (Global and Local Agri-food Supply Chains) in Thailand and Vietnam advances the literature on gender and entrepreneurship by exploring the impact of the plurality of women's identities on their entrepreneurial orientation. Case insights, drawn from 69 women entrepreneurs, twenty-three operating on Vietnam's Unicorn Island and forty six in Thailand's floating markets (23) and rice farming sectors (23), demonstrate the varied ways in which they are using their multiple social identities - traditional and modern, passive and proactive, shaped by their religiosity and a unique spiritual dimension- to both rework community dynamics and manage their enterprises. I conclude by accentuating the subtle tactics that women entrepreneurs are employing to subvert those dominant discourses of femininity and patriarchy that negate their agency and accomplishment. This timely work on a largely 'invisible' segment context is intended to assist agencies and policy initiatives in effectively targeting financial aid and training where it is most needed.

**Keywords:** entrepreneurial orientation; gender; Mekong; floating markets; rice farming; women entrepreneurs; Thailand; Vietnam.

## INVITED SPEAKERS

### INVITED SPEAKER 1 – SEASON 1:

#### **Flexible Immigration and Reverse Migration: Policies to Overcome Middle-Income Trap in Vietnam**

**Prof. Nguyen Trong Hoai**

*Chief Editor, Journal of Asian Business and Economics Study, UEH, Ho Chi Minh City, Vietnam*

*Email: hoaianh@ueh.edu.vn*

This paper critically examines the phenomena of flexible immigration and reverse migration, highlighting their impacts on labor markets and socio-economic development in developing countries. It contrasts traditional rural-to-urban migration patterns with the emerging phenomenon of reverse migration, which has gained prominence in the aftermath of the COVID-19 pandemic. Utilizing empirical data from Ecuador, China, and Vietnam, this study explores the driving forces behind migration, including urbanization, labor market integration, and the socio-economic barriers migrants face in accessing formal employment. Key migration theories, such as Faist's migration systems theory and Lee's push-pull model, are employed to elucidate the complex, multifaceted nature of migration flows and their broader socio-political contexts. The research provides a comparative analysis of migration trends in Vietnam, focusing on Ho Chi Minh City, Can Tho City, and Binh Duong Province, identifying critical policy gaps in addressing outmigration from rural areas. Drawing on international policy experiences, the study advocates for enhancing rural infrastructure, promoting entrepreneurship, and developing sustainable labor force policies to mitigate the adverse effects of migration. The findings offer a comprehensive framework for policymakers to devise strategies that not only address the immediate challenges of migration but also contribute to long-term, balanced economic growth, particularly in middle-income countries like Vietnam.

**Keywords:** Flexible Immigration; Reverse Migration; Middle-Income Trap; Urbanization; Sustainable Development



## INVITED SPEAKER 2 – SEASON 2A:

### Molecular Mechanisms Underlying The Biocontrol Activity of *Allorhizobium Vitis* VAR03-1 Against Grapevine Crown Gall

**Prof. Yoshiteru Noutoshi**

*Faculty of Environmental, Life and Natural Sciences, Okayama University, Japan*

*Email: noutoshi@okayama-u.ac.jp*

Although pesticide application is often ineffective in reaching pathogens in the soil, biological control using antagonistic microorganisms offers a promising approach to protect crops from diseases caused by soil-borne pathogens. In addition to disease control, plant-associated commensal bacteria hold potential for improving plant growth and enhancing responses to abiotic stresses, which is particularly relevant in addressing the impacts of global warming. However, the molecular basis of inter-microbial antagonism and the dynamics of plant-microbe interactions remain incompletely characterized.

Here, we identified rhizoviticin, a phage tail-like bacteriocin known as tailocin, as a key factor in the antagonism of *Allorhizobium vitis* VAR03-1, a biocontrol bacterium that can effectively suppress crown gall disease in grapevine caused by pathogenic strains of *A. vitis*. This mechanism provides VAR03-1 with a broad host range against crown gall pathogens across different plant species, in contrast to the well-known biocontrol agent *Agrobacterium radiobacter* K84, which produces the antibiotic agrocin 84. Rhizoviticin is the first tailocin identified in alphaproteobacteria.

We further investigated the growth habitats of two biocontrol agents, *A. vitis* VAR03-1 and *Pseudomonas protegens* Cab57, as models of commensal bacteria, in the rhizosphere of *Arabidopsis thaliana* using Murashige and Skoog agar medium. VAR03-1 showed visible colonization even at a distance from the roots, predominantly near the hypocotyl, whereas Cab57 did not form colonies. We found that their colonization patterns appeared to be defined by their nutrient requirements, such as sugars and organic acids, for growth. Consistently, supplementation of these limiting nutrients increased bacterial densities in the rhizosphere, but bacterial overgrowth resulting from nutrient supplementation led to plant growth suppression. Interestingly, this deleterious effect was reduced in the VAR03-1  $\Delta recA$  mutant, which exhibited increased biofilm formation, suggesting that activities associated with the free-living rather than the sessile lifestyle may be detrimental to host growth. Our findings highlight the importance of tightly regulating nutrient release from plant roots to effectively harness soil microbiota for plant health and growth.

**Keywords:** Flexible Immigration; Reverse Migration; Middle-Income Trap; Urbanization; Sustainable Development

## **INVITED SPEAKER 3 – SEASON 2B:**

### **Can We Apply Active Silviculture for Support of Forest's Role in Climate Change Mitigation?**

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Forests are playing an important role in the carbon uptake from the atmosphere. Currently, European forests annually absorb up to 10% of total European GHG emissions with the potential up to 22% to the year 2030. So that is possible to consider about the new societal challenge for forestry - GCC mitigation. We present results of investigation that were conducted to evaluate the impact of classical forestry management practice, i.e. thinning, on the photosynthetic carbon pumps of a forest stand, It is well known that thinning is influencing stand canopy solar radiation condition. The forest stand canopy is vertically differentiated, which determine basic ecological foliage categories - of sunny and shaded leaves. The participation of these foliage ecotypes in whole canopy carbon uptake is very different. Generally, shaded leaves contribution to the carbon pumping is negligible in the dense forest. Thus, thinning has a big potential for activation of whole canopy carbon uptake and storage mainly because improved solar radiation penetration into the crown body and thus achieve stronger participation of lower crown parts in the whole forest stand canopy photosynthetic activity – i.e., activation of the additional carbon pump. This effect is temporary but repeated thinning can keep it for a longer time. Similar effect is achieved by application of selective cutting system. Thus, both mentioned silviculture management systems could be considered an effective tool for “irritation” of stand canopy photosynthesis activity. The research conducted on stand level carbon fluxes and radial increment dynamics supports this conclusion. Thus, we can introduce the new role of these forest management systems as a tool of “sylvomitigation” of GCC.

## **INVITED SPEAKER 4 – SEASON 3A:**

### **Farmers' Shared Interests Can Advance Sustainable Safe Food Systems**

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In many Low-Medium Income Countries (LMIC), smallholder farmer access to consumer-driven markets is limited by lack of knowledge, capital, appropriate technology and technical training. While technical innovations and new techniques can improve the quality, quantity and safety of agricultural products for the market, adoption of new technologies and practices by smallholder farmers is often hindered by additional social and logistical constraints. To address the wide range of problems experienced by smallholder farmers seeking a higher standard of living, both natural science and social science solutions are required. Our research has defined a mechanism for overcoming multiple constraints smallholder farmers face when attempting to change their agricultural practices. Community-driven research programs were organized around the shared interests of individuals involved in various aspects of the agricultural supply chain in six villages in Cambodia. These Shared Interest Participatory Action Research (SIPAR) project were initially designed to help members learn to 1) as an organizing platform for team building 2) collectively identify problems and test solutions, and 3) provide dissemination outlets for early scaling of appropriate agricultural technologies. This case study proposes an innovative model for effectively mitigating multiple constraints that typically hinder LMIC agricultural advancements. The participatory, social learning SIPAR model is therefore a promising soft technology that warrants further testing at a larger scale to validate these findings.

**Keywords:** Farmers; Food Systems; Food Safety; Technology

## **INVITED SPEAKER 5 – SEASON 3B:**

### **An Overview of Japanese Trends in Smart Agriculture**

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Japan's agricultural sector faces an aging workforce, with a significant portion of farmers over 65 years old. This demographic shift has created an urgent need for automated and smart technologies to sustain productivity and meet labor demands. As a result, Japan has prioritized the development and adoption of labor-saving technologies, including autonomous systems, to address its shrinking agricultural workforce. In October 2024, a new act aimed at promoting smart agricultural technology was enacted to accelerate the integration of these innovations across the sector. This act emphasizes the importance of adapting production methods to align with smart technologies, speeding up development, and encouraging widespread adoption. For example, in rice paddy fields, efforts are being made to reduce labor demands during peak periods, such as seeding and transplanting, through the use of drones for direct seeding and systems that enable the efficient operation of multiple machines simultaneously. In upland fields, where tasks like seeding, transplanting, and harvesting are labor-intensive and time-sensitive, automation and labor-saving techniques—especially for machinery not yet automated—are essential. This presentation provides an overview of these emerging trends in Japanese smart agriculture, based on the new act to illustrate how technological advancements will be reshaping both paddy and upland farming practices.

**Keywords:** Aging farming population; labor-saving technology; smart farming act Japan

## **INVITED SPEAKER 6 – SEASON 4A:**

### **Circular Economy in Agriculture: Current Status and Solution For Model OF Low Carbon Footprint in Viet Nam**

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Development a circular economy is a trend in many countries around the world such as European, China and ASEAN countries because of it benefits. Implementing a circular economy is considered an important lever to achieve important goals of policy makers such as creating the economic growth, jobs and reducing environmental impacts. In particular, in the context of implementing sustainable development goals and responding to climate change, the approach to transitioning to a circular economy will contribute to directly achieving 8 out of 17 sustainable development goals and will continue to spread to promote the achievement of other goals. In Vietnam, developing a circular economy is considered one of the major policies to carry out the task of “managing, exploiting, and effectively using resources; protecting the environment and responding to climate change”. This can be considered one of the breakthrough solutions to solve the relationship between the economy and the environment in the context of Vietnam promoting the process of industrialization, modernization, and urbanization; therefore, resources are increasingly depleted and degraded, environmental pollution and climate change are increasing. Currently, Vietnam applied the regulations on the application of circular economy in the law on environmental protection.

In agriculture, developed countries have made significant progress in applying recycling agriculture and organic agriculture. However, in practice, agriculture still needs improvement because the use of polluting products and waste has not been improved, and the management infrastructure and value chains capable of exploiting the potential use of by-products need to be improved. In Vietnam, the amount of by-products from the agricultural production discharged into the environment is large. According to the Ministry of Agriculture and Rural Development, the total agricultural by-products in 2020 were over 156.8 million tons, including 88.9 million tons of post-harvest by-products, processed agricultural products (with 56.7%); 61.4 million tons of animal and poultry manure (with 39.1%); 5.5 million tons from forestry (with 3.5%) and nearly 1 million tons from aquaculture (with 10.6%). Therefore, in Vietnam, building a circular economy, especially in agricultural production, is identified as one of the country’s development orientations. The socio-economic development strategy for the period 2021 - 2030, with a vision to 2045, has set out the orientation of “developing circular economic models to effectively use the output of the production process”. In the field of agriculture - forestry - fishery, circular economy has actually been implemented by farmers for a long time based on the understanding

of the value chain, demonstrated in the VAC model, VACB model in agriculture. There were many translating science to practice, such as models have used biomass technology, collection the agricultural waste (tree stems, straw, rice husks), the bioaquatic models in aquaculture, etc. According to the Ministry of Agriculture and Rural Development, every year, the agricultural production has about 114 million tons of by-products such as corn stalks, beans, straw, rice husks, coconut fiber, etc. If they are recycled into animal feed, organic fertilizer, or produced into other products, the circular economy has been realized. Biotechnology solutions applied in the recycling process will increase productivity in the value chain of this circular economic model. Most studies on circular economy in agriculture are case studies, with few devoted to developing a framework for transferring theory into practical application and policy development. Therefore, Vietnam needs to research and build a model, from which to build criteria and evaluate the circular economy in general and the agricultural sector in particular, to issue specific guidance documents.

**Keywords:** by-products; animal wastes; circular economy; translating science to practice

## INVITED SPEAKER 7 – SEASON 4B:

The Roles of Mitochondria in *in vitro* embryo Production

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Reproductive technologies are essential for efficient animal production. In particular, Gamete culture and manipulation techniques, such as *in vitro* fertilization, have developed mainly in farm animals such as cattle and pigs, accelerating breeding programs, increasing productivity and facilitating the global exchange of valuable genetic material. These technologies are also now essential in the fields of creation of genetically engineered mice and human infertility treatment. *In vitro* production (IVP) of embryos has been improved over the past decade, nevertheless, IVP embryos still have inferior developmental and fertility outcomes compared to *in vivo* fertilized embryos. In recent years, we have focused on the functions of mitochondria in sperm, oocytes and early embryos. Mitochondria play a critical role in the generation of metabolic energy in eukaryotic cell. Mitochondria in the oocyte are responsible for most ATP production and are maternally inherited to the offspring after fertilization. In contrast, sperm mitochondria underpin sperm motility but are eliminated in the early embryonic stage after fertilization. Mitochondria produce reactive oxygen species as a byproduct of ATP production, and excessive ROS can cause oxidative stress that reduces the developmental competence of early embryos. Here, we discuss the multifaceted mechanisms by which mitochondrial function regulates gametes and embryos, and the potential for improving the quality of IVP embryos by controlling mitochondrial function.

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# ORAL PRESENTATION

**SESSION 1**  
**SOCIAL ECONOMICS IN SUSTAINABLE**  
**AGRICULTURE**

## THE ROLE OF RICE PRODUCTION IN SUSTAINABLE AGRICULTURAL DEVELOPMENT IN SOC TRANG PROVINCE

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### Abstract

Rice is a key national commodity, particularly for the Mekong Delta. The rice industry is evolving to prioritize high value, ecological advantages, market demand, and competitiveness. The coastal sub-region aims to develop “specialty rice” through sustainable cultivation systems that emphasize ecological and organic methods suited to local conditions. The Mekong Delta’s rice industry plays a crucial role in ensuring the income and livelihood of households, national food security, agricultural exports, and the country’s global agricultural and food status. Soc Trang is a significant province for specialty rice industry is prioritized to capitalize on the seasonally changing brackish water conditions. This study evaluates the role of rice production in sustainable agricultural development in Soc Trang province by surveying 81 agricultural staffs from 81 communes across 8 rice-growing districts in Soc Trang province in 2023. Interviews focused on changes in population, agricultural households, rice households, rice production area, rice varieties, and yield from 2020 to 2023. The findings reveal that farmers in Soc Trang primarily focus on rice production for household economic development, with over 70% of the natural land area dedicated to rice cultivation. Specialty rice production accounts for more than 50% of the total annual rice cultivation area, with most farmers growing specialty rice varieties during the Winter-Spring season. Approximately 55% of households in the Soc Trang province grow rice, and 70% of households involved in agriculture engage in rice cultivation. These findings underscore the critical role of rice production in sustainable agricultural development in Soc Trang province.

**Keywords:** Soc Trang; specialty rice; sustainable agriculture; livelihood



**ASSESSING FACTORS AFFECTING THE CHOICE OF ECO-TOURISM  
DESTINATION IN BINH CHAU - PHUOC BUU NATURE RESERVE,  
BA RIA -VUNG TAU PROVINCE**

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**Abstract**

Sustainable ecotourism is a part of sustainable agricultural development. Therefore, in this study, the author analyzes the factors affecting tourists' decision to choose Binh Chau Phuoc Buu Nature Reserve (KBTTN). The research model includes one dependent variable (destination choice decision) and five independent variables. Primary data were collected through direct interview survey method and Google Form. Using Likert scale with 5 lowest levels from (1) to highest (5) to record the evaluation of tourists who have traveled to Binh Chau Phuoc Buu. The number of questionnaires that met the requirements for analysis included 235. Data were stored using Excel software and analyzed using SPSS 20.0 software. The results of the regression equation between the factors affecting the choice of destination and the decision to choose the destination are Quality of service at the destination (0.254), Means of transport to the destination (0.232), Experience of the destination (0.170), Resources at the destination (0.119) and Tourism motivation (0.092). These factors all have a positive impact on the decision to choose an ecotourism destination of tourists. This shows that the quality of the destination is the most important factor. Tourism motivation is the factor with the lowest impact. Through the research results, it is possible to propose some solutions to attract tourists to Binh Chau Phuoc Buu, first of all, to maintain and improve the quality of tourism services; constantly improve and enhance the quality of means of transport to the tourist destination and in the tourist area. At the same time, it is necessary to maintain and preserve the wild, natural beauty here, preserving the integrity of the natural landscapes of the forests and seas; It is necessary to have the participation of local residents in informing and communicating activities in Binh Chau Phuoc Buu.

**Keywords:** ecology tourism; Binh Chau Phuoc Buu nature reserve; sustainable development; factors.

## CORPORATE GOVERNANCE FACTORS AFFECTING FINANCIAL INFORMATION TRANSPARENCY OF LISTED AGRICULTURAL COMPANIES IN VIETNAM

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### Abstract

Economic growth is a pivotal criterion of the Sustainable Development Goals (SDGs) that the United Nations is advancing in Vietnam. The transparency of financial information is an important aspect of corporate governance. It is a fundamental element of sustainable business development and a growing concern for both companies and society. This study aims to evaluate the corporate governance factors that influence financial information transparency in listed agricultural companies in Vietnam. Then, solutions are suggested to enhance financial information transparency for these companies. The study used the panel data regression method using the fixed effects model (FEM) and random effects model (REM), utilizing data from 300 financial reports of 25 listed companies in the agricultural sector from 2012 to 2023. The result showed the analysis identified two variables that negatively and significantly impact financial information transparency, including Financial Leverage (FL) (-0.271) and Fixed Asset Coefficient (FAC) (-1.308). Conversely, five variables were found to have a positive and significant influence on the transparency, including Operation years (0.045), Gender of Chief Accountant (0.359), Gender of Director (0.373), Number of Employees (NoE) (0.042), and Return on Equity (ROE) (0.720). Collectively, these variables explained 11.10% of the variation in financial information transparency among agricultural companies in Vietnam. Finally, solutions are proposed to decrease FL and FAC while increasing ROE and NoE. Besides, it is suggested that increasing the representation of women in Director and Chief Accountant positions will positively contribute to the transparency of financial information.

**Keywords:** financial information transparency; sustainable development goals; agricultural companies; corporate governance factors

## FACTORS INFLUENCING FARMERS' DECISION TO POSTPONE SELLING COFFEE BEAN: A CASE STUDY IN DAK HA DISTRICT, KON TUM PROVINCE

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### Abstract

Coffee stands as a significant export commodity for Vietnam, with its output ranking high among the nation's exports. However, the volatility in coffee prices primarily stems from the surge in supply during harvesting seasons, complicating income estimation for farmers and impeding investment decisions in coffee production. This paper delves into the determinants influencing farmers' decision to postpone selling their coffee bean products in Dak Ha district, Kon Tum province, Vietnam. Through a convenience sampling method, 122 farmers were directly interviewed via a structured questionnaire in April, 2024. We utilized binary logistic regression to estimate the factors influencing farmers' decision to postpone selling their coffee. The statistical descriptive analysis indicates that 40.2% of farmers choose to postpone selling their coffee beans. Moreover, the financial gain accrued from postponing sales hinges on the price differential between harvest and sale times. However, farmers encounter risks such as insufficient production capital and financial constraints for family expenditures during the postponed selling period. Additionally, the study identifies several crucial factors influencing farmers' decisions, including family size, coffee production volume, contract agreements, and coffee storage facilities. These findings highlight the complex interaction of economic, social, and logistical factors that shape farmers' selling strategies in the coffee industry.

**Keywords:** binary logistic; coffee bean; farmers; postpone selling

## ASSESSMENT OF GROUNDWATER RESOURCE PRESSURE ACCORDING TO THE WATER POVERTY INDEX (WPI)

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### **Abstract**

According to the report on groundwater monitoring results of the Center for Environmental and Natural Resources Monitoring of Tien Giang province, Vietnam from 2015 to 2021, the groundwater level in the main aquifers in the Province is decreasing at an average rate from 0.54 m/year to 0.84 m/year. The main reason comes from people's exploitation and utilization for the demand of daily life and agricultural production. Because, this local surface water resource is severely and persistently saline. Assessing the pressure on groundwater resources in Tien Giang province, Vietnam by the water poverty index (WPI) shows that local groundwater resources is under moderate to severe pressure, especially in concentrated population areas (Cities and towns in the Province) and districts with large agricultural areas. In addition, the environmental component of the water poverty index is on a decreasing trend with the factors of surface water quality and vegetation cover seriously decreasing in large production areas such as Chau Thanh and Go Cong Districts. Based on the analysis of the WPI index, the study also makes recommendations to adapt and diversify utilizing water sources to increase the WPI value of groundwater resources to become near the low and medium pressure levels.

**Keywords:** groundwater; water poverty index (WPI); environment; water utilization; salinity

## CURRENT SITUATION AND SOLUTIONS TO ENHANCE AGRICULTURAL LAND-USE EFFICIENCY IN CAI BE DISTRICT, TIEN GIANG PROVINCE

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### Abstract

The study's objective was to evaluate the current situation and propose solutions for enhancing the efficiency of agricultural land use in Cai Be district, Tien Giang province. The study applied two major methods being geographic information system (GIS) and multi-criteria analysis (MCA) for land evaluation. Agricultural production land in Cai Be district accounts for 80.95% of the natural area with 33,704.16 hectares, of which the area under perennial crops accounts for a high proportion with 16,860.89 hectares, accounting for 50.03% of the land area agriculture in the entire district. Based on the land use types analysis, the study selected 9 out of 39 land use types for land evaluation. In particular, vegetables and fruit trees, especially Grapefruit, have very high income, net profit and profit ratio are 2-3 times or even more than 4 times higher than other types of 2-3 crop rice crops. These types require large capital and high farming techniques. Cai Be district has 45 land mapping units. Applying the integrated model of GIS and ALES to classify land suitability, the result showed that the Cai Be district has 10 land suitability zones. On the other hand, the integrated model of GIS and MCA resulted in 06 land suitability zones. Based on the analyzed results, the study proposed solutions to enhance the efficiency of agricultural land use including policy solutions, management, applying science and technology to production, market, Investment capital, training human resources, strengthening infrastructure, organizing production and preliminary processing, and preservation of agricultural products.

**Keywords:** land evaluation; agricultural land use efficiency; sustainable agriculture; multi-criteria analysis

## ANALYZING THE CURRENT STATUS OF STRAW MUSHROOM PRODUCTION IN GO CONG TAY DISTRICT, TIEN GIANG PROVINCE

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### **Abstract**

This study aims to analyze current status of straw mushroom production and consumption in Go Cong Tay district, thereby proposing improvements. After analyzing and synthesizing through SPSS software, primary data of 70 straw mushroom farmers showed that: The average straw mushroom growing area is 1.28 (thousand m<sup>2</sup>/crop/household) with an average harvested mushroom yield of more than 1,390 kg/crop/household; Average revenue is more than 61 million VND/crop/household with an average selling price of nearly 43 thousand VND/kg. The average profit reaches more than 26 million VND/crop/household, corresponding to a profit margin of 78.44%. Considering the variables amount of fertilizer used and mushroom growing area, they had no impact on straw mushroom productivity. However, there are some factors which positively affect straw mushroom productivity as follows: the number of years growing - at the 1% level, the amount of straw used and labor - at the 5% level, and the amount of spawn used, the amount of lime and number of training sessions - at the 10% significance level. Several solutions to improve straw mushroom production efficiency are proposed: Solutions for input factors; Labor solutions; Technical training solutions; Reorganize production; Research and transfer of technical advances; Promotion; Strengthen international cooperation; Solutions on policy mechanisms.

**Keywords:** straw mushroom

## ANALYSIS OF FARMERS' AGRICULTURE LAND OWNERSHIP POLICY IN INDONESIA TOWARDS SUSTAINABLE GREEN AGRICULTURE

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### Abstract

The study aims to identify agricultural land ownership policies by farmers in Indonesia, analyze their impact, and formulate recommendations for agricultural ownership policies in Indonesia to support the realization of sustainable green agriculture in Indonesia. People or legal entities without agricultural skills and experience can access the farmland market in Indonesia today. Converting agricultural land into non-agricultural land, such as industrial or residential, has become a common practice, serving as a national strategic project to maximize economic income. Numerous conversions of agricultural land to non-agricultural land without accompanying data supporting the existing land potential can undoubtedly disrupt nature's balance. The loss of fertile agricultural land owned by farmers because it does not correspond to their land characteristics can affect food security in Indonesia. This explanatory social research uses a library study approach to explain the unhealthy phenomenon of agricultural land ownership by farmers in Indonesia, which results in the ease of farmland conversion as well as the impact of environmental damage. The study has produced a number of recommendations to give farmers a greater chance to retain their land and not transfer agricultural land functions based on good practices in European countries, such as Slovenia, Italy, Austria, and Hungary.

**Keywords:** agricultural land ownership policy; sustainable green agriculture; farmland conversion

**SESSION 2**

**ADAPTING AGRICULTURAL AND FORESTRY  
PRODUCTION TO CLIMATE CHANGE**



## A PRELIMINARY STUDY ON THE BENEFITS OF URBAN PARKS IN HO CHI MINH CITY USING I-TREE

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### Abstract

This study employs advanced assessment tools like i-Tree Canopy and i-Tree Eco to analyze the ecological benefits of two prominent urban parks, Tao Dan Park and 23/9 Park, in Ho Chi Minh City. The investigation focuses on biodiversity, carbon sequestration, and economic value to underscore the critical role of urban green spaces in enhancing environmental sustainability and urban resilience. Distinct management approaches are evident between the parks, with Tao Dan Park emphasizing greenery and biodiversity while 23/9 Park prioritizes infrastructure and accessibility. The ecological compositions vary, with Tao Dan Park exhibiting more tree/shrub cover (6.62 hectares) and herb/grass cover (1.45 hectares), compared to 23/9 Park's emphasis on impervious surfaces (1.96 hectares), buildings (0.86 hectares), and roads (0.68 hectares). Both parks have minimal water features, with Tao Dan Park having slightly more (0.24 hectares) than 23/9 Park (0.18 hectares). Key tree species identified include *Peltophorum pterocarpum* and *Dipterocarpus alatus*, contributing significantly to biodiversity, carbon storage, and oxygen production. For instance, *Peltophorum pterocarpum* in 23/9 Park contributes 15.7% to the tree count and 22.7% to leaf area, while *Dipterocarpus alatus* dominates Tao Dan Park, accounting for 27.9% of the tree count and 61.9% of the leaf area. Economic valuation reveals substantial benefits derived from pollutant removal, carbon storage, and avoided runoff. Tao Dan Park's carbon storage is estimated at 509.1 tons (valued at USD 9,333.7), while 23/9 Park's storage is 335 tons (valued at USD 12,284). Carbon dioxide absorption in Tao Dan Park is 115.4 tons/year compared to 75.93 tons/year in 23/9 Park. Additionally, Tao Dan Park exhibits higher values in air volume reduction and PM2.5 removal compared to 23/9 Park, emphasizing the park's significant contributions to environmental quality and public health.

**Keywords:** Carbon sequestration; Ecological service; i-Tree; Urban park

## POTENTIAL ROLES OF MANGROVES IN THE GREENER SHIPPING TRANSITION

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### Abstract

While the maritime industry plays an important role in global trade, it contributes to greenhouse gas (GHG) emissions. Research has proposed that conserving natural ecosystems, particularly mangroves, can be a sustainable solution. Mangroves absorb greenhouse gasses and improve water quality, but their services are not well-recognized by the maritime industry. This study analyzes monitoring data relating to the surface water environment of Sai Gon River, GHG emissions of seaports, and GHG sequestration by Can Gio mangrove forest to quantify the potential of improving environmental quality of mangroves near busy seaports in Ho Chi Minh City. The findings demonstrate a correlation between port emissions, surface water quality and mangrove absorption, suggesting mangroves can significantly offset the industry's impact. This information can be used by policymakers to develop financial mechanisms that incentivize the protection of mangroves, ultimately reducing the environmental impact of maritime activities. The study recommends further research in other areas of Vietnam to create a comprehensive understanding of the country's mangrove ecosystems and their valuable services.

**Keywords:** Can Gio; greenhouse gas; mangrove; Sai Gon River; seaport

## ASSESSING THE SUITABILITY OF COFFEE AREA IN A WARMING CLIMATE OVER THE CENTRAL HIGHLAND OF VIETNAM

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### Abstract

Vietnam is the second-largest coffee producer globally (after Brazil) with 1,953,990 tonnes produced in 2022. This high-value agriculture plant is an important livelihood of rural communities, especially over the Central Highlands, the region that contributes more than 90% to the annual production of Vietnam's coffee. In recent years, this region has experienced a great expansion of cultivation areas for coffee plants due to its high-value coffee products. However, this trend is driven purely by market value rather than a careful assessment of the suitability of local natural characteristics such as topography or climatic conditions, posing a potential threat to the sustainable production of coffee beans. Changes in regional climate – such as rising temperatures and changing rainfall patterns - further exacerbate the situation, as the coffee-growing environment is changing rapidly, making it difficult to predict the productivity and quality of coffee beans in this region. To understand the potential impacts of climate change on coffee cultivation, this study compares the current and future suitability of coffee trees across the Central Highlands of Vietnam. Specifically, we model the future (2050) changes in climate factors (including maximum temperatures, minimum temperatures, and annual precipitation) under two emission scenarios to see how the climatic suitability of coffee trees will change across the region. Climate data was downscaled from global datasets obtained from the Coupled Model Intercomparison Project Phase 6 (CMIP6) data. The findings show substantial shifts in suitable cultivation areas as a result of changes in climatic variables, highlighting the urgent need for regional climate change adaptation strategies to ensure a sustainable future for coffee cultivation.

**Keywords:** climate change; coffee; GIS; multi criteria evaluation

## THE SPREAD, DAMAGE AND CONTROL OF BLACK-HEAD CATERPILLAR *OPISINA ARENOSELLA* WALKER IN VIETNAM

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### Abstract

Native to India and Sri Lanka, the Coconut Black-headed Caterpillar (*Opisina arenosella* Walker) (BHC) is a deadly invasive species that attacks coconut trees at all stages of growth, from planting to maturity. In Vietnam, BHC was first detected in Ben Tre province in July 2020 and has since spread to other coconut-growing areas and nearby provinces in the Mekong Delta. Recently, BHC has been spreading to the South Central Coast and showed the potential risk of an outbreak. The biology of this pest was investigated in laboratory of Nong Lam University, life cycle of BHC was  $48.03 \pm 1.38$  days; female longevity was  $7.68 \pm 0.64$  days; ad laid  $82.52 \pm 13.28$  eggs in average. For controlling BHC, experiments to evaluate effectiveness of insecticides of BHC were conducted, Emamectine Benzoate showed high performance in laboratory as well as on the farm. For biological control, over ten species of natural enemies were found, with three species tend to be effective in controlling BHC in Vietnam, pupal parasitoids (*Brachymeria* sp., *Trichospillus pupivorus*) and the larval parasitoid (*Bracon hebetor*).

**Keywords:** Black-headed Caterpillar; Mekong Delta; Natural enemies; Coconut pest; Biocontrol

## ASSESSING SURFACE WATER QUALITY OF VAM CO DONG RIVER FLOWING THROUGH LONG AN PROVINCE FROM 2018 TO 2023

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### Abstract

The Vam Co Dong River, a tributary of the Vam Co River in the Dong Nai River system, flows through key socio-economic regions of Long An province. It plays a crucial role in regional economic development but is vulnerable to pollution from domestic and industrial wastewater, as well as agricultural pesticides. This study assesses spatio-temporal changes in the river's water quality from 2018 to 2023 across 18 monitoring sites, comparing data to national standards (QCVN 08:2023/BTNMT). The findings indicate that almost all sites had at least one instance of water quality levels classified as C or D, suitable only for industrial use after treatment or low-quality purposes. Organic pollutants (DO, BOD5, and COD) were the most prevalent. The water quality index (WQI) highlights significant issues at Vam Ba Mang, likely due to upstream domestic and industrial wastewater. The analysis results reflect the current state of water quality management for the Vam Co Dong River. Further in-depth research into the underlying causes is essential for developing more effective management strategies to protect this water source.

**Keywords:** water quality; WQI; wastewater management

## CO<sub>2</sub> AND CH<sub>4</sub> FLUXES AT THE RICE PADDY FIELD IN LONG AN PROVINCE, MEKONG DELTA

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### Abstract

In Vietnam, the most popular type of agriculture is wet rice cultivation, which is a significant economic sector. However, it is also the main contributor to the country's greenhouse gas emissions, as stated in the national greenhouse gas emission inventory report in 2016. In order to better understand the greenhouse gas exchange in wet rice cultivations and estimate the carbon budget in this ecosystem, the first eddy covariance station was installed in a paddy field in Long An province, Mekong Delta, Vietnam, in 2019. This station measures CO<sub>2</sub> and CH<sub>4</sub> gas exchange along with meteorological parameters. The station's data are processed in accordance with the integrated carbon observation system's (ICOS) CO<sub>2</sub> recommendations. As of now, there is no standard technique for CH<sub>4</sub> flux gap-filling. Therefore, data for CH<sub>4</sub> are individually processed and gap-filled using a random forest model from the machine learning software methane-gap fill-ml. Finally, an estimate of the carbon balance based on the fluxes of CH<sub>4</sub> and CO<sub>2</sub> was made. The study area implemented an innovative water management technique called alternate wetting and drying, which reduces methane emissions and preserves water. The findings indicate that the rice field serves as a carbon sink, absorbing 7 tons of Ceq per hectare in 2020 and 5 tons of Ceq per hectare in 2022.

**Keywords:** eddy covariance; greenhouse gas; methane; rice cultivation; Mekong Delta

## EFFECT OF LAND USE, LAND COVER CHANGE ON LAND SURFACE TEMPERATURE IN LAC DUONG MOUNTANOUS DISTRICT, LAM DONG PROVINCE, VIETNAM

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### Abstract

Land use land cover (LULC) change is a key reason leading to land surface temperature (LST) dynamics, impacting directly ecosystem and human health. This change reflects partly global warming and climate change at local and regional scales. Increasing LST is happening not only in urban areas by urbanization but also in rural areas. Lam Dong is one of the provinces having the strongest LULC change in Vietnam. Therefore, this study aims to evaluate the effect of LULC on LST change in Lac Duong mountainous district, Lam Dong province in the 10 years (2013 – 2023), and predict the LST change in 2033. The results of this study are a scientific basis so that managers issue appropriate solutions for LULC management in the future. The study used satellite image data from Landsat 8 and 9 OLI to build LULC and LST maps and used the CA-ANN model to predict the LST map. The results show LST negatively correlated with the area of forestry land, agricultural land, and water body with  $R^2 = 0.75, 0.71, \text{ and } 0.77$ , respectively. Meanwhile, LST positively correlated with the area of built-up land with  $R^2 = 0.81$ . LST increased by 2-3 °C during 10 years and the areas with higher temperature increased notably. The LST change was predicted to keep increasing in 2033.

**Keywords:** Land use land cover change; land surface temperature; Vietnam

## EFFECTS OF GROWING CONDITIONS ON SOME INDICATORS RELATED TO GROWTH AND PRODUCTIVITY OF SUPER DWARF TOMATO PLANTS

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### Abstract

The study was conducted to evaluate the effects of soil and hydroponic growing conditions on a number of indicators related to growth and productivity of a new super dwarf tomato varieties (yellow fruits) that imported into Vietnam recently. Growing medium TN1 and a static hydroponic system with two nutrient solutions, Grow Master and Hydro Umat F, were used as materials in this study. The results show that, compared to soil growing methods, plant height, number of branches/plant, leaf size were higher but flowering retardation of super dwarf tomato plants in hydroponic growing condition. Evaluating indicators related to productivity we found that super dwarf tomato plants grown on soil had higher fruit-bearing rate (reaching 75.07%) however the number of inflorescences/plant, number of flowers/plant as well as fresh fruit weight and fruit size, thus fruit yield were lower in comparing to those grown in hydroponics. In terms of the two nutrient solutions used in hydroponics, super dwarf tomato plants had a higher yield when grown in Hydro Umat F solution. Specifically, at 60 days after planting in Hydro Umat F solution, the plants tomato height reached 41.81 cm; The average number of branches was 6.06 branches/tree and the leaflet length was 9.28 cm. At 90 days after planting, tomato plants had an average of 57.23 fruits with a fruit diameter of 2.70 cm, fruit weight of 4.29 g and an average yield of 245.52 g/plant. Thus, hydroponic growing using Hydro Umat F nutrient solution is suitable for super dwarf tomato varieties in the context of reducing agricultural land area in Vietnam in general and the Hanoi area in particular.

**Keywords:** dwarf tomatoes; nutrient solution; growth; hydroponics; development



## DETECTION AND APPLICATION OF PLANT VIRUS VACCINE TO CONTROL PAPAYA RINGSPOT VIRUS W ISOLATE FROM SOUTH VIETNAM

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### Abstract

Papaya ringspot virus W type (PRSV W) is one of the most prevalent aphid-borne potyvirus that seriously affect cucurbit production worldwide. The traditional chemicals are not effective to control PRSV W virus. PRSV WAC (WAC), a mild strain generated by two mutations on its HC-Pro, completely protected cucurbits against PRSV W Taiwan isolate. In this study, PRSV W isolate from South Vietnam (PRSV W-HM isolate) caused mosaic symptoms on cucurbits was collected from the different vegetable areas in Ho Chi Minh City. Analysis of coat protein (CP) revealed that the PRSV W-HM isolate is closely related to Thai isolate (polyprotein nt and aa identities of 92.7% and 96.1%, respectively) and Taiwan isolate of PRSV W (polyprotein nt and aa identities of 92.4% and 95.5%, respectively). CP comparison and host range indicated that the PRSV W-HM isolate is PRSV W. To control the PRSV W-HM, the WAC mild strain was maintained in plants of *Cucumis metuliferus* (horn melon), and WAC inoculum was prepared from 0.1 gram of leaves of WAC-infected plants with 1 ml of 0.01 M potassium phosphate buffer. Muskmelon seedlings at 2-week were mechanically inoculated with WAC, and then mechanically challenged with PRSV W-HM isolate 15 days later. Symptom development was recorded at 20, 25 and 30 days post the challenge inoculation. Under greenhouse condition, WAC provided high level of protection against severe PRSV W-HM after the challenge inoculation, indicating WAC has a great potential to be used for control of PRSV W isolate from South Vietnam.

**Keywords:** disease control; plant vaccine; viruses on vegetable

## COMPOSTING OF VEGETABLE WASTE USING *IN-VESSEL* SYSTEMS AND COMPOST APPLICATION TRIAL TO LETTUCE (*LACTUCA SATIVA* L.)

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### Abstract

The increasing transportation costs of the vegetable waste generated from wholesale markets in Vietnam propose a decentralized waste treatment approach as *in-vessel* composters for more effective recycling of organic waste into valuable composts. Two *in-vessel* composting systems (rotary drum reactors–RDR and aerated cubic boxes–ACB) were designed to study different composting mixtures, consisting of 70% dewatered vegetable waste (DVW) and 30% additives (napier grass–NG, sugarcane baggasse–SB and corncob-derived biochar–CB). The treatment of 100% DVW was used as control. The results show that compost temperatures maintained over 55°C for four consecutive days in both RDR and ACB systems, and peak temperatures were 63.4°C–67.4°C, depending on each mixing ratio and *in-vessel* system. The mature compost derived from 70% DVW: 20% CB: 10% SB in ACB had a total nitrogen content of 2.5%; this compost met three of the four quality criteria specified for traditional organic fertilizer (QCVN 01-189/2019 standard): with a pH value, organic matter content, and C/N ratio of 7.5, 60.1%, and 10.9, respectively. A pot experiment was conducted to study the effectiveness of compost as a total (100% compost) or partial (25% to 75%) mineral nitrogen fertilization substitute on lettuce (*Lactuca sativa* L.). The treatments of 50% compost + 50% chemical fertilizer (CF) and 25% compost + 75% CF resulted in the highest vegetable yield of 1332.5–1335.2 g/m<sup>2</sup>, which was not significantly different from the 100% CF treatment, revealing that compost could help reduce from 25% to 75% of the recommended chemical N fertilizer.

**Keywords:** biochar; compost; in-vessel; nitrogen; vegetable waste

## INNOVATION TECHNIQUE IN SOIL TESTING

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### Abstract

Conventional soil tests are commonly used to assess single soil characteristics. Thus, many different tests are needed for a full soil fertility assessment, which is laborious and expensive. New broad-spectrum soil tests offer the potential to assess many soil characteristics quickly, but often face challenges with calibration and validation. This article describes the results of a 20-year research program aimed at overcoming the aforementioned challenges. A three-step approach was applied: (1) establishing two contrasting rapid broad-spectrum soil tests, (2) relating these new test results to the results of conventional soil tests for a wide variety of soils, and (3) validating the results of the new soil tests through field trials and communicating the results. Near Infrared Spectroscopy (NIRS) and multi-nutrient 0.01 M CaCl<sub>2</sub> extraction as broad-spectrum techniques were used. NIRS and CaCl<sub>2</sub> extraction technique were extensively calibrated and validated for the physical, chemical, and biological characteristics of soil and for 'plant available' nutrients, respectively. The results indicate that the accuracy of NIRS determinations is high for SOM, clay, SOC, ECEC, Ca-CEC, N-total, sand, and inorganic-C ( $R^2 > 0.95$ ) and good for pH, Mg-CEC, and S-total ( $R^2 > 0.90$ ). The combination of the CaCl<sub>2</sub> extraction technique and NIRS gave results that related well ( $R^2 > 0.80$ ) to the results of conventional soil tests for P, K, Mg, Na, Mn, Cu, Co, and pH. In conclusion, these two broadspectrum soil tests have improved soil testing, contributed to increased insights into soil fertility; thereby led to more sustainable soil management.

**Keywords:** 0.01 M CaCl<sub>2</sub>; Near Infrared Spectroscopy; sustainable soil management

## IDENTIFICATION OF GENETIC REGION CONTROLLING ANTHOCYANIN ACCUMULATION IN THE SWEETPOTATO STORAGE ROOT AND SEQUENCE ANALYSIS OF THE CANDIDATE GENE

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### Abstract

The objective of this study is to detect the genetic region(s) related to the anthocyanin (AN) accumulation in the sweetpotato storage root. Sweetpotato (*Ipomoea batatas* (L.) Lam) is a highly heterozygous, outcrossing, and polyploid species ( $2n=6x=90$ ), which complicates genetic and linkage analyses. An  $F_1$  mapping population consisting of 90 lines obtained by crossing Purple Sweet Lord (purple flesh) and 90IDN-47 (orange flesh) cultivars was used in this study. After extracting the AN from the freeze-dried storage root, the relative AN content was quantified as absorbance at 530 nm (A530) using a spectrophotometer. Genomic DNA was extracted from the young leaves and GRAS-Di analysis was performed to obtain the genome-wide SNPs. The paired-end short reads were mapped onto the *I. trifida* “Mx23Hm” (Itr\_r2.2) reference genome sequence by using the Bowtie2 software. SNP calling was performed using VarScan2. The filtered 42,835 SNPs were then subjected to GWAS analysis for polyploid species. As a result, we detected one major peak on the chromosome 5. The peak SNP (SNP with lowest  $p$  values), which exists in the simplex manner in Purple Sweet Lord, completely explained the presence or absence of anthocyanin in the storage root. *IbMYB1-2*, a transcription factor presumably regulating anthocyanin accumulation specifically to the storage root, is located near the QTL region. We also compared the sequences of this gene among the major cultivars in Japan to discuss the structure important for the function of this gene.

**Keywords:** sweetpotato; anthocyanin; *IbMYB1-2*; polyploid GWAS; GRAS-Di

## BIOMASS ALLOMETRIC EQUATION FOR (*MELALEUCA CAJUPUTI*) IN THE MEKONG DELTA, SOUTH VIET NAM

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### Abstract

*Melaleuca* in the typical alum forest ecosystem of the Mekong Delta. On the other hand, *Melaleuca* forests have economic value and also have environmental values such as the ability to accumulate carbon and stabilize climate in the region. The research was conducted in 10 places, in 7 provinces of the Mekong Delta. Collect data from 369 plots of 100 m<sup>2</sup> (10 x 10 m). Each place cuts at least 34 trees, the number of trees cut ranges from 34 - 40 trees/place, the total number of trees cut is 377 trees to weigh fresh biomass and take samples to dry until the weight remains constant, and analyze carbon of the tree parts in the laboratory. Ten tree biomass equations have been built, all equations have the form  $W = aD_{1.3}^b$ , with  $D_{1.3}$  is the tree trunk diameter at a height from the ground to a position of 1.3 m, the coefficient  $b$  fluctuates from 1.6988 to 2.3095.  $R^2$  value fluctuates from 90.65% – 99.24%. All equations are at a significance level of  $p < 0.05$ . The average biomass ranges from 52.13 - 240.68 tons/ha. This result is to provide information to calculate the biomass, carbon accumulation ability and CO<sub>2</sub> absorption value of *Melaleuca* forests, as a basis for implementation policy on payment for forest environmental services (PFES) as well as participation in the forest carbon market.

**Keywords:** Melaleuca biomass; Melaleuca forest; Biomass Allometric Equation; Mekong Delta

**SESSION 3**

**INNOVATIVE TECHNOLOGY IN  
SUSTAINABLE AGRICULTURE**

## STUDY ON EXTRACTION AND IDENTIFICATION OF CHEMICAL COMPONENTS OF *PERILLA ESSENTIAL* (L.) *BRITT* OIL USING GAS CHROMATOGRAPHY-MASS SPECTROMETRY (GC-MS)

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### Abstract

*Perilla frutescens* (L.) *Britt*, commonly known as Perilla, is a versatile herb used in culinary and traditional medicine across Asia. This study investigates the extraction and chemical composition of its essential oil through gas chromatography-mass spectrometry (GC-MS). The research objectives included identifying phytochemicals such as flavonoids, saponins, and tannins, quantifying major compounds including polyphenols and total nitrogen content, optimizing extraction conditions, and determining the chemical makeup of the essential oil under these conditions. The results revealed that Perilla extract is rich in flavonoids, tannins, and saponins, with significant polyphenol ( $1.94 \pm 0.043$  mg GA/g) and flavonoid ( $46.03 \pm 0.02$  mg QE/g) content. The total nitrogen content is  $4.39 \pm 0.05$  g/kg, corresponding to a total protein content of  $27.44 \pm 0.31$  g/kg. Ultrasonic extraction at 500W was the most efficient, though some compound losses occurred. GC-MS analysis identified 20 key components, including Diacetamide (25.36%), Limonene (6.36%), and Caryophyllene (4.69%). These results underscore the significant bioactive composition of the essential oil, highlighting its potential applications in various fields.

**Keywords:** perilla frutescens; essential oil; GC-MS; ultrasonic extraction; bioactive compounds

## OPTIMIZING THE EXTRACTION AND PURIFYING PROCESS OF PIPERINE FROM PEPPER IN VIENAM (PIPER NIGRUM)

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### Abstract

This study aimed to investigate the optimal parameters for the extraction and purification of piperine from pepper (*Piper Nigrum*). In this study, surveyed parameters include material: solvent ratio (1:3, 1:4, and 1:5 g/mL), extraction temperature (30 °C, 40 °C, and 50 °C), and extraction time (60 minutes, 90 minutes, 120 minutes). Additionally, the process of purifying piperine from the extract was studied with crystallization time varying from 10 hours, 24 hours, 48 hours, and 72 hours. As a results, the optimal conditions for the piperine extraction were determined including ethanol 96%, material: solvent ratio as 1:3.9 (g/mL), extraction time as 104 minutes, and extraction temperature as 37 ° C. With the above parameters, the obtained piperine content was 8.083 mg/mL. Furthermore, the purified process of piperine from pepper extract was carried out at a cold temperature (-10 °C) for 48 hours, and the obtained mass of piperine was 0.4954 g/g of extract.

**Keywords:** Piperine; Piper nigrum; Extraction; Pepper



## PREPARATION AND CHARACTERIZATION OF BACTERIAL CELLULOSE FILMS FROM PINEAPPLE PEEL INCORPORATED WITH CARBOXYMETHYL CELLULOSE

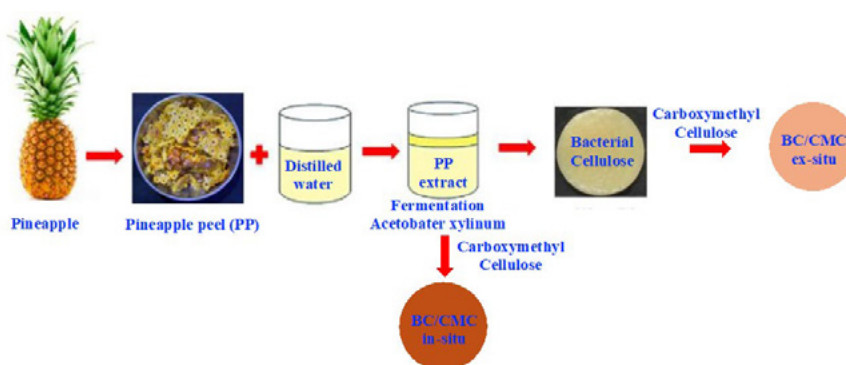
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### Abstract

This study aimed to explore the use of pineapple peel as a carbon source for the cost-effective production of bacterial cellulose (BC). The BC production process was conducted using single-factor tests. The results showed that the highest BC yield was 7.76 g/L under optimal conditions: a molasses concentration of 8g/L, a medium pH of 5.5, a pineapple peel to distilled water of 1:3 (w/v), and a fermentation period of 7 days. Furthermore, BC/CMC composites were prepared through an in-situ growth process by directly adding carboxymethyl cellulose (CMC) into the medium and compared with a composite made by immersed bacterial cellulose in carboxymethyl cellulose. The effects of CMC on BC films were evaluated by measuring moisture content, swelling ratio, water vapor permeability, and mechanical properties. The results indicated that incorporating CMC into BC acted as a plasticizer, enhancing mechanical strength of BC/CMC films, and significantly reducing their water vapor permeability. Fourier transform infrared spectroscopy, X-ray diffraction and scanning electron microscopy demonstrated excellent compatibility between CMC and BC. This findings suggest that pineapple peel is a viable carbon source for the production of BC films, offering a promising avenue for sustainable material production.



*Figure 1. The preparation process of BC/CMC.*

**Keywords:** Bacterial cellulose, Biofilm, Carboxymethyl cellulose, Pineapple peel

## OPTIMIZATION OF THE EXTRACTION BIOACTIVE COMPOUNDS FROM RED CARDINAL GRAPE POMACE USING DEEP EUTECTIC SOLVENTS

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### Abstract

Grape pomace is the primary by-product of the wine and juice industry and has been reported to contain bioactive compounds. This research aimed to optimize the extraction of bioactive compounds from *Red Cardinal* grape pomace using choline chloride, glycerol, and citric acid-based deep eutectic solvents. Central composite design and response surface methodology were employed to optimize extraction conditions, including the solvent-to-material ratio (20:1 - 25:1, v/w), extraction temperature (60 - 70 °C), and extraction time (90 - 120 min). The optimum extraction conditions were determined to be a solvent-to-material ratio of 23.6:1 (v/w), an extraction temperature of 69 °C, and an extraction time of 142 min. Under these optimal conditions, total phenolic content, total saponin content, and total proanthocyanidin content in the resultant extract were validated as  $71.50 \pm 0.35$  (mg GAE/g DW),  $185.06 \pm 0.62$  (mg AE/g DW), and  $29.25 \pm 0.08$  (mg CE/g DW), respectively. The content of specific phenolic compounds was also determined using the HPLC method. Additionally, the optimal extract exhibited high antioxidant capacity and antimicrobial activity against the tested bacterial strains. The results demonstrated that *Red Cardinal* grape pomace extract could be a potential source of bioactive compounds for food preservation.

**Keywords:** bioactive compounds; choline chloride; deep eutectic; grape pomace; optimization

## A LOW EXTERNAL INPUT TOWARDS SUSTAINABLE AGRO-ECOLOGY FOR SMALL COCOA FARMS

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### Abstract

Although recognized for its premium quality, cocoa production of Vietnam is declining and profitability of small farms is a serious and growing challenge. Due to the small farm size, intercropping is not a good solution for income diversification. Inspired by a successful case study in Laos, the waste in the farm can be transformed to feed livestock, and the waste from livestock used as manure fertilizer for crops in the farm. Furthermore, animal manure and household wastes can be further processed through by black soldier fly to produce high quality fertilizers. This can apply to crops in the farm and boost their productivity while can reduce the use of expensive chemical fertilizers. The project objective was to increase income for small cocoa farms by combination of livestock and cultivation of cacao that can form ecologically sustainable farms with zero waste. Six small cocoa farms were selected as demo farms in Ba Ria – Vung Tau, Ben Tre and Vinh Long provinces. At each cocoa farm, a half of area was applied a low external input approach, the rest area as conventional farms. The results showed that demo farms were making progress in low external input with sustainable agro-ecology for cocoa production. Cocoa yield of demo farms has increased 50% compared to conventional farms. Waste from cocoa pod husk which fermented could be mixed to 60% of fermented feed for pig. The research has brought the great opportunity to diversify income effectively for cocoa farmers with an improvement probably up to 80%.

**Keywords:** cocoa production; cocoa farmers; low external input; small cocoa farms; sustainable agro-ecology

**THE EFFECT OF VITAMIN D3 (CHOLECALCIFEROL) ON IMMUNITY,  
EGG PRODUCTION, AND EGG QUALITY OF ARABIAN CHICKENS  
(*GALLUS TURCICUS*)**

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**Abstract**

The objective of the experiment was to determine the effect of vitamin D3 (cholecalciferol) on immunity, egg production, and egg quality of Arabian chickens (*Gallus turcicus*). The study utilized 120 female Arabian chickens at point-of-lay (4.5 months old). A completely randomized design (CRD) was employed for the experiment, following a one-way pattern. The level of research treatments was: D0 (control) with basal feed containing 0 µg of vitamin D3 per kilogram of feed, D1 with 20 µg, D2 with 40 µg, D3 with 60 µg, D4 with 80 µg, and D5 with 100 µg of vitamin D3 per kilogram (kg) of feed. Each treatment was repeated four times, and each battery cage unit was occupied by five (5) Arabian chickens. The observed variables included immunity levels, egg production, and egg quality. The analyzed results showed that vitamin D3 had a significant effect ( $P < 0.05$ ) on the red blood cell count and red blood cell levels in Arabian chickens but did not have a significant effect ( $P > 0.05$ ) on the age at first egg laying, hen day production (HDP), egg weight, egg volume, relative yolk weight, relative egg white weight, relative eggshell weight, and eggshell strength. In conclusion, the administration of vitamin D3 up to a level of 100 µg/kg of feed improved immunity but did not significantly enhance/increase egg production and quality.

**Keywords:** cholecalciferol; calcitriol; ferroportin; red blood cells; arabian chickens

## IDENTIFICATION OF A YET-TO-BE DISCOVERED GENE ASSOCIATED WITH SOUTHERN ROOT-KNOT NEMATODE RESISTANCE AND PRODUCING TRANSFORMANTS FOR FUNCTIONAL ANALYSIS

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### Abstract

Southern root-knot nematode (SRKN) is the major pest for damaging sweetpotato production and yield. However, since resistant cultivars to the SRKN are limited, the development of sweetpotato cultivars with SRKN resistance has been required. In order to develop resistant cultivars effectively, it is necessary to identify gene(s) with SRKN resistance and understand the mechanism for the resistance. Previously, we detected quantitative trait locus (QTL) controlling SRKN resistance by QTL analysis and genome-wide association study using the F1 mapping population derived from resistant cultivar “J-Red” and susceptible cultivar “Choshu” (Sasai *et al.*, 2019). In addition, we performed an RNA-seq based transcriptome analysis to understand the mechanism for the SRKN resistance in sweetpotato. Eventually, we identified a novel candidate gene controlling SRKN resistance. In this study, we analyzed the detailed sequence of this candidate gene to identify a causal mutation associated with SRKN resistance. As a result, only the allele of “J-Red” including 17 SNPs and a deletion of 60bp was predicted to have an RX-CC like domain, which indicated that this allele derived from “J-Red” might be a putative functional allele. In the promoter region of this gene (<1kb), four cis-regulatory elements were detected only in “J-Red”. In addition, we tried to produce transformants for functional analysis of the candidate gene. The transformants were produced using susceptible cultivar “Hana-ranman” and the candidate gene was driven by CaMV35S promoter. Moreover, culture conditions were investigated to perform genome editing in “J-Red”.

**Keywords:** sweetpotato; southern root-knot nematode; resistance; transformation

## APPLICATION OF SACCHAROMYCES BOULARDII CELLS IN YOGURT

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### Abstract

This research was to study the application of *Saccharomyces boulardii* cells in yogurt to reach a live cells density of  $\geq 10^6$  (cfu/g). *S. boulardii* cells were prepared in YMA agar at 30°C for 48 hours. *Lactobacillus bulgaricus* and *Streptococcus thermophilus*, used as starter cultures for yogurt preparation, were isolated and cultivated under anaerobic condition in MRS agar at 37°C for 72 hours and in M17 agar at 37°C for 48 hours, respectively. Results showed that the presence of *S. boulardii* cells significantly had no effect on the growth of lactic acid bacteria and vice versa. In addition, the presence of yeast cells applied did not affect the fermentation parameters including time and the content of lactic acid accumulated in the prepared yoghurt. However, at the cells density of  $\geq 10^7$  (cfu/g), *S. boulardii* might cause bubble-structure and alcohol-flavour to the yogurt due to CO<sub>2</sub> and C<sub>2</sub>H<sub>5</sub>OH production. With fermentation temperature of 43°C, yeast cell concentration reduced by approximately 1 log after 4.5 hours of fermentation. Results on the survivability of *S. boulardii* cells in the produced yogurt sample through the exposure in simulated gastric fluid showed that yeast cell concentration significantly reduced 42–43% after 30 minutes of the exposure; however, in simulated intestinal fluid, the concentration of yeast cells increased significantly, while that of the free cells without yogurt continued to be decreased. The results also revealed that the yogurt with yeast cells addition remained good quality after 15 days of storage.

**Keywords:** *S. boulardii*; yeast cells; yogurt; fermentation; survivability

## ASSESSMENT OF COMBINE HARVESTERS USED IN RICE PRODUCTION IN MEKONG DELTA, VIETNAM

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### Abstract

Mekong Delta is considered as the rice granary of Vietnam with an annual production of 24.2 million tons. With the rapid development on agricultural mechanization, harvesting was one of the processes that was mechanized. Over the past decade, the adoption and advancement of combine harvesters in the region been swift. In the face of growing competitiveness, the imperative to establish bestpractices for combine harvesters becomes increasingly necessary. Thus, a comprehensive study was conducted incorporating surveys and field tests to assess both technical performance and economic feasibility. The result of the study showed that the average size of rice field in the region ranges from 0.77 to 1.62 hectares per plot, with plots spanning 0.5 – 1.0 hectares and 1.0 – 1.5 hectares constituting 18.9% and 25.9%, respectively. The average effective field capacity of combine harvesters was 0.62 hectares per hour, displaying a notable variability from 0.29 to 1.00 hectares per hour. Total losses attributed to the combine harvester is  $2.7 \pm 0.49\%$  coupled with a 0.4% scattering loss before harvesting, depending on the condition of the crop and the field. The study found out that the application of combine harvesters, coupled with proper operation and maintenance practices contributed to mitigating grain losses, reducing harvesting cost, and addressing labor shortages during the crucial harvesting period in Mekong Delta region in Vietnam.

**Keywords:** mechanization; combine harvester; field capacity; field size; reliability; grain losses; cost-benefit

## DEVELOPMENT OF SUGARCANE TRANSPLANTER FOR THE SUSTAINABLE AGRICULTURAL MECHANIZATION

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### Abstract

The Mekong Delta, a critical region for aquaculture in Vietnam, has experienced significant advancements in mechanization, contributing to increased productivity and sustainability. This survey research investigates the current state of aquaculture mechanization in the Mekong Delta provinces, including Ca Mau, Soc Trang, and Tra Vinh, examining its impact on production efficiency, labor dynamics, and environmental sustainability. Research collects data through in-depth interviews, field observations, and analysis of secondary sources, encompassing a diverse range of aquaculture operations for different species, including shrimp, catfish, and others. Findings indicate that mechanization has substantially improved feed management, water quality control, and harvesting processes, enhancing overall production yields. Adopting automated feeders, aeration systems, and advanced water filtration technologies has reduced labor dependency and operational costs while mitigating environmental impacts such as water pollution and resource depletion. However, the survey also identifies several challenges, including high initial investment costs, technical skill gaps among farmers, and varying levels of technology adoption across different farm sizes and types. The study underscores the crucial role of supportive government policies, financial incentives, and targeted training programs in promoting the widespread adoption of mechanization in the region. It is in the hands of policymakers to create and implement these policies and programs, thereby empowering them to shape the future of aquaculture in the Mekong Delta. Furthermore, the study highlights the need for ongoing research and development to tailor mechanization technologies to local conditions and address small-scale farmers' specific needs. By fostering a more mechanized aquaculture sector, the Mekong Delta can enhance its resilience, sustainability, and competitiveness in the global market, ensuring long-term economic and environmental benefits for the region.

**Keywords:** Aquacultural mechanization; sustainable development; Mekong Delta; aquaculture



## ENHANCING AGRICULTURAL PREDICTIVE MODELING THROUGH DATA AUGMENTATION AND ADVANCED DEEP LEARNING TECHNIQUES

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### **Abstract**

In the field of agricultural data analysis, achieving high quality in predictive modeling remains a significant challenge due to the inherent variability and complexity of agricultural datasets. This study delves into cutting-edge to enhance model performance through data augmentation techniques and the application of advanced deep learning models to artificially enlarge the training dataset, thereby improving model generalizability and robustness. Additionally, we evaluate the efficacy of state-of-the-art models (i.e., Casling-ViT, XCiT, ResNet, ConvNet) for agricultural data analysis. The experimental results reveal a marked improvement in terms of prediction accuracy and F1-Score. This underscores the potential of these techniques to significantly advance the field of agricultural informatics. The findings contribute to the development of more reliable and high performance models in agricultural practices.

**Keywords:** agricultural informatics; agricultural datasets; ViT; CNN

## MODELLING RESEARCH ON FRESH PADDY AERATION ON TRANSPORTING BARGES IN MEKONG DELTA, VIETNAM

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### Abstract

Mekong Delta is considered as a granary of Vietnam with an annual production of 23.8 million (2023). Currently, fresh paddy after harvesting is transported from farmers' fields directly to drying farms' rice mills. With a multi-river and canal system in the Mekong Delta, most of the paddy (up to 92%) is transported by barges. Although transporting by barge has lower costs (400-450 VND/ton/km) than transporting by truck, it has major disadvantages such as transporting time lasting from 3 to 5 days. Furthermore, because the paddy being transported is wet, the paddy is often yellowed, reducing its quality, and causing loss in quality. Thus, this research was conducted with an experimental model of paddy aeration, as a basis for developing paddy aeration on barges during transportation. The model was conducted with an amount of 1.4 tons of fresh paddy, a variety of DT80 at Cai Lay, Tien Giang Province. Parameters were monitored and analyzed including temperature and moisture content of paddy, ambient conditions, and grain quality. The model was tested with a specific airflow rate of  $129 \pm 23$  m<sup>3</sup>/h/ton. The temperature of paddy in the model with aeration is 28.8 0C, which is similar to the ambient temperature of 28.3 0C. As result, the whiteness of the paddy with aeration is maintained at 3.6% after three-day aeration, while it reduced from 3.6 to 3.2% for the paddy on a barge without aeration. This result shows that the application of aeration will contribute to reducing quality losses because the paddy on the barges does not become yellow, which is due to the fresh paddy getting high temperatures during transportation.

**Keywords:** fresh paddy; aeration; transporting barges; grain quality; losses

## VIET NAM AGRICULTURAL ENGINEERING TOWARDS THE SMART AGRICULTURE

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### Abstract

The World Bank states “Viet Nam’s shift from one of the poorest in the world into a lower middle-income country.” One of the main contributions to achieving this result is agricultural production. Indeed, Vietnam is still one of the agricultural countries with more than 50.54 % of the population living in rural areas equals nearly 50 million. There have more than 63.34 % of the total workforce above 15 years old is engaged in agriculture directly or indirectly. Agriculture is one of the most important primary industries in Vietnam that takes account 12% of Vietnam’s GDP in the year 2022. However, the productivity of the farmer and the quality of agricultural productions are still at lower levels than the ones of some countries in Asia. The level of agricultural mechanization is still at a low level. The key factors of this situation are the low technology adoption and low productivity. Recently, agricultural mechanization and automation have been combined to apply in agricultural production which is named “agrimation” or “smart agriculture”. The support from advances in technologies like sensors, Internet of Things (IoT), blockchain, computer, big data, artificial intelligence (AI), automation, robotics, and unmanned aerial vehicles(UAV), etc... are the solutions for agricultural engineering towards the modernization and urbanization in Vietnam. In this paper, which direction for Viet Nam agricultural engineering, how they should be oriented, and what should be done respectively is discussed. The future aspect is prospected and the concept proposed based on the discussion is also presented.

**Keywords:** agricultural engineering; agrimation; precision agriculture; smart agriculture

## OPTIMIZATION OF TECHNOLOGICAL PARAMETERS OF AUTOMATIC QUAIL EGGS PEELING MACHINE

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### Abstract

The objective of the experiment was to determine the optimal operating parameters of the automatic quail egg peeling machine model in food production and processing facilities, such as bakeries and restaurant kitchens. Optimizing the automatic quail eggshell peeling machine to achieve the best eggshell peeling rate, lowest egg damage rate, and food safety and hygiene. Based on the automatic quail egg peeling machine model was manufactured, using the experimental design method with a “black box” model and statistical analysis using the method of linear regression. The study has determined two quadratic regression equations describing the influence of working parameters including the velocity of peeling shaft pairs ( $v$ , m/s) and the frequency of pressing and holding eggs ( $t$ , times/minute) on the technical indicators of the peeling process, namely the egg peeling rate ( $y_1$ , %) and the egg damage rate ( $y_2$ , %). The optimization problem was solved using a random algorithm and direct search. The optimal operating parameters and criteria for the automatic quail eggshell peeling process have been determined: the maximum egg peeling rate  $y_{1\max} = 96.98\%$  and the minimum egg damage rate  $y_{2\min} = 5\%$  with the velocity of peeling shaft pairs of 0.12 m/s and the frequency of pressing and holding eggs of 63 times/minute.

**Keywords:** peeling; friction; quail eggs; peeling speed; peeling rate

## EFFECTS OF TEMPERING ON MICROSTRUCTURE, MECHANICAL PROPERTIES AND APPEARANCE IN NON FERMENTED COCOA IN VIET NAM

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### Abstract

The chocolate tempering process based on non fermented cocoa in Vietnam is studied. The experiment is developed to enhance the understanding and the control of the process. This study aims to predict temperature field during melting and crystallization of the product. The heat transfer problem is simplified by using an effective thermal water conductivity for experiments. The pre-crystallization process has a strong impact on the quality of last product by temperature. Over-tempering caused significant increases in product hardness and stickiness of product surfaces. Under-tempering induced in products with consequential quality defects on texture, colour and surface smooth. The resulting experiment gives an accurate prediction of the cooling rate and the temperature field of chocolate from non fermented cocoa in Vietnam.

**Keywords:** Chocolate; tempering; microstructure; crystallization

## UTILIZING AGRICULTURAL RESIDUES FOR RENEWABLE ENERGY AND ENVIRONMENTAL REMEDIATION IN DEVELOPING COUNTRIES

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### Abstract

In many developing countries, agricultural residues are frequently burned or discarded, leading to severe environmental pollution and adverse health effects. This study explores the potential of utilizing agricultural residues as a renewable energy source to partially replace fossil fuels, thereby meeting energy demands and mitigating pollution. We evaluated the characteristics of various agricultural residues, including macadamia shells, straw, durian shells, and bamboo. Our results indicate that these residues possess low ash and volatile matter content, along with low biomass content, highlighting their significant potential for use as gasification fuels to produce energy. Particularly, straw, with its high annual yield, stands out as a viable option. Additionally, the biochar, a by-product of the gasification process, demonstrates high efficiency and effectiveness in removing the antibiotic oxytetracycline (OTC) from water after activation. This finding underscores the dual benefits of this approach: not only does it offer a sustainable energy solution, but it also provides an effective means of water purification. Overall, this research supports the viability of converting agricultural residues into valuable energy resources and environmental remediation adsorbents, contributing to sustainable development in developing regions.

**Keywords:** agricultural residues; biochar; OTC

## EXPERIMENTAL STUDY ON DRYING NON-FERMENTED CACAO BEANS USING DRUM DRYING AND SOLAR GREENHOUSE DRYING METHODS

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### Abstract

Cacao beans are rich in polyphenols, which have anti-inflammatory and antioxidant properties. During traditional cacao processing, most polyphenols are degraded, primarily due to fermentation and drying processes. Nowadays, non-fermented cacao is frequently used as an additive in food, dietary supplements, and beauty products because of its high polyphenol content. In this study, a drum dryer and a solar greenhouse dryer were utilized to dry non-fermented cacao beans under various drying conditions to determine the effect of the drying process on drying time and cacao bean quality. Results indicated that reducing the moisture content of fresh cacao beans from 61% to below 6% using the drum dryer took approximately 28 hours at 50°C and 32 hours at 60°C. When using the solar greenhouse dryer, the moisture content of the cacao beans decreased from 61% to 16±1%, 13±1%, 10±1%, 8±1%, 7±1%, 6±1%, and 5±1% after 1, 2, 3, 4, 5, 6 and 7 days of drying, respectively. The additional drying time required with the drum dryer after initial drying in the solar greenhouse dryer for 2, 3, 4, and 5 days was 16 hours, 12 hours, 6 hours, and 4 hours, respectively.

**Keywords:** Non-fermented cocoa beans; drum drying; solar greenhouse drying; hybrid drying

**SESSION 4**

**RECENT ADVANCES IN ANIMAL  
BIOSCIENCE AND SUSTAINABILITY**



## FISH DIVERSITY OF DAU TIENG LAKE: AN UPDATED FISH SPECIES COMPOSITION AND FISH CATCH ASSESSMENT WITH FISHING GEARS

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### Abstract

Dau Tieng lake is the largest irrigation reservoir in Vietnam with a very important role in supplying clean water for the development of socio-economic sectors of the provinces of Tay Ninh, Binh Duong, Long An and Ho Chi Minh City. It is also considered the high level of biological diversity and conservation area for aquatic animal. The aim of this study was to update fish species composition distributed in Dau Tieng lake and assess fish catch by several main fishing gears. For more than one year of sampling (from November 2021 to December 2022), a total of 82 species and was identified belonging to 11 orders and 27 families. Cypriniformes is the most diverse order with 27 species accounting of 32.9%, followed by the Siluriformes with 20 species (24.4%) and Perciformes with 17 species (20.7%). Among them, there were 3 threatened species in Red Book of Vietnam (2007); 52 commercial species, 5 species used as ornamental fish. The result indicated that the highest CPUE (Catch per unit effort) with 14 tons per year of Lift net, followed by Trammel net with 7.2 tons per year and Drift gillnet with 5.6 tons per year.

**Keywords:** Fish species composition; biological diversity; fishing gears

## WATER VELOCITY REGULATION FOR FRESHWATER GIANT PRAWN MIGRATION AT PHUOC HOA FISH-PASSAGE

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### Abstract

Research content includes: (1) Survey on the current management status of fish-passage in Phuoc Hoa dam; (2) Hydraulic experiments to monitor the rate and speed of freshwater giant prawn (*Macrobrachium rosenbergii*) passing through open water channels at different water velocities; (3) Assess the possibility of migrating through fish-passage based on the prawn's biological characteristics and propose a water velocity management regime at Phuoc Hoa dam. The results of the survey show that the fish passage has high water velocity at some time, resting pools arrangement is not reasonable, the water depth and bottom are not suitable for the prawn to migrate. Experiments to monitor the ratio and passing speed of prawn were carried out on two sizes of prawns: 7.5-9.5 cm (size I) and 13.5-15.5 cm (size II), with 18 m long water velocity channel and three water velocity levels (0.3, 0.6 and 0.9 m/s) under hydraulic laboratory conditions. Monitoring results of the rate of prawn moving through the 18 m long channel in 10, 20 and 30 minutes at water velocity of 0.3 m/s are 13.33, 68.33, 94.17% for prawn size I, respectively; and 21.66, 76.00, 98.33% for prawn size II; at water velocity of 0.6 m/s are 2.50, 50.83, 79.16% respectively for prawn size I; and 9.16, 61.66, 90.83% for prawn size II; at a water velocity of 0.9 m/s, the rate of prawn moving through the 18 m long channel is 0%. The speed of prawn passing through the 18 m long channel at water velocity of 0.3 and 0.6 m/s is 1.15 and 0.92 m/min, respectively, for prawn size I; 1.18 and 0.96 m/min for prawn size II, showing that prawn sizes I and II require a minimum of 11.81 and 11.51 hours, respectively, at water velocity of 0.3 m/s; 14.76 and 14.15 hours at a water velocity of 0.6 m/s to passing between the furthest resting pools of Phuoc Hoa fish-passage. The results of evaluating the biological characteristics of prawn show that it has instinctive migration motivation, movement, nutrition and reproductive habits suitable for moving through the fish-passage if designed appropriately. The results of the study are practically related to Phuoc Hoa fish-passage with the proposed operating mode of water velocity of 0.6 m/s and adding resting pools along fish-passage to increase the efficiency of prawn moving through Phuoc Hoa fish-passage.

**Keywords:** Fish-passage; Freshwater giant prawn; Phuoc Hoa; Water velocity.

**BIOCHEMICAL COMPOSITION OF THE MUD CRAB *SCYLLA PARAMAMOSAIN* (ESTAMPADOR, 1949) FATTED IN THE RECIRCULATING WATER SYSTEM**

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**Abstract**

The meat yield, biochemical compositions of muscles, and hepatopancreas of mud crab (*Scylla paramamosain*) fatted in a recirculating water system were compared concerning molting stages, gender, and kinds of fresh diet. The juvenile crabs (100-200g of body weight) under the postmolt stage were reared into the recirculating water system and fed with two kinds of fresh diet (bivalve and tilapia meat). As the crab developed from the postmolt stages into the intermolt and premolt stages, they would be harvested and analyzed for their biochemical components. The results showed that meat yield from the legs-claws muscle of male crabs was higher ( $P < 0.05$ ) than that of females, and hepatopancreas of crabs under the premolt stage was also accumulated higher ( $P < 0.05$ ) than those of crabs under the intermolt stage. In terms of molting stages, the moisture content in muscles and hepatopancreas of crabs under the premolt stage was lower ( $P < 0.05$ ) than those of crabs under the intermolt stage, Fe content in hepatopancreas was the same result too ( $P < 0.05$ ). Conversely, protein and lipid contents in legs-claw and hepatopancreas, Mg content in body and legs-claw muscles, and K content in legs-claws and hepatopancreas of crab under the premolt stage were higher ( $P < 0.05$ ) than those of crabs under the intermolt stage. For the gender aspect, lipid contents in body muscle and hepatopancreas, P content in the legs-claw and hepatopancreas, and K content in the leg-claw muscle were higher ( $P < 0.05$ ) in females than in males. In comparison, the ash content in body muscle and Fe content in the hepatopancreas of male crabs were higher ( $P < 0.05$ ) than in the females. Regarding diet, crabs fed on a fresh bivalve would accumulate ash in body muscle; Ca, Mg, and P contents in hepatopancreas were higher than those of crabs feeding fresh tilapia. The results illuminate the possibilities for both consumers and processors to correctly select the molting stages, gender, and kind of meat source to cater specifically to their requirements.

**Keywords:** biochemical compositions; fresh diet; gender; molting stages; mud crab

## ANTIFUNGAL POTENTIAL OF HERBAL EXTRACTS AGAINST FUNGAL STRAINS ISOLATED FROM LICHEN-LIKE STRUCTURE IN WHITE-LEGGED SHRIMP PONDS

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### Abstract

The study aims to evaluate the antifungal ability of some herbal extracts that can resist some fungal strains isolated from lichen-like structure samples appearing in white-legged shrimp ponds. A total of 20 screened herbal extracts originating in Vietnam were evaluated *in vitro* using the method with percent inhibition of radial growth (PIRG). In this study, isolated fungal strains were morphologically identified and sequenced in the ITS and LSU gene regions belonging to the strains *Fusarium* sp., *Aspergillus* sp., *Trichoderma* sp., *Curvularia* sp., and *Rhizopus* sp. that are pathogenic on plants. Research results have found that 03 types of herbal extracts were found, including *Piper betle*, *Terminalia catappa*, and *Allium tuberosum* can resist 05 fungal strains at concentrations from 5 - 10 mg/mL with PIRG > 65% ( $P < 0.05$ ). Research results show that there are 2 fungal strains belonging to *Furisium* sp. and *Aspergillus* sp. capable of causing over 80% mortality of white-legged shrimp at a spore density of  $5.0 \times 10^6$  conidia/mL and show signs of loose intestines (white feces syndrome, WFS). The potential for applying herbal extracts to treat lichen-like structures is entirely possible, aiming at biosecurity and sustainable farming.

**Keywords:** antifungal; fungi; herbal extract; lichen-like structure

## TOTAL MIXED RATION (TMR) BASED ON ALKALINE-TREATED RICE STRAW IMPROVES GROWTH RATE AND FEED INTAKE OF SINDHI CROSS-BRED CATTLE

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### Abstract

The purpose of the current study was to evaluate effects of total mixed ration (TMR) based on alkaline-treated rice straw in a basal diet using soybean meal and dried brewer's malt on growth performance and feed consumption of Sindhi cross-bred cattle. A total of 36 cows at 9 months of age were randomly assigned to four treatments in a 2x2 factorial arrangement (feeding methods (FM): traditional feeding method (TF) as forages and concentrate feeds were fed separately versus TMR method (TMR); rice straw treatments (RST): untreated rice straw (UT) versus alkaline-treated rice straw (AT)). Four treatments (9 cows/treatment raised individually and fed *ad libitum*) included (1) TFUT; (2) TFAT; (3) TMRUT and (4) TMRAT, and the study lasted 3 months. Body weight (BW) of cows at the beginning time was almost equal ( $P>0.05$ ) among four treatments. The results showed that BW, average daily gain (ADG) and feed consumption of cows fed by the TMR were significantly improved ( $P<0.05$ ) as compared to the TF. Furthermore, BW, ADG and feed intake of cows were also improved ( $P<0.05$ ) in AT group in comparison with the UT. There were significant interactions between the FM and RST ( $P<0.05$ ) during experimental period. Therefore, cows fed daily diets in the TMRAT had a greater BW and ADG as well as a lower dry matter intake (DMI) than those fed the diets in the other groups ( $P<0.05$ ) although there were no significant differences ( $P>0.05$ ) in prevalence of digestive disease among four groups. In brief, these findings suggest that TMR based on alkaline-treated rice straw seems to improve the growth rate and feed consumption of Sindhi cross-bred beef cows.

**Keywords:** alkaline-treated rice straw; total mixed ration; intake; daily gain; beef cattle

**GROWTH PERFORMANCE OF CROSSBRED CATTLE BETWEEN WAGYU BULL WITH RED ANGUS CROSSBRED COWS (RED ANGUS X BRAHMAN CROSSBRED) AND CHAROLAIS CROSSBRED COWS (CHAROLAIS X BRAHMAN CROSSBRED) FROM BIRTH TO 12 MONTHS OF AGE**

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**Abstract**

This study aims to compare the growth performance of crossbred cattle between Wagyu bull with Red Angus crossbred cows (Red Angus x Brahman crossbred)-WAB and Charolais crossbred cows (Charolais x Brahman crossbred)-WCB. The experiment carried out at Ruminant Research and Development Center, Binh duong province from March 2023 to April 2024. A total of 80 newborn calves was divided into two groups with included 40 heads of the Wagyu x (Red Angus x Brahman crossbred)-WAB and 40 heads of the Wagyu x (Charolais x Brahman crossbred)-WCB. All diets for crossbred calves according to NRC standards (2016). The trial lasted for 12 months. The results showed that average weight of WCB was higher than the average weight of WAB from birth to 6<sup>st</sup> month of age ( $P < 0.05$ ). At 12<sup>st</sup> month of age, the weight of WAB was 288.6 kg and he weight of WCB was 297.1 kg. The gain weight of WAB and WCB from birth to 12<sup>st</sup> month of age were 710.7 and 731.2 g/head/day, respectively. In summary, weight gain of WCB was higher than weight gain of WAB by crossbred with Waygu breed.

**Keywords:** Wagyu crossbred; growth performance; feed conversion rate

## UTILIZING SHRIMP HEADS AND SHELLS AS PROTEIN-RICH INGREDIENTS IMPROVES THE GROWTH PERFORMANCE AND HEALTH OF FATTENING PIGS FROM 96 TO 164 DAYS OF AGE

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### Abstract

The study was conducted at the pig farm in Vinh Khanh commune, Thoai Son district, An Giang province from August to October 2023. The experiment aimed to assess the effects of dietary supplementation of shrimp heads and shell on growth and diarrhea rate of fattening pigs. A total of 90 crossbred grower pigs (DPYL) were assigned to 3 treatments with 5 replicate pens of 6 pigs in the RCBD experiment. The 3 dietary treatments included (1) Control basal diet (PC), (2) Basal diet plus shrimp heads meal (SHM) (CPT), (3) Basal diet plus shrimp shells meal (SSM) (CTS). The results show that the diets supplemented with shrimp heads meal and shrimp shells meal have positive impacts on the feed conversion rate (FCR):weight gain (WG) ratio. Particularly, the F:G ratio in treatment supplied with shrimp heads meal with 2.98 is the lowest compared to that with shrimp shells meal with 3.03 and the control treatment with 3.01 ( $P=0.047$ ). Besides, in the second stage (135 days of age - slaughter), the average feed intake in the diet supplement with the meal of shrimp heads and shells was lower than the control treatment ( $P<0.01$ ). However, there was no significant difference between three treatments on average weight ( $P>0.05$ ). Similarly, the average daily weight gain in the three treatments included C, CPT, and CTS was 726.8, 751.2, and 772.6 g/pig/day, respectively with  $P>0.05$ . Briefly, the addition of shrimp head meal and shrimp shell meal to the diet for fattening pigs slightly decreased the rate of diarrhea compared to the remaining treatment ( $P>0.05$ ).

**Keywords:** Shrimp heads and shells; feed to gain ratio; diarrhea, fattening pigs

## THE EFFECT OF LOCAL CHICKEN LINES AND PHYTOBIOTICS SUPPLEMENTATION ON BODY WEIGHT AND LYMPHOID ORGANS

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### Abstract

This study aimed to determine the interaction between the line of local chickens and phytobiotics on body weight and the percentage of lymphoid organ weight. The research material consisted of Kampung, KUB, and Kedu chickens, a total of 480 birds; basal feed and phytobiotics consisted of basal/control feed, basal feed + 1% sambiloto, basal feed + 1% garlic, and basal feed + 1% kalimun. The experiment used a completely randomized design factorial pattern. Data were analyzed using the analysis of variance. The results of the analysis of variance showed that the interaction between local chicken lines and immunomodulatory feeds showed no significant effect ( $P>0.05$ ) on body weight and percentage of lymphoid organ weight of local chickens. The chicken line had a significant effect ( $P<0.05$ ) on body weight and percentage of thymus and Bursa of Fabricius weights. Supplementation of 1% phytobiotics had a very significant effect ( $P<0.01$ ) on the body weight of the local chicken. It was concluded that there was no significant interaction between local chicken lines and immunomodulatory feeds on body weight and percentage of lymphoid organ weight. KUB chickens have a higher lymphoid organ than Kampung and Kedu chickens. Supplementation with 1% sambiloto reduced the body weight of local chickens.

**Keywords:** growth; local chicken; lymphoid organ; phytobiotics



## THE ROLES OF MACROPHAGE ON EARLY PHASE OF PATHOGENESIS IN *EIMERIA TENELLA* INFECTION

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### Abstract

The aims of this study are to evaluate the immune status of chick cecum under the macrophage depleted condition in the early periods of *Eimeria tenella* infection and to understand the roles of macrophage. A total of 24 chicks were divided into two groups: Mf (-) group; macrophage depletion by carrageenan intraperitoneal injection in 12-, 13-, and 16-days post hatch. Control (CT) group; treated with PBS. Both groups were orally inoculated with sporulated oocysts of *E. tenella* at 14 days old. Three chicks in each group were sacrificed at 0-, 1-, 3-, and 5-days post-infection to collect cecum sections for histopathological observation and gene expression analysis. There was no statistical difference in histological observation at 0 and 1 dpi in both groups ( $P > 0.05$ ). Meanwhile, lesion score was significantly lower in the carrageenan group ( $1.09 \pm 0.08$  at 3 dpi and  $3.15 \pm 0.06$  at 5 dpi) than CT group ( $1.59 \pm 0.08$  and  $3.5 \pm 0.04$ , respectively). The parasite burden scores between two groups have statistical differences, which were  $0.13 \pm 0.07$  and  $3.7 \pm 0.09$  in Mf (-) group;  $0.67 \pm 0.14$  and  $4 \pm 0.00$  in CT group at 3 dpi and 5 dpi, respectively. These results suggest that macrophages in cecum have important roles in both parasite proliferation and the formulation of early immune status. Further evaluation at the molecular level is underway by analyzing the expression levels of cytokines and immune effector molecules by qRT-PCR.

**Keywords:** carrageenan; *Eimeria tenella*; lesion score; macrophage; qRT-PCR

## THE INFLUENCE OF 5-AMINOLEVULINIC ACID SUPPLEMENTATION TO CECAL MICROBIOTA COMPOSITION IN LAYING HEN INFECTED WITH *EIMERIA TENELLA*

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### Abstract

The aim of this study was to evaluate the compositional changes of cecal microbiota in *Eimeria tenella* infected chicks by 5-aminolevulinic acid (5-ALA) supplementation. Chicks (n=20, White Leghorn) were divided randomly in two groups: CT; control group, 5-ALA; 5-ALA 20 ppm supplemented chick group. Chicks in 5-ALA supplemented groups were started to administer at 7 days old. On day 14 after hatching, chicks from both 5-ALA and CT groups were further divided into two groups. One group of chickens in each group was inoculated with *E. tenella* oocysts (*E. tenella* OPU strain, 2,500 sporulated oocysts/chick) at 14 days old. Cecal contents from all groups were collected at 5 days post infection for the NGS analysis of microbiota composition. Comprehensive base sequences were collected by next generation sequence analysis targeted 16s rRNA V4 region. Denaturing gradient gel electrophoresis (DGGE) were also performed to observe the cecal bacterial changes, especially lactic acid bacteria. PCR products of cecal contents amplified by nested PCR were used as samples for DGGE analysis. The results of Taxonomy analysis showed the relative abundance of family *Lactobacillaceae* increased in *E. tenella*-infected groups by 5-ALA supplementation. The result of DGGE analysis showed several notable bands, and that three bacteria, *Limosilactobacillus fermentum*, *Lactobacillus delbrueckii*, and *Weissella paramesenteroides*, were detected. These results suggest that 5-ALA supplementation leads to increase the relative abundance of lactic acid bacteria in the cecum of chicken infected with *E. tenella*, and that this phenomenon is possible to be one of mechanisms of action of 5-ALA.

**Keywords:** 5-aminolevulinic acid; Cecal microbiota; *Eimeria tenella*; lactic acid bacteria; Laying hen

## RELATION BETWEEN PENTOSE PHOSPHATE PATHWAY ACTIVITY ACCORDING TO FOLLICLE SIZE AND MEIOTIC AND DEVELOPMENTAL COMPETENCE OF PORCINE OOCYTES

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### Abstract

The objective of this study was to evaluate the relation between pentose phosphate pathway activity, which was determined by brilliant cresyl blue (BCB) staining, and meiotic/developmental competence of porcine oocytes derived from different follicular sizes. Oocytes derived from MF (medium follicles with 3-6 mm in diameter), SF (small follicles with 1-3 mm in diameter), and VSF (very small follicles with less than 1 mm in diameter) were collected. There was a difference in the oocyte diameter of BCB+ and BCB- oocytes derived from SF and VSF. Furthermore, the number of CCs per BCB+ COCs in MF and SF was significantly larger than that of BCB- counterparts. The NADPH level was not significantly different between BCB+ and BCB- oocytes in each follicular size, but that of MF-derived oocytes was significantly higher than SF- and VSF-derived those. After BCB staining, the GSH level of BCB+ oocytes reduced significantly while the ROS level recovered suddenly compared to BCB- oocytes and control groups in each follicular size. The meiotic competence of BCB+ oocytes showed the significant superiority in all three different follicular sizes, as compared with BCB- ones. The blastocyst formation rate of MF-derived BCB+ oocytes was the highest, while VSF-derived BCB- oocytes were incapable of forming blastocyst after parthenogenetic activation. In conclusion, although there is a tendency to increase ROS production after BCB staining, we found that COCs with a relative low PPP activity show superior meiotic and developmental competence.

**Keywords:** BCB; in vitro maturation; oocytes; pigs; pentose phosphate pathway activity

## ABNORMAL REPRODUCTIVE DISORDERS INCREASING IN BREEDING PIG HERDS WITH THE INVOLVEMENT OF NOVEL PATHOGENS

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### Abstract

Reproductive disorders in swine herds pose significant challenges to pig breeding, with both infectious and non-infectious factors contributing to these issues. In the context of modern, large-scale pig farming, co-infections are becoming more prevalent, impacting sow health and overall herd productivity. This study investigates the prevalence of key pathogens in farms experiencing reproductive disorders in Vietnam. A total of 216 samples were collected from 9 farms, encompassing whole blood, and various tissues from fetuses and weak-born piglets. PCR/RT-PCR/Realtime-PCR techniques were employed to detect pathogens, including porcine circovirus type 3 (PCV3), *Mycoplasma suis* (*M. suis*), and others. Results revealed a high prevalence of *M. suis*, PCV3, with co-infection rates of PCV3 and *M. suis* reaching 31.94%. Notably, other major reproductive disorder pathogens such as African swine fever virus (ASFV), classical swine fever virus (CSFV), porcine circovirus type 4 (PCV4), and others were absent or detected at low rates. Genetic analysis confirmed the consistent presence of PCV3b genotype strains. The study highlights the need for increased attention to *M. suis*, its high prevalence in reproductive disorder farms, and the significant co-infection rates with PCV3. This is the first report on the prevalence of these pathogens in Vietnam, raising questions about their combined impact on swine reproductive health and emphasizing the importance of further research in this critical area.

**Keywords:** co-infection; important pathogens; reproductive disorders; pigs

## THE CHANGE OF CELLULAR POPULATION OF BOVINE OVIDUCTAL FIMBRIAE EPITHELIAL CELLS DURING THE ESTROUS CYCLE

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### Abstract

Oviduct divided into three parts: fimbria, ampulla and isthmus. Epithelia of the oviduct are composed by ciliated cells and non-ciliated cells. Our previous studies showed that the proportions of ciliated and non-ciliated cells are changed during the estrous cycle for regulating ciliogenesis in ampulla and isthmus, however, the mechanism of ciliogenesis in fimbriae is not well understood. In the present study, the proportions of ciliated and non-ciliated cells in fimbriae are investigated during the estrous cycle. Bovine oviducts were fixed and sections were prepared. Ki67(a marker of proliferative cells), acetylated- $\alpha$ -tubulin (a marker of cilia), FOXJ1 (a marker of ciliogenesis), PAX8 (a marker of non-ciliated cells) and ODF2 (a marker of the root of cilia) were used for immunohistochemistry. After a length approximately 1 mm of the epithelium was randomly selected along the basement membrane, coverage rate of cilia (AcTUB) and number of cell (Ki67, FOXJ1, PAX8 and ODF2) were measured. The result show that the number of Ki67+ and FOXJ1+ cells were significantly increased ( $p < 0.05$ ) in stage IV than the other three stages, The coverage rate of AcTUB+ cells was significantly increased ( $p < 0.05$ ) in stage I and IV. In the base of epithelia, the number of ODF2+/FOXJ1+ cells were doubled from stage III to stage IV. These results suggested that ODF2+/FOXJ1+ cells were significantly increased in basal area of epithelia around the ovulation to enhance the ability of capture oocyte, and it may also support the increase of ciliated cells in stage IV.

**Keywords:** bovine; ciliogenesis; estrous cycle; non-ciliated cells; oviductal fimbriae epithelium

## PORCINE MODEL OF SEPTIC SHOCK WITH PROLONGED RESUSCITATION USING PSEUDOMONAS AERUGINOSA INFUSION

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### Abstract

Fluid overload is a major issue in critical care, especially during sepsis treatment. Its evaluation in an experimental model requires prolonged care and fluid resuscitation. The objective of the study was to develop a translational porcine sepsis model with positive fluid balance over a 24-hour period. A total of 15 female *Landrace* pigs ( $58 \pm 5.8$  kg) were randomly assigned to two groups. All the animals were placed on mechanical ventilation, maintained under anesthesia with propofol and midazolam, and catheters were inserted into jugular veins and the femoral artery for hemodynamic monitoring. In the experimental group, sepsis was induced by an intravenous infusion of *Pseudomonas aeruginosa* at varying doses. Fluid resuscitation and norepinephrine were protocolized for septic shock management. Parameters were recorded for 24 hours following the initiation of bacterial infusion. The survival rate at 24-hour in the experimental and control groups was 72.7% and 100%, respectively. The percentage of septic shock was 63.6% (7/11). There were significant differences in 24-hour fluid balance (5752 mL vs 1230 mL,  $P < 0.001$ ), peritoneal fluid volume (611 mL vs 11 mL,  $P = 0.009$ ), the wet-dry ratio of lungs (5.7 vs 2.3,  $P = 0.0002$ ), and the wet-dry ratio of kidneys (5.09 vs 2.78,  $P = 0.04$ ) in the experimental and control groups. Differences in urine output and pleural fluid volume were not significant ( $P > 0.05$ ) between the two groups. Overall, the *P. aeruginosa* porcine model induced sepsis with positive fluid balance and was maintained over a long-term period.

**Keywords:** sepsis; porcine model; *Pseudomonas aeruginosa*; fluid overload; anesthesia

## BIODEGRADATION OF POLYESTER POLYURETHAN (IMPRANIL) BY BACTERIA ISOLATED FROM NATURAL ENVIRONMENT

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### Abstract

Polyurethanes (PUR) is a plastic commonly used in industry and manufacturing that has been proven to be susceptible to biodegradation. In the study, waterborne PU dispersion Impranil® DLN-SD (from Covestro) was used to evaluate PUR degradation of bacteria. Bacterial strains were isolated from natural environment (soil, wasted water, wasted plastic bag) and screened for their ability to degrade Impranil on NB agar added Impranil 0,1% at 37°C. Ninety five Impranil-degrading bacterial strains were chosen from 150 samples. Two strongest Impranil-degrading strains were selected to carry out the experiment on NB broth supplemented Impranil 1, 3, and 5%. OD value at 600 nm and FT-IR spectre were measured after 21 days of incubation at 37°C. OD value in the bacteria-treated Impranil 1% and 3% lots (0,4; and 1,7) decreased markedly compared to the control (1,4; and 5,2), respectively, and no change was observed the bacteria-treated Impranil 5%. FT-IR spectre showed the disappearance of the peak at 1735 cm<sup>-1</sup> (corresponding to the carbonyl group C=O), the sharp decrement at 1170 and 1140 cm<sup>-1</sup> (C-O stretching), 1245 cm<sup>-1</sup> (C-N-H bond), 1630 cm<sup>-1</sup> (urea bond) in the bacteria-treated Impranil 1% compared to the control. The findings indicate that bacterial strains isolated from natural environment are capable of degrading Impranil and have enormous potential for biodegradation of PUR in situ.

**Keywords:** Polyester polyurethan; Impranil; biodegradation; FT-IR

## GENETIC DIVERSITY OF PHAN RANG SHEEP BASED ON MITOCHONDRIAL D-LOOP AND CYTOCHROME C OXIDASE SUBUNIT I SEQUENCES

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### Abstract

This study aimed to investigate the genetic divergence of Phan Rang sheep at Ninh Thuan province of Vietnam based on nucleotide variations of mitochondrial D-loop and cytochrome c oxidase subunit I (COI) region. The primers were designed to amplify the target gene with 709 bp in size, which contained the fragment of 650 bp of the D-loop region, and the COI gene with 882 bp in size. The sequences from 20 individual samples were used to analyze the nucleotide, haplotype diversity, genetic distance and reconstruct the phylogenetic tree. The results showed that the average number of nucleotide composition was 38.0% A, 28.7% T, 20.8% C, 12.5% G, 66.7% A+T, and 33.3% G+C for D-loop, and was 27.7% A, 31.2% T, 17.2% C, 23.9% G, 58.9% A+T, and 41.1% G+C for COI, the A+T were more common than the G+C showing an AT bias in both sites. The nucleotide diversity ( $p$ ) was  $0.02641 \pm 0.0000241$  in D-loop and  $0.00204 \pm 0.00080$  in COI. In the D-loop, there were 75 polymorphic sites and 13 haplotypes were found and the haplotype diversity ( $H_d$ ) was  $0.932 \pm 0.00177$ . Similarly, in the COI, there were 10 polymorphic sites and 4 haplotypes were found and the haplotype diversity ( $H_d$ ) was  $0.500 \pm 0.122$ . In the D-loop, the genetic distance value between Phan rang sheep (PRS) and Arabian purebred sheep (ArS) or ArS and hybrid Australian sheep (AuHS) was the highest (0.0359-0.0359), then lower between ArS) and AuHS (0.0320). The lowest value was observed between PRS and AuHS (0.0207) or ArHS (0.0262) or between AuHS and ArHS (0.0235). Similar, genetic distance value between hybrid Australian sheep (AuHS) and Arabian purebred sheep (ArS) was the highest ( $d=0.00386 \pm 0.00060$ ), then lower in between hybrid Arabian (ArHS) and ArS ( $0.00342 \pm 0.00034$ ) or between Phan Rang sheep (PRS) and ArS ( $d=0.00334 \pm 0.00003$ ), while this value was lowest in between PRS and AuHS ( $d=0.00103 \pm 0.0002$ ) or ArHS ( $d=0.00111 \pm 0.00022$ ). The results of the phylogenetic tree demonstrated that most of Phan Rang sheep and crossbred sheep grouped into one clade and more closer to Asian sheep, especially South East Asia region, and haplogroup B was found to be dominant in Phan Rang sheep. In conclusion, the conservative sequence in the COI is higher than those in the D-loop region,



both genes can be used as markers to identify the origin of domestic sheep breeds. The genetic relationship of Phan Rang sheep is closer to Asian sheep breeds, increasing sample size and whole D-loop as well as COI sequencing for further analysis are required.

**Keywords:** COI; Phan Rang Sheep; mitochondrial DNA; D-loop; genetic diversity

# POSTER

**SESSION 1**  
**SOCIAL ECONOMICS IN SUSTAINABLE**  
**AGRICULTURE**

## GEOSPATIAL ANALYSIS OF LAND USE CHANGE IN CAN GIO DISTRICT USING GOOGLE EARTH ENGINE

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### Abstract

As the gateway to the sea of Ho Chi Minh City, Can Gio plays an important role in Vietnam's economy, society, defense, development and international integration. In the coming time, Can Gio district will have many large national projects. Besides, the development of Can Gio will also be associated with tasks and solutions to protect the biosphere. Therefore, monitoring land use changes contributes to supporting sustainable Can Gio planning. In this study, multi-temporal Landsat satellite image data is used to extract land use information through Google Earth Engine (GEE). At the same time, the GIS method is also used to process data layers and calculate land cover changes in Can Gio at 4 times: 1990, 2000, 2010 and 2023. Research results show that, from 1990 to 2023, bare land in Can Gio has been effectively converted. That has increased the area of land types such as: forest, non-agricultural and aquaculture. With forest restoration and forest protection policies of the state and non-governmental organizations, it has helped increase the area of mangrove forests in Can Gio (increased 5.7 times, equivalent to 1,275 hectares). Besides, the increase in population and economic development has increased the area of non-agricultural land (increased 1.8 times, equivalent to 15,422 hectares). Research results also show that GEE geospatial processing service is a useful solution for land use analysis on a large scale such as Can Gio district. From there, it contributes to quickly and effectively support the supervision of Can Gio master planning, where comprehensive and sustainable development is needed.

**Keywords:** Can Gio; Google Earth Engine; land use; multi-temporal Landsat

## RESEARCHING AND DESIGNING MULTI- SCALES THEMATIC MAP OF HYDROLOGIC NETWORKS IN THANH HOA DISTRICT, LONG AN PROVINCE

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### Abstract

Hydrologic networks are fundamental elements in cartography. Each element has different characteristics that are represented on the map using distinct methods. When illustrating, it is crucial to consider the shape, the structure, the density, the distribution type, and the application characteristics.... Thanh Hoa district, Long An province is a region which famous for its dense, abundant river and canal systems, also well as its diverse and specific agricultural production potential. In terms of waterways, there are vital traffic routes connecting with important canal systems, serving economic exchanges between the locality and Dong Thap province, Tan An City, Ho Chi Minh City, and between internal districts in the province. This article aims to research, build, and design multi- scales thematic map of hydrologic networks in Thanh Hoa district, Long An province associated with decentralization of water system elements in Thanh Hoa district, Long An province based on the solution of automated map generalization and a hierarchical hierarchical classification of hydrologic features, ensuring the consistency of connection between scale levels as a basis for providing thematic map products serving the state management of land along with resource management at different levels, regional overview, and also the most detailed review of the research area.

## SOME ISSUES ON DIGITAL TRANSFORMATION TOWARDS SUSTAINABLE GOALS IN THE FIELD OF AQUACULTURE IN THE MEKONG DELTA, VIETNAM

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### **Abstract**

Digital transformation is not a trend but truly a revolution, becoming an inevitable path to help aquaculture enterprises in the Mekong Delta improve the efficiency of business management and adapt to the changing environment of technology and market, towards sustainable goals. To overcome some obstacles in terms of awareness, access to information, and implementation methods, it is necessary to identify and evaluate the need for digital transformation as well as implement a number of solutions to support this process. Through case studies of 3 businesses and a survey of 30 businesses in some areas in the Mekong Delta, the authors have initially made some comments on the current situation, identifying the advantages and disadvantages of the digital transformation process, thereby proposing a number of solutions to encourage aquaculture businesses in the area to enhance digital transformation in a practical and effective way.

**Keywords:** aquaculture; digital transformation; Mekong Delta

## THE INITIAL VALUE PROBLEM OF INTUITIONISTIC FUZZY DIFFERENTIAL EQUATIONS AND APPLICATION TO ECONOMIC GROWTH MODELS

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### Abstract

In economics, we often see economic models that only focus on studying two objects that are related to each other in a certain context. For example: the investment capital and output of a factory, the bumper harvest and loss of value of an agricultural product, the supply and demand of a product in the market, etc. On the other hand, in most technical and economic models, the input data of models always contains fuzzy information, meaning uncertain information. This research aims to provide a mathematical framework for building economic models as we mentioned above, where these economic models will have intuitionistic fuzzy input data. Specifically, we prove the existence and uniqueness of solutions to the initial value problem of intuitionistic fuzzy differential equations on ordered semilinear space. This is the mathematical framework we need, and then we build on this framework to build economic models. These economic models will be a mathematical description of models in economics. They help us understand and make predictions about their future behavior. Finally, we give some examples to illustrate the results of the presented theory.

**Keywords:** economic growth model; intuitionistic fuzzy number; intuitionistic fuzzy differential equation; initial value problem; ordered semi-linear space

**LINKS IN GINGER PRODUCTION AND CONSUMPTION OF FARM  
HOUSEHOLD IN DUONG HOA COMMUNITY, HUONG THUY TOWN,  
THUA THIEN HUE PROVINCE**

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**Abstract**

This study aims to evaluate the current status of farmer households' linkages in ginger production and consumption in Duong Hoa commune, Huong Thuy town, Thua Thien Hue province. Three main methods were used to collect information including: in-depth interviews with knowledgeable people (n = 3), actors (n = 2); semi-structured interviews (n = 30) and group discussions (n = 1). The results show that Ginger is a popular crop grown in Duong Hoa commune, bringing a stable source of income for farming households. The association network of farmers is quite diverse. Farmers can both join cooperatives to sign contracts with companies and can link directly with traders in the consumption of fresh ginger products. However, the connections between farmers are seasonal and do not have a close connection. Therefore, the study identifies obstacles to the association of farmers including local government policies and management, market fluctuations and the production scale of farmers as factors affecting affects the cooperative activities of farmer households. From there, we propose a number of solutions to improve the effectiveness of farmers' linkages in ginger consumption in the future, aiming for a sustainable agricultural model with close links between participating parties.

**Keywords:** Link; Production; Consumption; Ginger; Duong Hoa; Thua Thien Hue



## ECONOMIC VALUATION OF NHUNG MIEN MANGROVE IN NGOC HIEN DISTRICT, CA MAU PROVINCE

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### Abstract

The study aims to provide a comprehensive economic valuation of the Nhung Mien mangrove forest resources to inform sustainable protection and development strategies. Employing various economic valuation techniques such as market price for direct values including timber, firewood, construction materials, wildlife, aquaculture, and natural aquatic products; damage cost for functional values like water quality maintenance and nutrient provision for aquaculture; production function for microclimate stabilization and support for local aquaculture; and contingent valuation for local willingness to pay for biodiversity conservation, the study underscores the critical importance of the Nhung Mien mangrove ecosystem. It not only provides livelihoods for local people, particularly the impoverished but also ensures the protection of coastal communities' living and production spaces through its ecological functions. The total estimated value of the Nhung Mien Mangrove stands at 54,353 million VND per hectare per year. The study identifies over-harvesting of firewood, leading to forest degradation, and the lucrative nature of shrimp farming, which heightens the pressure for forest clearance, as the primary factors contributing to the reduction of forest area in Nhung Mien.

**Keywords:** economic valuation; mangrove conservation; sustainable development; Nhung Mien mangrove

## EVALUATING THE IMPACT OF MARKET ACCESSIBILITY ON AGRICULTURAL INCOME OF FARMERS IN NINH THUAN PROVINCE

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### Abstract

This paper aims to evaluate the impact of market accessibility on agricultural income of farmers in Ninh Thuan Province. The study utilizes the logit regression model with the Maximum Likelihood Estimation method (MLE) and the Propensity Score Matching (PSM) method to analyze the relationship between farmers' participation in the market and their income levels. Data was collected through surveys and interviews with 796 farmers in Ninh Thuan. The results show that farmers participating in the market experience significantly higher income level (53.25%) compared to those not participating in the market. The income difference ranges from approximately 2.675 million VND/ha to 8.022 million VND/ha, . This study identified several factors that influence farmers' market accessibility such as education level, experience, farm size, gender of house head, linkage, extension, smartphone and cultivation of plants. Among these factors, Extension (0.5588<sup>\*\*\*</sup>), smartphone (0.5103<sup>\*\*\*</sup>), and linkage (0.0955<sup>\*\*</sup>) demonstrate the strongest and most positive effects on farmers' market accessibility. The findings contribute to the understanding of the importance of market accessibility in promoting farmers' economic well-being and provide valuable information for policymakers and stakeholders in the agricultural sector.

**Keywords:** Market Accessibility; Agricultural Income; Ninh Thuan; Propensity Score Matching

## ANALYSIS OF FACTORS AFFECTING FARMERS' AGRICULTURAL PRODUCTION INTENTION COMPLYING WITH FOOD SAFETY STANDARDS IN DON DUONG DISTRICT, LAM DONG PROVINCE

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### Abstract

Food safety is becoming more important in Vietnam, especially when the country officially joins the ASEAN Economic Community (AEC) in the year 2015. This study aims to analyze the factors influencing farmers' intention to engage in agricultural production practices that comply with food safety standards in Don Duong District, Lam Dong Province. The research utilizes a combined model of the Technology Acceptance Model (TAM) and Theory of Planned Behavior (TPB) integrated with other variables to explore farmers' intention behavior. The study is conducted in the Central Highland region of Vietnam, focusing on Lam Dong Province, known for its high-tech agricultural production. The partial least squares linear structural equation modelling (PLS-SEM) is employed for data analysis. The sample consists of 618 observations collected through a random survey method in Don Duong District. The results show that the degree of influence of the factors on the attitude, intention and implementation behavior to engage in agricultural production practices that comply with food safety standards is 50.9%, 58.6% and 42.3%. This intention depended on many factors such as behavioral control (0.183\*\*\*), attitude (0.259\*\*\*), subjective norm (0.39\*\*\*), and knowledge (0.311\*\*\*). Additionally, the variation of the attitude factor explained by factors such as perceived benefits (0.358\*\*\*), and perceived easy applied (0.207\*\*\*). The findings contribute to understanding the determinants of farmers' intention towards agricultural production complying with food safety standards, providing insights for policymakers and stakeholders in promoting safe and sustainable farming practices.

**Keywords:** Don Duong; food safety; intentions; partial least squares linear path modelling

## APPLICATION OF PLS-SEM MODEL IN ASSESSING THE GREEN SUPPLY CHAIN MANAGEMENT PERFORMANCE OF SMALL AND MEDIUM ENTERPRISES IN HO CHI MINH CITY, VIETNAM

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### Abstract

Today, there is an increasing demand for social responsibility and environmental orientation in supply chain management. This research focuses on exploring the mediating role of green supply chain management in the relationship between social responsibility, environmental orientation, and the supply chain performance of businesses. Data were collected through a questionnaire distributed to small and medium-sized enterprises in Ho Chi Minh City, Vietnam, resulting in 333 valid responses. The study employed partial least squares structural equation modeling (PLS-SEM) for quantitative analysis. The findings supported the study's hypotheses, underscoring the significant role of green supply chain management in the model. Additionally, social responsibility and environmental orientation were found to positively impact the supply chain performance of small and medium-sized enterprises in the study area. These results provide business managers with valuable insights into the practical and theoretical importance of green supply chain management, highlighting its substantial influence on supply chain performance.

**Keywords:** environmental orientation; green supply chain management; Ho Chi Minh City; PLS-SEM; social responsibility

## CURRENT SITUATION AND SOLUTIONS FOR EFFICIENT USE OF DRAGON PLANTING LAND IN BAC BINH DISTRICT, BINH THUAN PROVINCE

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### Abstract

The research evaluates the current status of land use for dragon fruit cultivation in Bac Binh district, Binh Thuan province to determine influencing factors and propose solutions for stable and effective use of this type of land. Through survey data of dragon fruit growers and consultation with experts to assess the current situation and development trends, as a basis for proposing solutions. Results achieved: (1) The area planted with dragon fruit in the period 2010-2020 increased by 3,767 hectares, from 2021 it began to decrease sharply, by 2023 it was only 2,933 hectares, down 1,718 hectares (36.94%) compared to 2020. (2) Productivity is quite high, average output is about 25-30 tons/ha (on-season) and 20 tons/ha (off-season). In the period 2010-2020, the average profit reached 150-170 million VND/ha/year, but from 2021 until now the profit has decreased sharply (on average only about 93.6 million VND/ha/year) and tends to be decreasing, leading to a gradual decrease in the area of dragon fruit-land. (3) The main factors leading to the shrinking area of dragon fruit-land are: selling prices are decreasing; export is not favorable; product quality is unreliable,... (4) Research and propose solution groups: organize production according to the value chain; support the development of large-scale enterprises; policy solutions; human resources solutions.

**Keywords:** dragon fruit; land use; exported fruit; GAP; Binh Thuan

## FACTORS AFFECTING FARMERS' BEHAVIOR TO REDUCE PLASTIC WASTE IN AGRICULTURAL PRODUCTION IN DA LAT CITY, LAM DONG PROVINCE

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### Abstract

This research aims to analyze factors affecting the farmers' behavior to reduce plastic waste in agricultural production in Da Lat city, Lam Dong province. The research used the partial least squares structural equation modeling (PLS-SEM) with smart PLS 4.0 software on a sample of 412 farmers. Results showed that the change of farmers' behavior to reduce plastic waste in agricultural production explained by intention and media factors are 44,9%. Concurrently, farmers' intention to reduce plastic waste in agricultural production is influenced by perceived behavior control, finance, media and attitude factors. Beside, farmers' intention to reduce plastic waste in agricultural production is influenced indirectly by knowledge factor. On the other hand, attitude is affected positively by knowledge, environmental awareness and health awareness factors.

**Keywords:** agricultural plastic waste; behavior; Da Lat; reduce

**SESSION 2**

**ADAPTING AGRICULTURAL AND FORESTRY  
PRODUCTION TO CLIMATE CHANGE**

**EVALUATION OF GENETIC DIVERSITY OF *MELALEUCA CAJUPUTI*  
POPULATIONS BASED ON LEAF MORPHOLOGICAL CHARACTERISTICS  
AND ISSR MARKERS**

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**Abstract**

“Tràm gió” (*Melaleuca cajuputi* Powell) is a medicinal plant belonging to the Myrtaceae family. *M. cajuputi* is also multifaceted uses from fuelwood and paper production to essential oil distillation, available antimicrobial and antioxidant. The purpose of this study was to evaluate genetic diversity of ten *Melaleuca cajuputi* Powell populations were collected from the Dong Thap Muoi Center for Research Conservation and Development of Medicinal Plants based on the leaf morphological characteristics and inter-simple sequence repeat (ISSR) markers. The leaf morphological characteristics showed differences in leaves size and color of ten *Melaleuca cajuputi* populations. Total of 12 ISSR primers were used to analysis of 10 *M. cajuputi* populations. The results showed that total of 122 bands, of which 112 bands were found to be polymorphism. The percentage of polymorphism ranged from 75% to 100%, with an average of 91.26%. The polymorphism information content (PIC) varied from 0.38 to 0.48 with an average of 0.44. The genetic distance coefficients ranged from 0.06 to 0.38 with a minimum between population MC03 and MC04 and a maximum between population MC01 and MC09. Cluster analysis based on UPGMA divided ten *Melaleuca cajuputi* populations into five major clusters. The archived results would be useful information to contribute for the conservation and development of the genetic resources of *Melaleuca cajuputi* for medicinal purposes at the Dong Thap Muoi Center of Research Conservation and Development for Medicinal Plants.

**Keywords:** Conservation; Diversity; Essential oil; Medicinal plant; Polymorphism



## BAYESIAN STRUCTURAL TIME SERIES FOR AIR QUALITY PREDICTION: A CASE STUDY IN VIETNAM

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### Abstract

Urban areas grappling with substantial pollution concerns are placing growing importance on air quality prediction. This study employs the Bayesian Structural Time Series (BSTS) model to forecast the Air Quality Index (AQI) in Vietnam. The BSTS model offers a strong framework for forecasting time series data, enabling the inclusion of different structural elements such as trends, seasonality, and external regressors. We utilized hourly AQI dataset to construct and verify a BSTS model. This model is designed to capture fundamental patterns and provide predictions for air quality. The findings of our study indicate that the BSTS model successfully elucidates the dynamic characteristics of air quality, encompassing abrupt variations and recurring oscillations. The performance of the model was assessed using established measures, and the findings indicated a notable degree of accuracy and dependability. This work offers a strategy for predicting air quality, giving useful insights for policymakers and stakeholders involved in managing and reducing air pollution, and reducing the likelihood of environmental pollution issues.

**Keywords:** Bayesian structural time series; air quality index; pollution factors; data analysis; prediction

## CARBON FOOTPRINT OF A WOODEN HOUSE: A CASE STUDY OF THE COMPANY FOR WOOD PRODUCT PROCESSING IN SOUTH VIETNAM

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### Abstract

The goal of this study is to evaluate greenhouse gas emissions throughout the various stages of the life cycle of wooden houses and analyze emissions for several key structural systems. The results will be used to identify emission reduction solutions to produce integrated wooden houses for the Company for Wood Product Processing in South Vietnam, as well as to obtain Environmental Product Declarations (EPD). The research was conducted using the carbon footprint assessment method according to the ISO 14067 standard, the product life cycle assessment method according to ISO 14040 and ISO 14044 standards, and the greenhouse gas calculation method following the guidance of the Greenhouse Gas Protocol. Emission data were calculated based on the Ecoinvent database within SimaPro (version 9.4.0.2) software. The results reveal that the total life cycle carbon footprint of a wooden house is  $-18.03 \text{ kgCO}_2/\text{m}^2\text{GFA}$ , indicating that it sequesters more carbon than it emits.

**Keywords:** carbon footprint; greenhouse gas emissions; LCA; sustainable development; wooden house

**LAND ASSESSMENT FOR SUSTAINABLE AGRICULTURAL DEVELOPMENT  
IN THE TAN MY IRRIGATION AREA, NINH SƠN DISTRICT,  
NINH THUAN PROVINCE**

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**Abstract**

The Tan My irrigation area, equipped with the most advanced irrigation technology in Vietnam, features a main water channel made of pressure steel pipe, which reduces input costs and provides clean water sources. This makes it highly suitable for developing high-tech and organic agriculture, especially in terms of sustainable agricultural production. However, the economic efficiency of agricultural production in the Tan My irrigation area remains low compared to its inherent potential and advantages. The farming practices of the local population are largely self-sufficient, resulting in low crop yields. Additionally, the transformation of crop structures has been slow, and the efficiency of production and business activities is low. Therefore, assessing land quality and proposing changes to the agricultural land use structure to enhance economic efficiency and promote sustainable development are essential. This study used the FAO land assessment method, GIS technology, and the AHP method to evaluate the land. Based on this assessment, we propose 16 land use patterns for the study area, focusing on 12 main crops: rice, maize, fruit trees, and annual crops such as watermelon, palanquin, asparagus, aloe vera, and medicinal plants.

**Keywords:** Land Assessment; Crop Transformation; AHP; Tan My Irrigation Area; Ninh Thuan Province

## WATER LEVELS IN HYDROLOGICAL ASSESSMENT IN THE MEKONG DELTA

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### **Abstract**

The Mekong Delta is the main economic regions of Vietnam, located in the southwest of Vietnam, including 13 provinces and centrally run cities: Long An, Tien Giang, Ben Tre, Tra Vinh, Vinh Long, Dong Thap, An Giang, Kien Giang, Can Tho. Tho, Hau Giang, Soc Trang, Bac Lieu and Ca Mau. Agriculture is the main economic, with the main products being rice, fruit, and seafood. Climate change and saltwater intrusion are major challenges for the Mekong Delta, affecting agricultural production and people's lives, including the impact of rain and flooding. Research on water level, extreme rain events support climate change adaptation activities for the Mekong Delta region, contributing to ensuring food security and socio-economic security. Rain data used in the study is from 1990 to 2023.

**Keywords:** water level; extreme rain; climate change; Mekong Delta

## STUDYING THE EFFECTS OF FEEDER MATERIALS ON THE GROWTH AND YIELD OF SHALLOT IN HUONG AN WARD, HUONG TRA TOWN, THUA THIEN HUE PROVINCE

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### Abstract

This study was conducted on the shallot (*Allium fistulosum* L) of the *Allium* genus, the Liliaceae family in order to determine the effect of feeder materials on the growth and yield of shallot cultivation. The study was implemented at the site of GREEN LIFE Farm in Huong An ward, Huong Tra town, Thua Thien Hue province in Spring seasons of 2022. The experiment was designed in the Randomized Complete Block Design (RCBD) with 5 formulas and 3 repetitions. The area of each experimental plot is 10m<sup>2</sup>. The results of the study showed that: the feeder material with rice husk (CT 3) is the best optimum formula for growth and development of shallot as well as achieved the highest of Value Cost Ratio (VCR) in the Spring crop. The real yield in the Spring crop was 19.59 tons per ha, the Value Cost Ratio (VCR) was 3.91. Density and disease rate in experimental plots in the feeder material with rice husk (CT 3) were the lowest. The feeder material with rice husk (CT 3) gave the best height and the highest number of leaves in comparison with the remaining formulas. This research needs to be continued for two more crop seasons in order to confirm validity of rice husk (CT 3) in shallot cultivation in Thua Thien Hue province.

**Keywords:** shallot; rice husk; feeder materials; Huong Tra; Huong An

## ESTIMATING BIOMASS AND ABOVE-GROUND CARBON STOCKS OF MANGROVE FORESTS BY USING UNMANNED AERIAL SYSTEMS (SOUTHERN VIETNAM)

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### Abstract

Mangrove forests are considered potential carbon sinks in the atmosphere, surpassing other terrestrial ecosystems and playing a crucial role in the global carbon cycle. As the world strives towards climate neutrality and zero greenhouse gas emissions, the importance of mangrove forests is becoming increasingly evident. We estimated canopy height (CHMuav) from the DSM and DTM models. A total of 96 trees from various species were measured in the field to validate the accuracy of the UAV method using statistical indices such as Root Mean Square Error (RMSE) and Coefficient of Determination (R<sup>2</sup>). The estimated heights from UAV correlated closely with ground-truth heights, with R<sup>2</sup> = 0.99 and RMSE = 0.2 m. There was a strong correlation between canopy height from UAV (CHMuav) and DBH, with R<sup>2</sup> = 0.95 and RMSE = 0.40 cm. The DTM ranged from -0.9 m to 10.8 m, DSM ranged from -0.9 m to 21 m, and the estimated canopy height (CHMuav) ranged from 1 m to 21.5 m. Above-ground biomass of *Rhizophora apiculata* forest ranged from 1 Mg ha<sup>-1</sup> to 78 Mg ha<sup>-1</sup>, with an average of 74 Mg ha<sup>-1</sup>; *Avicennia alba* species ranged from 2 Mg ha<sup>-1</sup> to 42 Mg ha<sup>-1</sup>, with an average of 22 Mg ha<sup>-1</sup>; Above-ground biomass of mixed-species ranged from 2 Mg ha<sup>-1</sup> to 47 Mg ha<sup>-1</sup>, with an average of 25 Mg ha<sup>-1</sup>. Above-ground carbon stocks of *Rhizophora apiculata* species ranged from 0.5 Mg C ha<sup>-1</sup> to 42 Mg C ha<sup>-1</sup>, *Avicennia alba* species ranged from 1 Mg C ha<sup>-1</sup> to 20 Mg C ha<sup>-1</sup>, and mixed-species ranged from 2 Mg C ha<sup>-1</sup> to 22 Mg C ha<sup>-1</sup>. Using the Unmanned Aerial Vehicle (UAV) and Real-Time Kinematic (RTK) methods reduced the uncertainty in estimating above-ground biomass and carbon stocks.

**Keywords:** Mangrove forests; Aboveground biomass; Carbon sequestration; Unmanned Aerial Vehicles (UAV)

## INVENTORY OF GREENHOUSE GAS EMISSION FROM WETLAND AREAS IN GIAO THUY DISTRICT, NAM DINH PROVINCE

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### Abstract

Wetlands provide essential ecosystem services that underpin socioeconomic well-being, environmental protection, and biodiversity. They are also widely recognized for their pivotal role in climate change mitigation and adaptation strategies. However, wetland ecosystems can also serve as sources of greenhouse gas (GHG) emissions, contributing to climate change. GHG emission and sequestration inventories for wetlands are critical foundations for proposing sustainable utilization practices for these valuable ecosystems to minimize GHG emissions. This study presents the findings of a combined remote sensing analysis, field survey, and secondary data approach to assess the current status of wetlands and quantify GHG emissions from various wetland types, including mangrove forests, aquaculture, and rice paddies in Giao Thuy, a coastal district of Nam Dinh Province. The research outcomes provide valuable insights and practical foundations for refining GHG inventory methodologies for wetlands in Vietnam.

**Keywords:** greenhouse gas; inventory; wetland; Giao Thuy; Vietnam

## EFFECTS OF PLANT DENSITY, IRRIGATION, FOLIAR FERTILIZER ON GROWTH AND YIELD OF CUCUMBER (*CUCUMIS SATIVUS* L.) CULTIVATED IN GREENHOUSES AT HO CHI MINH CITY

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### Abstract

The study was done to determine the appropriate plant density, amount of drip irrigation water, and additional foliar fertilizers for cultivating hydroponically four parthenocarpic cucumber varieties in greenhouse at Ho Chi Minh City. The study consisted of two two-factor experiments inheritedly each other and both be arranged in split-plot design with 3 replications. In the first experiment, the main-plot factor was four parthenocarpic cucumber varieties (Lucas 603, NL 107, Kichi 207 and Kami 98) and the sub-plot factor was three row distances (40, 50 and 60 cm). In the second experiment, the main-plot factor was four amounts of drip irrigation water (the amounts of irrigation water were applied differently at three periods of plant growth: from planting to 7 days after planting, 7 days after planting to flowering, and flowering to the end of harvest as the following: 1) 0.8 L, 1.4 L, and 1.8 L water.plant<sup>-1</sup>.day<sup>-1</sup>; 2) 1 L, 1.7 L and 2.2 L water.plant<sup>-1</sup>.day<sup>-1</sup>; 3) 1.2 L, 2.1 L, and 2.5 L water.plant<sup>-1</sup>.day<sup>-1</sup>; 4) 1.3 L, 2.4 L and 2.9 L water.plant<sup>-1</sup>.day<sup>-1</sup>) and the sub-plot factor was three types of foliar fertilizer (Nutri - Gold, Sitto FoPro, Solinure). The results indicated that plant density directly affected plant height, fruit size and yield component elements such as the numbers of female flowers and fruits per plant then impacting on the yield of parthenocarpic cucumber. Related to plant densities, all tested cucumber varieties cultivated at 60 cm in row performed high yield and economic efficiency. The fruit yield of the examined cucumber varieties showed significantly different. Kichi 207 produced the highest profit at 64,811 thousand VND.1,000 m<sup>-2</sup>.crop<sup>-1</sup>. The variety of Kichi 207 planted at 60 cm in row was chosen to cultivate in the second experiment. The amount of drip irrigation water directly affected on the height, the number of branches, leaves and yield component elements such as the numbers of female flowers and fruits per plant then impacting on the yield of Kichi 207 cucumber variety. The foliar fertilizers did not directly affect the growth, development and yield of Kichi 207 cucumber variety. Drip irrigation at 1 L water.plant<sup>-1</sup>.day<sup>-1</sup> during the period of planting to 7 days after planting; 1.7 L water.plant<sup>-1</sup>.day<sup>-1</sup> in the period from 7 days after planting to flowering; 2.2 L per water.plant<sup>-1</sup>.day<sup>-1</sup> during the period from flowering to the end of harvest, combined with applying Sitto FoPro foliar fertilizer provided the highest profit at 83,902 thousand VND.1,000 m<sup>-1</sup>.crop<sup>-1</sup>.

**Keywords:** cucumber; variety; drip irrigation; foliar fertilizer; hydroponics



**STAND STRUCTURE, WOODY SPECIES DIVERSITY AND COMPOSITION OF  
SUB-TROPICAL FOREST OF KON KA KINH NATIONAL PARK,  
GIA LAI PROVINCE, VIETNAM**

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**Abstract**

Woody species composition and diversity were accessed in 18 plots of 1000 m<sup>2</sup> at three altitudinal gradients from 881 to 915 m, 1150 to 1204 m and 1289 to 1308 m according to the distribution of vegetation in sub-tropical forest of Kon Ka Kinh National Park, Gia Lai province. A total of 1,797 individuals belonging to 46 species and 32 families were recorded. The most dominant families were Theaceae, Fagaceae, Dipterocarpaceae, Myrtaceae and Magnoliaceae. The total basal area in three plots ranged from 50,57 to 57,72 m<sup>2</sup>/ha. The total volume was 501,01 m<sup>3</sup> equally 166,67 m<sup>3</sup>/ha in each elevation plot. The N/D distribution in three elevations followed the Meyer distribution. The N/H distribution in three elevations followed the normal distribution. The Margalef index (d) was from 3,5 to 6,2 which was highest in elevation from 881 to 915 m and lowest in elevation from 1204 to 1308 m. The Shannon - Wiener (H') index was from 2,5 to 2,9, highest in elevation from 881 to 915 m and lowest in elevation from 1204 to 1308 m. The Gini - Simpson index was from 0,88 to 0,92 in three elevations. The research results could be useful information for forest management and development in the region.

**Keywords:** species composition; stand structure; elevation; basal area; sub-tropical forest

## IMPACT OF BIO-ORGANIC FERTILIZER ON THE YIELD AND QUALITY OF QUINOA CULTIVATED UNDER DROUGHT CONDITIONS IN THE CENTRAL HIGHLANDS OF VIETNAM

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### Abstract

This study was conducted to determine the most suitable amount of bio-organic fertilizer for an imported quinoa variety (Atlas) cultivated on red basalt soil and grey soil in the Central Highlands region of Vietnam for obtaining optimal yield, high total protein content, and suitable starch content. Six formulations using a bio-organic fertilizer (Con Co Vang brand) and one control formulation were designed for planting quinoa during the dry season of 2024 with a planting density of 100,000 plants per hectare (row spacing of 50 cm, plant spacing of 20 cm). The results showed that bio-organic fertilizer formulation CT1 (2 tons fertilizer/ha/crop) led to the highest quinoa yield and quality among the investigated formulations. Specifically, the formulation CT1 resulted in the theoretical quinoa yields of 2.86 tons/ha/crop in red basalt soil and 2.22 tons/ha/crop in grey soil and the corresponding actual yields of 2.30 and 1.75 tons/ha/crop, respectively. Quinoa seeds harvested from plants fertilized with the CT1 formulation showed the highest total protein content (21.68% in red basalt soil and 22.86% in grey soil) and relatively high starch content (65.43% in red basalt soil and 63.07% in grey soil). The promising results recommend that quinoa can be well adapted with the limited irrigation condition (one of the most serious issues with agriculture in the Central Highlands region of Vietnam during dry season) with a proper application of bio-organic fertilizer.

**Keywords:** bio-organic fertilizer; drought; quinoa; seed quality; yield

## FACTORS AFFECTING THE INTENTION TO PRODUCE STRAW MUSHROOMS INDOORS OF FARMERS IN TAN HUNG DISTRICT, LONG AN PROVINCE

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### Abstract

This study aims to analyze factors affecting farmers' intention to produce straw mushrooms indoors in Tan Hung district, Long An province, thereby proposing policy implications to increase the possibility of producing straw mushrooms. After analyzing and synthesizing through SPSS software, primary data of 120 straw mushroom farmers showed 5 factors that affect farmers' intention to produce straw mushrooms indoors and are arranged in descending order as follows: Factor Perception of ease of use Indoor straw farming (SD) has the largest impact with coefficient  $\beta = 0,314$ ; The factor Perceived Usefulness (HI) has the second largest impact level with coefficient  $\beta = 0,301$ ; The factor Farmers' production resources (NL) has the third largest impact with coefficient  $\beta = 0,260$ ; The Subjective Norm factor (CQ) has the fourth largest impact level with coefficient  $\beta = 0,258$ ; The factor Perceived behavioral control (HV) has the weakest impact with coefficient  $\beta = 0,226$ . There are some policy implications are proposed: Policy implications on the factor Perception of ease of use of producing straw mushrooms indoors (SD); Policy implications of the factor Perceived Usefulness (HI); Policy implications of the factor Farmers' production resources (NL); Policy implications of the Subjective Norm factor (CQ); Policy implications of the factor Perceived behavioral control (HV).

**Keywords:** straw mushroom

## THE POTENTIAL OF REARING BEET ARMYWORM (*SPODOPTERA EXIGUA* HUBNER) ON ARTIFICIAL DIETS

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### Abstract

The beet armyworm (*Spodoptera exigua* Hubner) is a dangerous pest that has a direct impact on crop quality and productivity. This study aims to provide information on the biological characteristics to support the mass-rearing process and supply biological control activities. The experiments were conducted at the laboratory of the Plant Protection Department, Faculty of Agronomy, Nong Lam University, Ho Chi Minh City. The experiments result indicated that in three artificial diets (D1, D2, and D3) the artificial diet D1 was the most suitable for rearing Beet armyworm, it achieved the lowest average larva mortality rate of 29.5% and the maximum pupation rate of 70.5%. The average lifecycle was 19.2 days, the fecundity was 711.6 eggs/female with an egg hatch rate of 94%. Furthermore, the addition of honey at a 20% concentration demonstrated the highest potential for fecundity, resulting in an average of 746.8 eggs/female. Additionally, mustard scent can be used to stimulate the fecundity. This study successfully provided the main information to rear Beet armyworms with artificial diets in laboratory conditions.

**Keywords:** Biological control; mass-rearing; *Spodoptera exigua*; stimulate the fecundity

## VARIATIONS IN YIELD AND CONSTITUENTS OF LEAF ESSENTIAL OIL OF *MELALEUCA CAJUPUTI* GROWING ON COASTAL SAND DUNES IN CENTRAL VIETNAM

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### Abstract

*Melaleuca cajuputi*, a native species in Vietnam, is found naturally in wetlands and coastal sand dunes areas, and has high economic value for its essential oil. Due to overharvesting, natural populations of the species have declined, prompting conservation and plantation efforts by authorities and the local community. Understanding factors affecting quantity and quality of its essential oil is important for efficient use, plantation and conservation. In this study, we investigated the yield and volatile compounds of leaf essential oil of *M. cajuputi* growing on coastal sand dunes in three provinces (Thua Thien Hue -TTH, Quang Tri -QT and Quang Binh-QB) in Central Vietnam. Essential oil was extracted by steam distillation and was analyzed by chromatography coupled with mass spectrometry (GC/MS). The mean yield of essential oil from *M. cajuputi* leaves were 0.60% in TTH, 0.54% in QT and 0.55% in QB. Thirty-three compounds accounted for 99% of the entire essential oil in TTH and thirty-one for 97% in QT, while only twenty-three for 98.4% in QB. The major compounds of the *M. cajuputi* oil in TTH, QT and QB were  $\alpha$ -eudesmol (12.6%, 13.2% and 22.1%, respectively), guaiol (10.3%, 10.1% and 16.6%), eremoligenol (5.3%, 4.6% and 5.4%), bulnesol (3.3%, 2.1% and 6.6%),  $\alpha$ -terpineol (7.4%, 8.3% and 0.4%) and hinesol (1.3%, 1.1% and 11.5%). Only in TTH and QT, the 1,8-cineole (22.7% and 23.1%, respectively), valerianol (15.1%, 13.5%) and  $\gamma$ -eudesmol (5.8%, 6.2%) were detected. In contrast,  $\beta$ -budesmol (21.6%) was a main compound found only in QB.

**Keywords:** *Melaleuca cajuputi*; Central Vietnam; 1,8-cineole;  $\alpha$ -eudesmol; guaiol

## ZOOPLANKTON ABUNDANCE AND DISTRIBUTION EVALUATION AT RUI RESERVOIR, CHAMPHONE DISTRICT, SAVANNAKHET PROVINCE, LAOS.

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### Abstract

Sui reservoir was created in 1987 with c.a 211.842.391.23 m<sup>2</sup> of the catchment area and c.a 47,250,000 m<sup>3</sup> of the basin volume. Sui reservoir is a significant source of water on one side of the Savannakhet related to the livelihoods of local such as that provide the irrigation water for people's agricultural production, the most critical Sui reservoirs a habitat for all of the aquatic animals, aquatic plants, and other organisms that is an abundance of the water ecosystem. This study was conducted from May 2020 to September 2020 to evaluate zooplankton abundance and distribution at the Rui reservoir. The water quality test results showed that the water source was within the specified standard; the water temperature was between 27 to 33.3°C, the pH of the water was between 6 to 7.1, and the dissolved oxygen was between 6 to 7.8 mg/l. The study recorded 74 species of zooplankton, 42 genera, and 19 families of 3 main groups of zooplankton. In which two main groups were Cladocera (29%), and Copepoda (64%) of the total number of zooplankton species, and newly recorded species of zooplankton at Sui reservoir were *Alonella exique*, *Moina macrocopa* (Cladocera), and *Platyias quadridentatus*, *Filinia* (Rotifera). The distribution of zooplankton species based on stations concentrated in stations 1, 2 found 60 species, accounting for 21%, and 54 species, accounting for 19%, respectively. The distribution of zooplankton species is based on the time the highest in September found 50 species, the lowest in July found 33 species.

**Keywords:** Sui reservoir; zooplankton; abundance; biodiversity; ecosystem

## DETECTION OF PASSIONFRUIT VIETNAM VIRUS (PVNV) IN PASSIONFRUIT BY RT-PCR

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### Abstract

Passionfruit Woodiness Disease has caused by the *Passionfruit Vietnam Virus* (PVNV) and serious damage for passionfruit production due to the lack of suitable treatment. The presence of viruses on passionfruit is necessary to detect early and accurately for effective control. In this study, RT-PCR was established to determine the presence of *Passionfruit Vietnam Virus* (PVNV) in Viet Nam. Primer was designed specifically to detect PVNV with the amplified product of 410 bp. The optimal annealing temperature, primer concentration and limit of detection was 59°C, 0.2 µM and 10 copies, respectively. A total of 3 cDNA of virus ToMV, ToMMV, SPFMV were tested to verify the specificity of the assay. There were 9/34 field samples were detected with PVNV of which 26.47% samples were infected with virus. The study has successfully established an optimal RT-PCR assay to detect the presence of PVNV.

**Keywords:** passionfruit; PVNV; RT-PCR

## ASSESS THE ABILITY OF ARBUSCULAR MYCORRHIZA FUNGI TO SYMBIOSIS MAIZE PLANTS (*ZEAMAY L.*) AND SORGHUM PLANTS (*SORGHUM BICOLOR*)

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### Abstract

The study assessed the symbiosis in maize (*Zea may L.*) and sorghum (*Sorghum bicolor*) of four AMF genera: *Glomus*, *Acaulospora*, *Gigaspora*, and *Scutellospora*, isolated from 40 rhizosphere soil samples of a vegetable growing area in Ho Chi Minh City, Vietnam, and identified by morphology characteristic. The trial results showed that the growth criteria, including plant height, root count, root length, and root biomass, of maize and sorghum plants in the presence of AMF strains all increased significantly compared to plants without AMF supplementation. After 45 days of inoculation, the genus *Glomus* had a 62.7% symbiosis rate with the host plant, with an average total spore count of 153.2 spores per 100 g of soil. *Acaulospora* has an average symbiosis rate of 50.7%, with 138 spores per 100 g of soil. *Gigaspora* and *Scutellospora* have lower symbiosis rates (45.8% and 46.7%, respectively), with average total spore counts of 123.2 and 106.2 spores per 100 g of soil. Maize plants have an average root biomass growth coefficient of 1.4 and an average spore proliferation rate of 500% following 45 days of exposure to fungal spore strains.

**Keywords:** *Glomus*; *Acaulospora*; *Gigaspora*; *Scutellospora*; arbuscular mycorrhiza



## DETECTION OF TOMATO MOSAIC VIRUS INFECTING TOMATO USING REALTIME RT-PCR

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### Abstract

Tomato mosaic virus (ToMV) is known as one of the most common and devastating tomato viruses worldwide. It is a virus that causes mosaic disease which occurs commonly and seriously affecting the productivity and quality of tomatoes in Vietnam. Early and accurate detection of ToMV's presence in tomatoes for disease control is currently an urgent issue. The aim of the study is to develop a real-time RT-PCR method to detect ToMV virus. In this study, a positive control carrying ToMV's target gene segment was amplified by 595 bp in size, then was cloned into pJET1.2 vector and transformed into Escherichia coli JM109. A real time RT-PCR procedure was established to detect and quantify the virus by designing primer sequencing to amplify a gene segment of 182 bp in size of the RdRP-ORF2 gene region. I established a calibration curve with the equation  $y = -3.777x + 41.973$ . The correlation coefficient  $R^2 = 0.9939$  is used to quantify the ToMV virus. In addition, the procedure quantified test samples ranged from  $1.7 \times 10^4$  to  $9.5 \times 10^6$  copies/ $\mu$ L.

**Keywords:** Tomato mosaic virus; Realtime RT-PCR; RNA virus; cDNA; Escherichia coli JM109

## DETECTION OF ZUCCHINI YELLOW MOSAIC VIRUS INFECTING PUMPKIN USING REALTIME RT – PCR

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### Abstract

ZYMV (Zucchini yellow mosaic virus) is one of the viruses causing yellow mosaic on Cucurbitaceae, it has the ability to spread strongly from diseased plants to healthy plants or from seed sources, seriously reducing the yield and quality of pumpkin after harvest. Currently, there is no drug that can kill this virus, so the most effective method of control is to screen seeds before planting and remove plants showing signs of disease. In the study, the 214 bp target gene of ZYMV virus was amplified with a specific primer, then cloned into the pJET1.2 vector and transformed into Escherichia coli JM109. The real time RT - PCR procedure was built to detect and quantify ZYMV with a primer pair designed with the size of 164 bp. The standard curve was established with the equation  $y = -3.417x + 49,605$ . The correlation coefficient  $R^2 = 0.9969$  is used to quantify ZYMV virus. The Realtime RT – PCR was built with qualitative results corresponding to the PCR method. In addition, the procedure quantified mass samples ranging from  $7,1 \times 10^6$  to  $8,5 \times 10^9$  copies/ $\mu$ L.

**Keywords:** ZYMV; yellow mosaic; Realtime RT – PCR; Curcubita moschata

## ISOLATION OF NEMATOPHAGOUS FUNGI FROM SOIL SAMPLES COLLECTED FROM VEGETABLES CAN CONTROL ROOT-KNOT NEMATODES (MELOIDOGYNE SPP.)

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### Abstract

Vegetable cultivation is an essential part of Vietnam's agricultural development strategy (Ministry of Agriculture and Rural Development, 2016). Root-knot disease, caused by *Meloidogyne* spp., is a serious harmful disease that reduces plant vitality and leads to reduced yield and quality. The research aimed to select fungal strains capable of controlling *Meloidogyne* spp., which causes root-knot disease in vegetable plants. As a result, strains of the fungi *Paecilomyces lilacinus*, *Mariannaea* sp., and *Penicillium* sp. were controlled for inactivating J2 *Meloidogyne* spp. after 72 hours, in which immobilized nematodes by *Paecilomyces lilacinus* reached 64.5%, *Mariannaea* sp. was 72%, and *Penicillium* sp. was 70% compared to the control, not inoculum fungi (13.5%). The nematophagous fungal strains will form an adhesive network trap structure when the nematodes are present. The experiment to investigate the influence of fungal strains on J2 *Meloidogyne* spp. on Malabar spinach (*Basella alba* L.) in a greenhouse showed that the strain *Mariannaea* sp. inoculum on plants with a density of 107 cfu/ml gave the best results in terms of root length (25.3 cm) and root weight (0.4 g) compared to the control without fungus inoculation (18.5 cm; 0, 3 g) and the control nematode strain only (11.2 cm; 0.3 g). Especially the *Mariannaea* sp. strain is capable of controlling the number of J2 larvae per 30 g of soil (5.0 J2) compared to the control (16 J2).

**Keywords:** *Meloidogyne* spp.; Nematophagous fungi; *Mariannaea* sp.; *Paecilomyces lilacinus*; *Penicillium* sp

## ANALYZING THE CORRELATION BETWEEN DROUGHT, SALINITY INTRUSION AND LAND USE CHANGE - A CASE STUDY OF COASTAL DISTRICTS, BEN TRE PROVINCE

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### Abstract

Drought and salinity intrusion directly affect production activities, including land use. At present, the flow in the lower Mekong region is declining rapidly, which is very low compared to the average data for many years since 1980. The prolonged sunny months of the year, the increased use of water on tributaries and the storage of water in dams are the causes leading to severe drought, water shortage and salinity intrusion in coastal districts of Ben Tre province. This study assessed land use change during the period 2009-2019 using Landsat multi-temporal satellite data with a spatial resolution of 30 meters. In addition, the TVDI (Temperature Vegetation Dryness Index) and the EC (Electrical Conductivity) are used to analyze the correlation between land use change and the factors: drought and salinity intrusion. The regression results show that if the drought level increases by one level, the probability of land use change increases by 10.994 times. At the same time, if the salinity level increases by one level, the probability of land use change decreases by 0.862 times. The results of the study showed that drought is positively correlated with land use change, while salinity is negatively correlated. This explains why the drier the drought, the more land use change occurs and vice versa. Meanwhile, when salinity increases (or decreases) by 5 times or more, the probability of land use change is almost 100%. That is, land users should then choose a more suitable form of cultivation than the current one.

**Keywords:** Ben Tre; drought and salinity intrusion; land use change; multi-temporal Landsat

## PHYCOREMEDIATION OF THIAMETHOXAM AND SULFAMETHAZINE BY FRESHWATER MICROALGAE *SCENEDESMUS OBLIQUUS*

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### Abstract

Long-term and extensive use of neonicotinoid insecticides and antibiotics has prompted concerns about exposure of non-target organisms and ecological health. The present study investigated the removal and metabolic fate of thiamethoxam (THI) and sulfamethazine (SMT), the two commonly used neonicotinoid and sulfonamide, from aqueous media by freshwater microalgae *Scenedesmus obliquus*. The results showed that 50 mg/L THI exerted negligible effects on the growth of *S. obliquus*, while 10 mg/L SMT severely inhibited microalgal growth. Both abiotic and biotic processes were involved in the degradation of THI and SMT; however, the presence of *S. obliquus* substantially accelerated the dissipation of both xenobiotics. After 12 days of exposure,  $97.9 \pm 0.3\%$  of THI (50 mg/L) and  $76.4 \pm 1.1\%$  of SMT (2 mg/L), respectively, were removed from the media. Importantly, the occurrence of clothianidin, the main metabolite of THI and a potent neonicotinoid active ingredient, was also observed across all sampling intervals, even at higher concentrations than the parent compound. As such, while *S. obliquus* is a promising candidate for the removal of both THI and SMT from the contaminated water, their metabolic fate should also be further explored to ensure a safe and efficient application.

**Keywords:** biodegradation; clothianidin; metabolic fate; neonicotinoids; sulfonamides

## BIOCHAR REDUCED THE DISSIPATION AND PLANT UPTAKE OF THE INSECTICIDE THIAMETHOXAM IN AGRICULTURAL SOIL

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### Abstract

This study investigated the influence of biochar amendment on the dissipation and plant uptake of thiamethoxam (THI) in agricultural soil. Biochar significantly inhibited the degradation of THI, potentially due to the increased sorption capacity of the biochar-amended soil. After 28 days of incubation, approximately 76.1% of the initial applied THI dissipated from the unamended soil, while that in the soil amended with 2% biochar was only 42.8%. Furthermore, biochar enhanced the vegetative growth of tomato plants and reduced the bioaccumulation of THI and its main metabolite clothianidin (CLO) in various plant tissues. With the amendment of 1% biochar in the soil, plants accumulated less than 0.26 mg THI/kg and 0.22 mg CLO/kg roots. Similarly, the THI and CLO concentrations in the stems decreased by approximately 43.8 and 40.0%, respectively, compared with those in the control treatment. In the leaves, the uptake of THI and CLO also decreased by 71.9 and 55.4%, respectively, compared to that in the control treatment. Overall, biochar was effective at reducing the bioavailability and plant accumulation of THI and CLO in the soil. As such, biochar application is a promising technique for remediating soils contaminated with neonicotinoid insecticides and ultimately ensuring food safety.

**Keywords:** *Acacia auriculiformis*; bioaccumulation; residues; sorption; tomato

## EFFECTS OF DIFFERENT CONCENTRATIONS AND APPLICATION TIMES OF HUMIC ACID ON GROWTH AND YIELD OF ST24 RICE UNDER SALINITY

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### Abstract

Salinization due to climate change poses a serious threat for production of high-quality rice cultivars, which are sensitive to salinity stress. Humic acid, which were reported to induce salinity tolerance in plants, can provide a solution. However, proper concentration and time for application must be investigated for the highest effectiveness. We cultivated ST24 rice in pots for 105 days, and subjected the plants to NaCl solution of 4‰ during the seedling stage (15–30 days after sowing (DAS)). Humic acid at the concentration of 0.2, 0.4 or 0.6% was applied by leaf spraying once per week for 5 weeks, starting from 8, 11 or 15 DAS (–7, –4 or 0 days before salinity). Shoot length, number of leaves, number of stalks and chlorophyll content index showed no differences among humic acid concentrations. However, humic acid application of all 3 concentrations starting from 15 DAS resulted in significantly longer shoot length at 90 DAS compared to Control (no humic acid application). Grain weight did not differ among treatments. However, number of panicles per plant, number of grains per panicle, and firm grain percentage were higher in treatments of 0.4% or 0.6% humic acid, with no observable effect of application time, resulting in similar trends in theoretical and actual yields. All treatments of 0.4% or 0.6% humic acid had significantly higher yield than Control, regardless of humic acid application time. These results highlight the potential of humic acid as a solution to mitigate salinity damage in rice production and maintain high yield.

**Keywords:** rice; humic acid; yield; salinity

## ASSESSES THE ABILITY TO CONTROL PHYTOPHTHORA SP. TO DAMAGE ON CHILLI PLANT OF ARBUSCULAR MYCORRHIZA FUNGI (AMF) PRODUCT

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### Abstract

*Phytophthora* sp. was isolated from a sample of pepper field at Dong Nai province. Morphological identification determined *Phytophthora* sp. by characteristics: morphology of mycelium with rosette or stellate pattern, white hyphae and no partition. Sporangia are transpicuous, ovoid, or ellipsoid, measuring 26-37.5 µm in length and 15.6-20 µm in width, with a length/breadth ratio of 1.7 to 1.9. The trial controls *Phytophthora* on chili plants with eight plots by AMF product (AMF product mixed: *Glomus* sp. and *Acaulospora* sp.). In there, which had two control plots, five plots were inoculated AMF products with diverse formulas (AMF formula rates: 30%, 40%, 50%, 60%, 70%), and commercial product plot. The study results reveal that AMF plots promoted growth and development, and reduced the impacts of damaging *Phytophthora* on chili plants. Especially in a plot formulated with 70% AMF preparations with the best effect on growth and development, the symbiosis rate of AMF in chili roots was high and root disease levels decreased, and the difference was statistically significant when compared to other trials at 7 times; 14; 21 and 28 days after infection *Phytophthora*.

**Keywords:** AMF product; *Glomus*; *Acaulospora*; *Phytophthora*



## RESEARCH ON THE IMPACT OF SOME PHYSICAL FACTORS AFFECTING FOREST ECOSYSTEM SERVICES IN BIDOUP NUI BA NATIONAL PARK

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### Abstract

Climate change is happening faster and faster in a direction that is unfavorable to the living environment of species, which has greatly affected the balance of ecosystems. Research to determine the role and impact of physical factors on the current state of forest ecosystems is very necessary. The results of this study show that physical factors such as rainfall and temperature, air humidity have directly affected the diversity of ecosystems in Bidoup Nui Ba National Park, in which the factor of rainfall has the greatest impact. In the period 2019-2024, the diversity of ecosystem types did not decrease in number but fluctuated in area, all 07 ecosystem types had fluctuations in area and distribution, in which the area of perennial crops increased. The most perennial ecosystem is 110ha and the aquatic ecosystem decreased significantly by 46ha. The least fluctuating HST type is the primary forest HST, belonging to the strict protection zone of 26.95ha. Ecosystem services are optimally guaranteed in the rainy season (June-August) and gradually decrease in the dry season (November-April).

**Keywords:** ecosystem; temperature; humidity; precipitation; impacts; ecological services

## AGRICULTURAL DROUGHT MONITORING USING DRUG INDICATORS IN SUBURBAN DISTRICTS OF HO CHI MINH CITY

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### Abstract

The purpose of this study is to analysis the spatial characteristics of drought during the El Nino period in 2023 and 2024 in agricultural areas located in the suburb of Ho Chi Minh City (HCM city) by using different drought index. From Landsat 8 - 9 satellite image, this article calculated the standardized precipitation index (SPI) based on the lack of rainfall and the temperature-vegetation drought index (TVDI) based on the relationship land surface temperature (LST) with normalized difference vegetation index (NDVI). Research results showed that during periods of prolonged heat, high temperatures caused the amount of water vapor in the air to decrease, and the LST value also increased, leading to an impact on surface vegetation. Thereby, these indicators are a parameter that visually displays the impact of drought on agriculture, serving as a basis for responding to the climate changes taking place today.

**Keywords:** sub-urban of Ho Chi Minh City; SPI index; TVDI index; Landsat 8 - 9

## ISOLATION AND SCREENING OF *PSEUDOMONAS FLUORESCENS* ISOLATES AGAINST *FUSARIUM OXYSPORUM* AND THEIR MODE OF ACTION.

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### Abstract

Beneficial microorganisms in the soil can promote plant growth and inhibit the activity of pathogens via different mechanisms, one of which releases volatile organic compounds (VOCs). In this study, based on the 16S-rRNA sequence, four bacteria ĐHT3, CC-LĐ1.2, CC-LĐ2.4 and O-BT3.1 were identified as *Pseudomonas fluorescens* and can inhibit the mycelial growth of *Fusarium oxysporum* strain KTĐT01, that caused seedling wilt disease on tomato plants. Bacteria O-BT3.1 and CC-LĐ2.4 have strong chitinase enzyme activity (clear zone above 13 mm), while bacteria DHT3 has strong protease enzyme activity (clear zone above 13 mm). At the same time, these 4 bacteria ĐHT3, CC-LĐ1.2, CC-LĐ2.4 and O-BT3.1 also can produce volatile compounds that inhibit the fungus *Fusarium oxysporum* strain KTĐT01 with the mycelial growth inhibition (%) respectively: 72.9%, 67.0%, 33.6% and 40%.

**Keywords:** bacterial identification; enzyme activity; *Pseudomonas fluorescens*; VOCs; mycelial growth inhibition

**EVALUATION OF THE PLANT GROWTH - PROMOTING ABILITY OF PSEUDOMONAS SPP. STRAINS ISOLATED IN SALINE AFFECTED AREAS OF BEN TRE PROVINCE, VIET NAM.**

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**Abstract**

From 20 saline soil samples collected in Ba Tri, Giong Trom, and Chau Thanh districts, Ben Tre Province 12 strains capable of thriving in King B medium and fluorescing under UV light were isolated. Ten strains labeled P1, P2, P3, P4, P5, P6, P8, P9, P10, and P11 demonstrated a good salt tolerance at NaCl 7%. These strains also exhibited the ability to synthesize IAA, nitrogen fixation, phosphate solubilization, biofilm formation, cellulase and protease production. Among them, P3, P5, and P11, showed the most efficient IAA synthesis of 62.45 µg/mL (P3), 39.52 µg/mL (P5), and 28.75 µg/mL (P11) after 3 days, as well as nitrogen fixation of 0.911 µg/mL (P3), 1.485 µg/mL (P5), and 1.334 µg/mL (P11) after 4 days. Strains P3 and P5 significantly enhanced seed germination rates and promoted the growth of tomatoes under both normal and saline soil conditions in greenhouse conditions. The P3 was exhibited 100% similarity to *Pseudomonas hunanensis*, while the P5 strain showed 99.79% similarity to *Pseudomonas juntendi* and 99.86% similarity to *Pseudomonas taiwanensis*. The results of this study provide a foundation for biofertilizer production and applying *Pseudomonas* spp. in agriculture.

**Keywords:** *Pseudomonas* spp.; salt tolerance; IAA; nitrogen fixation

## EFFECTS OF NATURAL OLEORESIN-HEAT TREATMENT ON THE IMPROVEMENT OF PHYSICAL AND MECHANICAL PROPERTIES OF RUBBERWOOD AND LOBLOLLY PINE

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### Abstract

Natural oleoresin extracted from dipterocarp is considered one of the most important non-timber forest products of forest-adjacent communities in Southeast Asia. Rubberwood (*Hevea brasiliensis*) from plantations in Vietnam and loblolly pine (*Pinus taeda*) imported mainly from the Southeastern United States have been widely used for furniture and construction in Vietnam. In this study, the effects of heat treatment with oleoresin and used cooking oil on the mechanical and physical properties of rubberwood and loblolly pine were investigated in this study. The rubberwood and loblolly pine samples (540 x 100 x 28 mm) were heat-treated with a mixture of oleoresin and used cooking oil under different ratios of oleoresin (20% to 40%), temperatures (130°C to 180°C), and durations (60 minutes to 120 minutes). The natural oleoresin is collected from the Central of Vietnam, and the used cooking oil collected from an oil-recycling facility. Response surface methodology (RSM) models for the ratios of oleoresin in the mixture, treatment temperature, and treatment duration of heat-treated oleoresin and used cooking oil were developed. The water-repellent efficiency (WRE), anti-swelling efficiency (ASE), Janka hardness, and modulus of rupture (MOR) of the treated samples were determined. The results demonstrate that the dimensional stability of rubberwood and loblolly pine was enhanced by heat treatment with oleoresin and used cooking oil. The strength properties and Janka hardness were affected by the treatment conditions. The proper ratio of oleoresin, treatment temperature and time were determined to apply for the improvement of physical and mechanical properties of rubberwood and loblolly pine.

**Keywords:** loblolly pine wood; oleoresin heat treated; physical mechanical properties; rubberwood

## REGENERATION AND ASSESSMENT OF GAMMA IRRADIATION EFFECTS ON GROWTH AND MUTATION IN SWEET POTATO (*IPOMOEA BATATAS* L.)

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### Abstract

This study investigated the effects of gamma irradiation on the regeneration and mutagenesis of sweet potato (*Ipomoea batatas* L.) in two primary stages. Initially, an optimal concentration of plant growth regulators (PGRs) was established for the regeneration of shoots from shoot tips and nodes on MS medium supplemented with 2 mg/l BAP and 0.2 mg/l IBA. This medium facilitated shoot proliferation and served as a basis for subsequent irradiation experiments. The second stage explored the impact of gamma irradiation doses ranging from 0 to 90 Gy on survival, mortality, and morphological changes of the plant material. The results indicated significant detrimental effects on plant vitality, leading to increased mortality and a variety of morphological abnormalities such as wavy leaves, split leaves, chlorophyll loss, abnormal root proliferation, and stems lacking apical meristems. Notably, the split leaf variant was identified as genetically distinct from the original plant using the SCoT marker. This research contributes to the understanding of gamma irradiation's influence on sweet potato, an essential food crop, highlighting its potential for inducing beneficial mutations for crop improvement. Future work will focus on enhancing plant stress tolerance through irradiation and in vitro culture techniques.

**Keywords:** Gamma irradiation; Morphological variation; SCoT markers; Sweet Potato; Regeneration

## BIOCONTROL EFFICACY OF RHIZOCTONIA SOLANI DAMPING-OFF AND GROWTH PROMOTION OF MUSTARD BY STREPTOMYCES ROCHEI BT02

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### Abstract

This study aims to evaluate the antagonistic activity of *Streptomyces rochei* BT02 strains against *Rhizoctonia solani*, the pathogen causing damping off disease in mustard, under laboratory, greenhouse, and field conditions. In the laboratory, the *Streptomyces* strains exhibited antagonistic efficiencies ranging from 10.2% to 58.5%. The BT02 strain showed the highest efficiency, reaching up to 58.5%. In greenhouse and field conditions, BT02 not only effectively controlled the disease comparably to the fungicidal mancozeb but also promoted plant growth, with a biomass increase of up to 27% compared to the control. These results demonstrate the potential of bacterial strains as an alternative to chemical control methods, contributing to sustainable and environmentally friendly agriculture.

**Keywords:** antagonistic activity; damping off; mustard; *Rhizoctonia solani*; *Streptomyces rochei* BT02

**EFFECT OF POTASSIUM FERTILIZER QUANTITY ON YIELD AND  
QUALITY OF 02 SWEET CORN HYBRID COMBINATIONS (ZEA MAYS VAR.  
SACCHARATA)**

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**Abstract**

The study aimed to determine the appropriate amount of potassium fertilizer for 02 newly selected sweet corn hybrid combinations of the Department of Genetics and Plant Breeding, Nong Lam University - Ho Chi Minh City. The experiment was conducted in the Winter-Spring crop of 2023 - 2024 in Thu Duc, Ho Chi Minh City with 4 potassium levels (70, 90, 110 and 130 kg K<sub>2</sub>O/ha) and 2 combinations of sweet corn hybrids BN191, BN211, and varieties Golden Cob control. The results show that different amounts of potassium fertilizer affect the yield, quality and resistance to pests and diseases of sweet corn hybrid combinations. Potassium dosage of 130 kg K<sub>2</sub>O/ha gave the highest fresh ear yield, low pest and disease infection rate and highest Brix for the two selected hybrid combinations and the Golden Cob variety.

**Keywords:** field experiment; potassium fertilizer; sweet corn; fresh ear yield; Brix level



## ISOLATION AND IDENTIFICATION OF FUNGI CAUSING TUBER ROT DISEASE ON NGOC LINH GINSENG (*PANAX VIETNAMENSIS* HA ET GRUSHV.)

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### Abstract

Ngoc Linh ginseng (*Panax Vietnamensis* Ha et Grushv) is a rare and valuable medicinal herb endemic to Vietnam. However, diseases on ginseng over the years, particularly tuber rot, have severely impacted its yield and quality. This research aims to identify the cause of tuber rot disease in Ngoc Linh ginseng and explore potential biological control measures. Through isolation and morphological identification, *Fusarium solani* was identified

as the pathogen responsible for tuber rot in ginseng. Pathogenicity test of isolated *Fusarium solani* on the Ngoc Linh ginseng slices using the artificial inoculation method under laboratory conditions. The results showed that the ginseng slices developed symptoms five days after re-inoculation with isolated *F.solani*. Further, the study evaluated the antagonistic activity of *Chaetomium* sp. in inhibiting the growth of *F.solani* using a dual – culture method on PGA medium. The antagonistic efficiency recorded after 11 days of culturing was 64% when *Chaetomium* sp. and *F. solani* was inoculated on the same day and 71.8% for when *Chaetomium* sp. was inoculated three days before *F. solani*. These results demonstrate that *Chaetomium* sp. has a high inhibitory effect on the growth of *Fusarium solani* mycelium. The findings of this study provide a valuable foundation for developing disease prevention strategies for Ngoc Linh ginseng, contributing to the conservation and sustainable cultivation of this rare medicinal herb.

**Keywords:** Chaetomium; dual - culture; Fusarium solani; Ngoc Linh ginseng; tuber rot

## THE OCCURRENCE AND IDENTIFICATION OF ORCHID MYCORRHIZAL FUNGI IN THE RHYZOPHERES OF DENDROBIUM ORCHIDS

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### Abstract

Orchid Mycorrhizal Fungi (OMFs) is a form of symbiosis between beneficial fungi and plants in the Orchid family (Orchidaceae), including *Dendrobium* orchids. This the study aimed to determine the occurrence of OMFs in *Dendrobium* sp. orchid's roots as well as in their growing medium using both morphological and molecular biology techniques. Thirty *Dendrobium* sp. orchid samples were collected in Ho Chi Minh City to screen for the presence of OMFs. The OMFs forms were then cultured on PDA medium and characterized based on morphological approach and sequencing of ITS1 and ITS4 regions. The results revealed that four vesicular structures (V1-V4) and six mycelial structures (M1-M6) presenting in the *Dendrobium* sp. orchid roots with occurrence rates ranging from 3.3 to 60.0% and from 20.0 to 66.7%, respectively. The V1 and M1 structures were the most popular form presenting in *Dendrobium* roots. In the growing media, five spore forms were recorded, with an average total spore density ranging from 61 to 405 spores per gram. Based on the morphology of OMF spores, the results suggested that the isolated OMFs belonged to the fungal genera *Sclerocystis*, *Funneliformis*, *Claroideoglosum* and *Acaulospora*. Further characterization based on ITS1 and ITS4 region sequencing indicated that the isolated OMFs could be *Rhizopus* sp., *Trichoderma* sp. and *Chaetomium* sp.

**Keywords:** *Dendrobium*; germination; ITS; Orchid Mycorrhizal Fungi; symbiosis

## ASSESSMENT OF GENETIC PURITY OF EIGHT INBRED SWEET CORN LINES USING PHENOTYPIC AND GENOTYPIC MARKERS

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### Abstract

Sweet corn (*Zea mays* var. *saccharata*) is a popular, tender variety of maize known for its high sugar content, making it a favored vegetable for fresh consumption and culinary uses. In a field study conducted in Thu Duc, Ho Chi Minh City, Vietnam, the genetic purity and agronomic characteristics of eight inbred sweet corn lines of the S7 generation were evaluated. Phenotypic parameters, including growth traits and yield, along with genotypic assessment using SCoT molecular markers, were used to identify lines ideal for breeding high-vigor F1 varieties. The lines demonstrated robust growth, yielding between 7.8 and 11.6 tons per hectare, with a Brix degree ranging from 11.0% to 12.9%, indicating their suitability for fresh consumption. All lines showed high phenotypic uniformity, with standard error levels below 1 and a coefficient of variation below 5% for key traits such as plant height, ear height, ear weight, and ear diameter. The genetic purity of these lines, as confirmed by SCoT marker analysis, varied from 0.81 to 1, making them excellent candidates for inclusion in F1 breeding programs targeted at Southeast Vietnam.

**Keywords:** coefficient of variation; genetic purity; inbred sweet corn lines; phenotypic uniformity; SCoT markers

## EVALUATE THE EFFECTS OF GAMMA IRRADIATION ON GROWTH OF PLEUROTUS SAJOR-CAJU

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### Abstract

The study was conducted to determine the effect of irradiation doses on *Pleurotus sajor-caju*, the radiation source used was Gamma Co-60. *Pleurotus sajor-caju* was collected at the Laboratory of Edible and Medicinal Mushrooms of Research Institute for Biotechnology and Environment, mycelium samples were treated at different irradiation doses (0 kGy, 0,25 kGy, 0,5 kGy, 0,75 kGy and 1 kGy). After irradiation, samples were surveyed on primary and secondary nutrient media and culture substrates. Survey results have been obtained, for primary nutrition medium at three irradiation doses of 0 kGy, 0,25 kGy and 0,5 kGy, PGAY medium is suitable for the proliferation stage of fungi, with two irradiation doses of 0,75 kGy and 1 kGy, PGA medium is more suitable for the proliferation stage than PGAY. When increasing the dose of irradiation, the speed and quality of mycelium gradually decreased. On spawn culture medium (boiled rice supplemented with rice bran), at dose of 0,25 kGy the mycelium system developed the best in all treatments, at high doses such as 0,75 kGy and 1 kGy, the mycelium spread slowly and thinly. On the substrate medium, almost the mushroom has adapted to the new nutrient source, so there is no significant difference in the quality of the mycelium. Harvesting results at the dose of 0,25 kGy gave the fastest harvesting time (average 69,6 days) and the highest biological efficiency (11,56%), higher than the control group, average harvesting time (70,4 days), biological efficiency reached (9,51%). Irradiation dose of 1 kGy gave the longest mean harvest time (72 days) and the lowest biological efficiency (7.45%). Research results have found that the irradiation method has an effect on the growth and development of the mycelium *Pleurotus sajor-caju* on the difference nutrition medium, which can increase or decrease the yield and quality of the mushroom.

**Keywords:** *Pleurotus sajor-caju*; Gamma Co-60; irradiation method

## BIOACTIVITIES OF OPHIOCORDYCEPS SPHECOCEPHALA FROM BIDOUP, LAM DONG, VIET NAM

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### Abstract

The fungal genus *Ophiocordyceps* are entomopathogenic fungi, belonging to the phylum Ascomycota, have been utilized in traditional Chinese and Tibetan medicine for centuries, owing to their purported valuable medicinal properties such as immunomodulatory, anticancer, and anti-inflammatory. Our research investigated the bioactive properties of mycelial extracts from the fungus *Ophiocordyceps sphecocephala*, that was collected from Bidoup, Nui Ba, Lam Dong province, Vietnam and cultivated under *in vitro* conditions.

The hexane extracts of the *O. sphecocephala* mycelium exhibited several bioactivities, including DPPH radical scavenging capacity, inhibition of  $\alpha$ -glucosidase activity, and cytotoxicity against various human cancer cell lines: MCF-7 (breast cancer), HeLa (cervical cancer), Jurkat (leukemia), and NCI-H460 (lung cancer). The extracts displayed the highest cytotoxic potency against Jurkat and NCI-H460 cells, while exhibiting the lowest effects on MCF-7. These findings highlight the pharmacological potential of *O. sphecocephala*, and promise further investigation into their therapeutic applications. Furthermore, the successful *in vitro* cultivation of *Ophiocordyceps sphecocephala* could provide a sustainable source of bioactive compounds, and potentially mitigate the impacts of climate change on vulnerable species within the *Ophiocordyceps* genus.

**Keywords:**  $\alpha$ -glucosidase; anticancer; bioactivity; cytotoxicity; DPPH

## EFFECTS OF MEDIA ON THE BIOACTIVE CONTENTS OF OPHIOCORDYCEPS SPHECOCEPHALA FROM BIDOUP, LAM DONG

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### Abstract

*Ophiocordyceps*, an entomopathogenic fungus belonging to the phylum Ascomycota, has gained significant recognition for its potent medicinal properties attributed to its diverse array of bioactive compounds. Among the most notable bioactive constituents are cordycepin and adenosine, nucleoside derivatives renowned for their wide spectrum of biological activities. Additionally, *Ophiocordyceps* is a rich source of immunomodulatory polysaccharides such as  $\beta$ -glucan. In this study, we investigated the effects of cultivation media on the biosynthesis of cordycepin, adenosine, and  $\beta$ -glucan by *Ophiocordyceps sphecocephala*, a species collected from Bidoup, Nui Ba, Lam Dong province, Vietnam, and cultivated under *in vitro* condition.

Our results revealed that the MCM culture medium yielded the maximum cordycepin production, while the highest adenosine concentrations were observed in HEN, SDAY, and MYA media. When testing various carbon sources, all media containing 6-carbon sugars significantly enhanced cordycepin levels, whereas only fructose, maltose, and sucrose supported maximum adenosine biosynthesis. The evaluation of five different nitrogen sources showed that silkworm powder, yeast extract, and tryptone enhanced cordycepin production, however, no notable variations in adenosine concentration were detected across the tested nitrogen sources. Interestingly, the analysis of  $\beta$ -glucan content revealed no statistically significant differences when varying the carbon and nitrogen sources during fungal cultivations. These results could contribute to the development of crop varieties with improved resilience and productivity under changing environmental conditions and therefore hold significant potential for developing sustainable and climate-resilient agricultural strategies.

**Keywords:** adenosine;  $\beta$ -glucan; bioactive; cordycepin; cultivation

## DISTINCT RESPONSES OF DIFFERENT STRAWBERRY CULTIVARS TO CHANGES IN LIGHT QUALITY IN A PLANT FACTORY

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### Abstract

Climate change and other natural-social problems have significantly impact production and distribution of agricultural products such as strawberries (*Fragaria × ananassa* L.). Application of advanced cultivation technology, such as plant factory, could address these issues, but only if optimum growth conditions, such as for light quality, are identified. We hydroponically cultivated two strawberry cultivars, the Japanese ‘Sky Berry’ and the New Zealand ‘Pajero’, for 180 days in a container-style plant factory under four types of LED light (cool white, warm white, red:blue of 70:30 ratio, and red:blue of 60:40 ratio), all with PPFD of 100  $\mu\text{mol}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$ . The results showed red:blue LED combination significantly shortened time to flowering and fruiting. The number of fruits, fruit formation rate and number of marketable fruits for ‘Sky Berry’ reached the highest under 70:30 red:blue treatment, while for ‘Pajero’ there were no differences in these parameters among cool white and the two red:blue treatments. Actual yield and marketable yield were also highest under 70:30 red:blue treatment for ‘Sky Berry’, while for ‘Pajero’ the two red:blue treatments gave higher results than white LED treatments, but were not significantly different from each other. On the other hand, fruit weight of ‘Sky Berry’ were not different among treatments, while red:blue treatments produced significantly heavier fruit of ‘Pajero’ than white LED treatment. These results highlight the distinct responses of different strawberry cultivars to conditions such as light quality in a plant factory, and the need to carefully investigate these responses before selection of growth conditions.

**Keywords:** strawberry; light quality; plant factory; yield; fruit size

## PROPAGATION FOR HUPERZIA SQUARROSA USING CUTTINGS AND IN VITRO CULTURE

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### Abstract

The tassel fern, *Huperzia squarrosa*, is a rare, medicinally valuable plant containing Huperzine A, naturally propagated by spores and rhizomes, or by cuttings and clump division with a very low and slow multiplication rate. This study aims to establish optimal conditions for the propagation of *H. squarrosa* using stem cuttings and *in vitro* culture techniques to support the preservation and development of this species. Apical and stem cuttings were treated with indole-3-butyric acid (IBA) at concentrations of 500 ppm, 1000 ppm, and 1500 ppm, or naphthaleneacetic acid (NAA) at concentrations of 10 ppm, 20 ppm, and 30 ppm, and subsequently planted in a substrate composed of coir dust, charcoal dust, and burnt rice husk in a 3:2:2 ratio. All apical cuttings treated with 1500 ppm IBA for 30 minutes showed the rooting success, identified as the optimal method for cutting propagation of *H. squarrosa*. Shoots were surface sterilized with a 40% bleach solution for 40 minutes and treated with antibiotics (2.5 mg/mL ampicillin and 2.5 mg/mL tetracycline) for 30 minutes, resulting in a 73.8% clean sample rate. Culturing on ¼ MS medium achieved 70% survival and 55% rooting after 60 days. Ongoing research focuses on enhancing complete plant regeneration and improving the *in vitro* propagation efficiency of *H. squarrosa*.

**Keywords:** apical cutting; *Huperzia squarrosa*; IBA; MS medium; rooting



## EFFECTS OF IBA, NAA AND SUBSTRATE MIXING RATIO ON GROWTH OF MAI VANG (OCHNA INTEGERRIMA) HD01 LINE

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### Abstract

Mai vang existed in culture and tradition for a long time and was considered as a symbol of the traditional Tet. The experiments conducted on Mai vang HD01 line, selected at Huu Duc apricot garden in Binh Loi apricot village with many exceptional characteristics. The primary objective of this research was to determine the optimal IBA, NAA concentrations appropriate for root formation from shoot samples in *in vitro* condition and the optimal substrate mixing ratio appropriate for the growth of the HD01 variety in *ex vitro* condition. The study including two experiments were arranged in completely randomized design with one-factor and two-factor. For rooting induction, the culture medium supplemented with concentrations of IBA combined with concentrations of NAA was used, while to grow, Mai vang trees were planted in a substrate of coconut fiber, sand, rice husk ash and vermicompost with different mixing ratios. The results showed that Mai vang shoots were cultured on MS medium supplemented with 0.5 mg/L IBA combined with 2 mg/L NAA suitable for rooting and creating complete plants. The number of roots, root length, tree height and number of leaves were 6.9 roots; 3.5cm; 2.3 cm and 5.9 leaves, respectively. Mai vang trees in the plant nursery stage were suitable for planting on a substrate with a mixing ratio of 1 coconut fiber : 1 sand: 1 rice husk ash: 1 vermicompost with a 100% survival rate, grow quickly to a height of 5.1 cm, higher than trees were planted on other substrate mix ratios.

**Keywords:** *in vitro*; *ex vitro*; substrate; plant growth regulator; Mai vang

## INDUCTION OF SCALP AND SOMATIC EMBRYO FORMATION FROM THIN SLICES OF BANANA (*MUSA PARADISIACA* VAR. AWAK)

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### Abstract

Banana (*Musa spp.*) is an herbaceous plant with high commercial value both internationally and domestically. Propagation of banana through somatic embryogenesis is considered an effective method to produce large quantities of uniform plants. This study presents the induction of scalp and organogenesis from thin scalp slices of banana (*Musa paradisiaca* var. *Awak*). *In vitro* shoots with or without decapitation were cultured on MS medium (Murashige and Skoog, 1962) supplemented with NAA and BAP at various concentrations. After eight weeks, large, firm scalps without shoots were cut into 5-7 mm longitudinal thin slices and transferred to MS medium supplemented with NAA and BAP to induce organogenesis. The results showed that on MS medium supplemented with 0.2 mg/L NAA and 2.0 mg/L BAP, the highest scalp formation rate of 50% was achieved in non-decapitated shoot samples. However, scalps from decapitated shoot samples were larger, firmer, morphologically uniform, and less capable of shoot formation. The highest rate of embryogenesis (66.29%) was obtained when thin scalp slices were cultured on MS medium supplemented with 0.2 mg/L BAP and 2.0 mg/L NAA. The highest average number of embryos per sample (1.64 embryos) was achieved on MS medium supplemented with 0.2 mg/L BAP and 1.0 mg/L NAA. The highest rate of shoot formation (38.51%) was obtained when cultured on MS medium. Further studies to increase the biomass of somatic embryos are being conducted to improve propagation efficiency.

**Keywords:** BAP; NAA; *Musa paradisiaca* var. *Awak*; Scalp; Somatic embryos

## EFFECT OF TDZ CONCENTRATION ON SOMATIC EMBRYOGENESIS FROM STEVIA REBAUDIANA LEAVES

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### Abstract

*Stevia rebaudiana*, a member of the Asteraceae family, contains various biologically active substances, including steviol glycosides, phytochemicals, proteins, carbohydrates, lipids, fibers, oils, vitamins, and phenolic compounds. This study aims to determine the optimal concentration of TDZ for embryogenesis from callus derived from *Stevia rebaudiana* leaves and to create material for future research. *In vitro* leaves were cultured on Murashige and Skoog (MS) medium supplemented with TDZ under dark conditions. After 4 weeks, the embryonic callus was transferred to MS medium with TDZ (0–1 mg/L) to induce embryos. All samples induced callus at 0.5 mg/L and 0.7 mg/L TDZ within 14 days. The best embryogenic callus was achieved at 0.7 mg/L TDZ. After 3 weeks, the callus mass increased to 1213.3 mg from an initial leaf weight of 5 mg on MS + 0.7 mg/L TDZ. The highest embryo formation rate of 100% was recorded on MS medium supplemented with 0.5 mg/L or 0.7 mg/L TDZ.

**Keywords:** callus; in vitro; somatic embryo; *Stevia rebaudiana*; TDZ

## EFFECTS OF MICROBIAL ORGANIC FERTILIZER ON GLYCOALKALOID CONTENT AND YIELD IN SOLANUM PROCUMBEN LOUR.

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### Abstract

*Solanum procumbens* is a traditional medicinal plant that is rich in glycoalkaloids. The objective of this research was to determine the appropriate types and rates of microbial organic fertilizers for optimizing yield and glycoalkaloid content in *Solanum procumbens* Lour. A two-factor experiment was conducted using a split-plot design (SSD) with three replications. The main plots consisted of four types of microbial organic fertilizers (HD301, HD302, Komix-BL2, and HCMK7), while the sub-plots included three application rates (2, 4, and 6 tonnes/ha/crop). Various parameters were measured, including fresh and dry biomass per plant, fresh and dry yield per hectare, glycoalkaloid content, and glycoalkaloid yield over two crops. The results indicated that applying HCMK7 at a rate of 6 tonnes/ha/crop resulted in a fresh biomass of 255.2 g and dry biomass of 111.1 g per plant, fresh yield of 15.77 tonnes/ha, dry yield of 6.99 tonnes/ha, glycoalkaloid content of 0.70%, and glycoalkaloid yield of 48.97 kg/ha in the first crop. For the ratoon crop, the same application rate of HCMK7 achieved a fresh biomass of 282.5 g and dry biomass of 134.6 g per plant, fresh yield of 17.62 tonnes/ha, dry yield of 9.21 tonnes/ha, glycoalkaloid content of 0.76%, and glycoalkaloid yield of 48.97 kg/ha. The highest average glycoalkaloid content (0.73%) and total glycoalkaloid yield (119.63 kg/ha) across two crops were also recorded at this application rate.

**Keywords:** biomass; glycoalkaloids; microbial organic fertilizer; *Solanum procumbens*; yield

## EVALUATING THE EFFECTIVENESS OF NAA AND SUBSTRATES FOR PROPAGATION AND CULTIVATION OF MON COEUR ROSE (ROSA SP.)

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### Abstract

The objectives of this study were to determine suitable growth medium, NAA concentration, and the substrate ratio for cutting propagation of rose in order to promote the development and give to economic efficiency of potted rose Mon Coeur cultivar. The study consisted of two experiments. The first experiment was arranged in a completely randomized design (one factor) 3 replications with 6 treatments corresponding to 6 growing media mixing ratio. The growing media include: 3,5 coconut peat + 1,5 rice husk ash + 2 cow dung + 1,5 perlite + 1,5 vermiculite increased the number of first-order branches (reached 6.1 branches/plant), leaves (reached 124.3 leaves/plant) the number of flowers (reached 12.4 flowers/plant) and the highest economic efficiency, with a profit of 56.3 million VND/1,000 pots and a return rate of 1.9 times. The second experiment was arranged in a completely randomized design with two factors (NAA concentration and the substrate ration), each with 3 replications. The rose propagation cuttings in the substrate supplemented with vermiculite achieved the highest survival rate (60.8%), the greatest number of roots (10.6 roots/cutting), and highest transplanting success rate (56.9%). Rose stems treated with NAA at a concentration of 1,500 ppm showed the highest survival rate (75.9%), the greatest number of roots (10.8 roots/cutting), and the highest transplanting success rate (60.7%). Stem cuttings on substrates supplemented with vermiculite in combination with NAA treatment at a concentration of 1,500 ppm achieved the highest transplanting success rate (71.1%).

**Keywords:** NAA; Vermiculite; Perlite; substrate; propagation; Mon coeur; Rosa sp

## ISOLATION AND EVALUATION OF BIOLOGICAL CHARACTERISTICS OF ENDOPHYTIC BACTERIA OF BANANA PLANTED IN GIA LAI PROVINCE

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### Abstract

Endophytes play important roles in improving plant nutrient uptake and synthesis of plant growth regulators. Endophytes are diverse microbes, most commonly bacteria and fungi. Isolation of domestic bacteria from bananas in our practical farm fields and assessment of their functional potentiality as biological fertilizers is necessary.

This study was carried out with the aim of isolation and evaluation of biological characteristics of endophytic bacteria, such as fixing nitrogen, producing essential phytohormones (like indole acetic acid (IAA)), and synthesizing extracellular enzymes to enhance the breakdown of complex organic matter. Fifteen endophytic bacterial isolates were collected from twenty banana roots in Mang Yang district, Gia Lai province. The morphological characteristics of colonies were circular shape, raised elevation, smooth margin, milky white or pure white on NFb medium, white or yellow on Baz medium.

All strains were able to fix nitrogen and synthesized indole acetic acid (IAA). Four strains D1.5, D2.6, D3.8 and R1.5 had the high ability of N-fixing with 2.40 µg/ml, 2.92 µg/ml, 2.24 µg/ml, 2.66 µg/ml of NH<sub>4</sub><sup>+</sup> concentration, respectively, while strain D2.6 gave the highest concentration of IAA at 2.06 µg/ml. Four bacterial isolates were selected for partial 16S rRNA gene sequencing. The results show that strain D2.6 was determined as *Bacillus pumilus* with 99.93% homogeneity level and strains D1.5 and R1.5 were determined as *Bacillus subtilis* with 99% homogeneity level and strain D3.8 was determined as *Brevundimonas terra* with 99.93% homogeneity level.

**Keywords:** Banana; endophytic bacteria; nitrogen fixation; IAA synthesis

**RESEARCH ON PRODUCING OF GANODERMA LUCIDUM INSTANT TEA**

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**Abstract**

A healthy *Ganoderma lucidum* instant tea with appropriate auxiliary materials and characteristics of soluble and clear in hot water was produced after extraction, concentration and freeze drying. The aim of this study was to determine the appropriate temperature, the ratio of raw materials/solvent, extraction time of polysaccharides from *Ganoderma lucidum* and produce instant tea from the extract of *Ganoderma lucidum* mushrooms. The results indicated that the optimum conditions were an extraction temperature of 100 °C, an extraction time of 90 min and a substrate/liquid ratio of 1:20. The yield of polysaccharides from *Ganoderma lucidum* was 16.76 mg/g. The blend formula of the soluble tea product gave the highest sensory evaluation score, with the mixing ratio of *Ganoderma lucidum* mushroom: stevia sugar: maltodextrin being 12:10:15. According to TCVN 3215:79 criteria on flavour and taste, the *Ganoderma lucidum* instant tea has an organoleptic score of 15,97 with slightly bitter, good stability. The appropriate formulas was built and selected to make dissolved tea *Ganoderma lucidum* instant tea products meet quality standards; the product analysis criteria are within the allowable limits based on the established standards.

**Keywords:** instant tea; *Ganoderma lucidum* extract

## THE INHIBITORY EFFECT OF CHAETOMIUM SP. ON NEOSCYTALIDIUM SP. AND ALTERNARIA SP. CAUSING DISEASE ON DRAGON FRUITS

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### Abstract

*Neoscytalidium* sp. and *Alternaria* sp. are two pathogens that cause brown spot disease and branch tip rot on dragon fruit trees (*Hylocereus* spp.). This is a serious threat to the productivity and quality of this important crop in Vietnam. To contribute to disease prevention, finding highly effective antagonistic organisms against two pathogenic fungi is important. For a long time, fungi of the genus *Chaetomium* have been used as biological agents to prevent pathogens on different plant species, so in this study, the antagonistic ability of six strains of *Chaetomium* fungi against two fungal species causing diseases on dragon fruit trees were evaluated by co-culture method. The results showed that after 15 days of co-culturing six *Chaetomium* fungal strains all showed the ability to inhibit the growth of fungal mycelium, in which the antagonistic efficiency against *Neoscytalidium* sp. ranged from 58.2% to 73.54 % and *Alternaria* sp. ranged from 60.85% to 73.02%. After that, the three *Chaetomium* fungal strains, including C3, C4 and C5, with the highest antagonistic efficiency, were continued to investigate their inhibitory ability against two fungal pathogens by in vitro testing. The results showed that all three lines have the ability to reduce disease rates to less than 50%. Research on the biological and molecular characteristics, synthesis of antifungal compounds and disease control ability of these fungal strains is continuing to be able to apply to kill *Neoscytalidium* sp. and fungus *Alternaria* sp. in the fields.

**Keywords:** Antagonistic activity; *Neoscytalidium* sp.; *Alternaria* sp



## IDENTIFICATION OF GENES AFFECTED BY EXOGENOUS GLUTATHIONE IN NEEDLES OF GENUS LARIX BY RNA-SEQ

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### Abstract

Glutathione, an essential metabolite with multiple functions in plants that other metabolites cannot accomplish in plant development, including roles in biosynthetic pathways, detoxification, antioxidant biochemistry, and redox homeostasis. The previous studies provide some insight into how glutathione enhances photosynthesis to alleviate stresses in plant species by avoiding oxidative stress. However, the molecular mechanisms of how glutathione enhances photosynthesis are still unidentified. This study aims to understand the molecular mechanism of increasing photosynthesis processes triggered by exogenous oxidized glutathione (GHHS) applied through foliar spray fertilization in the *Larix gmelinii* var. *japonica*. This tree species has been in increasing demand for plantation in Hokkaido, Japan in recent years due to its economic value. The present study investigated the photosynthesis-related gene expression in response to exogenous GHHS supplementation through RNA sequencing. A total of six branches of mature tree was randomly assigned to two treatments, (1) fertilized with GHHS and (2) no fertilization as a control. Each treatment was replicated with three mature trees of one branch. We analyzed the up/down-regulated differentially expressed genes (DEGs) involved in photosynthesis processes in GHHS-fertilized treatment compared to the control.

**Keywords:** foliar spray, gene expression, glutathione, photosynthesis, RNA-sequencing

## ISOLATION OF RHIZOSPHERE BACTERIA FOR IN VITRO CONTROLLING OF ROOT-KNOT NEMATODES (MELOIDOGYNE SPP.)

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### Abstract

Root-associated bacteria living in soil, on root surface or inside root are considered as rhizosphere bacteria (RB). In nature, RB plays an important role in nutrient synthesis and promoting plant growth therefore widespread applied on sustainable agriculture especially on crop protection. In this research, forty one bacteria strains isolated from black pepper roots (*Piper nigrum L.*) and rice roots (*Oryza sativa*) were screened by evaluating the number of dead root-knot nematodes after immersing 50 J2 in 500 ul of bacteria suspension at  $10^7$  CFU . The isolate RT7 collected Trang Bom - Dong Nai showed a remarkable result with 83,5% mortality of juveniles followed by isolate RL7 (65%) from Ninh Hoa - Khanh Hoa . The 16S rDNA sequence indicated that these isolates were *Bacillus pumilus* (RT1) and *Priestia megaterium* (RL7). It is suggesting that two strains RT1 and RL7 have potential as biological control agents of *Meloidogyne* spp.

**Keywords:** biological control; rhizosphere bacterial; Meloidogyne spp.; juvenile mortality; 16s rDNA

**EFFECT OF GROWTH REGULATORS AND CULTURE CONDITIONS  
FOR MICROPROPAGATION OF VIETNAMESE GINSENG (PANAX  
VIETNAMENSIS HA ET GRUSHV) ON A TEMPORARY IMMERSION SYSTEM**

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**Abstract**

Ngoc Linh ginseng is a valuable medicinal crop recognized for its anti-amnesia, anti-inflammatory, hepatoprotective, and anti-cancer properties. This study was to investigate the variation effect of growth regulators and culture conditions for micropropagation of Ngoc Linh ginseng (*Panax vietnamensis* Ha et Grushv.) on a temporary immersion system. After ten weeks of cultivation, the best callus induction rate in a solid MS medium containing 2,4-D 1.5 mg/L was 90%. Callus cultured on MS medium (IBA 0.7 mg/L) supplemented with TDZ 0.8 mg/L resulted in the highest embryogenesis rate, reaching 69.29%, with an average of 11.25 embryos per explant. MS medium supplemented with BAP 1 mg/L and NAA 1 mg/L was shown to be appropriate for shoot growth from Ngoc Linh ginseng embryos. The temporary immersion system showed that with a BA concentration of 1.5 mg/L for 3 minutes of immersion, the greatest value for shoot number was 6.00 shoots/explant, and the height was 2.70 cm. Roots developed best at a treatment with a 5 minutes of immersion and NAA 1 mg/L concentration, root formation frequency, and root length reaching values of (71.25%; 1.61 cm). As a result, the TIS system can be used for high-efficiency *in vitro* propagation of Ngoc Linh ginseng plants.

**Keywords:** Auxin; Cytokinin; Immersion time; *Panax vietnamensis* Ha et Grushv; Temporary immersion system (TIS)

## OPTIMIZATION OF SODA COOKING FOR CELLULOSE PREPARATION FROM SUGARCANE BAGASSE

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### Abstract

Sugarcane bagasse is a fibrous material containing cellulose as its main component. It is produced in large quantities across the world. The aim of this work was the production of unbleached pulp from sugarcane bagasse by applying the soda cooking process using sodium hydroxide as an alkaline reagent. The response surface methodology program was used to study the effect of pulping variables that influence pulping results. The optimal conditions predicted by Minitab 21.2 to obtain the highest yield of 46.4% w/w and the lowest kappa number of 20.6 were 23% sodium hydroxide dosage, 155°C pulping temperature, and 93 min pulping time. Refining the pulp obtained at optimal cooking condition by PFI mill under different revolutions of 0, 500, 1000, 1500, 2000, 2500, 3000. At the point of refining 31oSR (revolution of 2500), the strength properties of handsheet (basic weight 85 gsm) reached maximum value with the tensile strength of 2 kN/m, burst strength 2.7 kgf/cm<sup>2</sup> and ring crush strength 6.9 kgf. These basic strength properties of cellulose were found that the produced paper is in compliance with the commercial kraft cellulose pulp and can be developed for nanocellulose preparation.

**Keywords:** response surface methodology; sugarcane bagasse; soda pulping

## URBAN AGRICULTURE ADAPTATION TO CLIMATE CHANGE: A CASE STUDY IN HO CHI MINH CITY

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### Abstract

The goal of the studying is to build a greenhouse model with the integration of IoT; assessment of potential application of a vertical farming system for common groups of leafy vegetables; and to bring into people's awareness and transferring or giving instructions to house-holder. The authors used several research methods: (i) Survey residents' awareness of urban gardens using a questionnaire; (ii) Greenhouse design by using AutoCAD and Photoshop software, and Construction of greenhouses according to approved design drawings carried out; (iii) Carry out cultivation experiments in greenhouses using the experimental setup method (There are 04 types of fertilizers tested in pilot: 100% using inorganic fertilizer; Inorganic fertilizer (50%) + Organic fertilizer (50%); 100% organic fertilizer; and Organic fertilizer (100%) + microbial organic fertilizer, spray every 7 days). The best pilot test formula will be selected for large-scale testing. The results of the studying the specific case of Ho Chi Minh City by surveying residents' perceptions of urban gardens and designing specific garden models proved that, urban agriculture is truly necessary and brings many values, contains: Eco-environmental values, responding to climate change and providing a safe food source for urban residents. At the same time, it brings natural beauty to the urban landscape of the city and surrounding areas. Research results have recorded: (i) Vegetable productivity per unit area of vertical farming is 157% - 269% higher than that of vegetables grown in the field. (ii) Vertical farming's ability to absorb carbon dioxide per unit area is 1.5 - 2.7 times higher than vegetables grown in the field. This study also recorded "To get 1.0 kg of biomass yield, plants need to absorb 1.6 kg of carbon dioxide and emit 1.0 kg of oxygen into the environment". (iii) The results of this study show that planting vertical gardens saves 6 to 8 times more water than traditional planting. At the same time, any nutrients and water not absorbed by the roots can be recycled rather than lost to the system. The studying results meets the demands of the following SDGs of UN: No.2 "End hunger, achieve food security and improved nutrition and promote sustainable agriculture", and No. 12 "Ensure sustainable consumption and production patterns", and No. 13 "Take urgent action to combat climate change and its impacts". The research was completed thanks to funding support from the British Council and Van Lang University for the project "Urban Resilience in Agriculture Through Highly Automated Vertical Farming in Vietnam and the UK".

**Keywords:** Eco-environment; climate change; urban agriculture; vertical garden; urban landscape

**SESSION 3**

**INNOVATIVE TECHNOLOGY IN  
SUSTAINABLE AGRICULTURE**

## ISOLATION AND SELECTION OF YEAST TRAINS FOR THE FERMENTATION OF BANANA WINE (MUSA CAVENDISH)

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### Abstract

In pursuit of isolating and selecting yeast strains suitable for banana wine fermentation, the study focused on identifying highly active yeast strains presented in raw Cavendish banana flesh. Yeast strains with robust activity were isolated and further investigated their potential. Six isolates were obtained from naturally fermented banana wines, including YDC, YCL1, YCL2, YCL3, YCL4, and YCL5. Morphological analysis revealed that these yeast strains predominantly belonged to the *Saccharomyces* genus. Furthermore, these six isolated yeast strains were compared with another set of yeast strains (SDA 578, SDA MN, SDA 94, DS1, DS3, and DS4) obtained from the yeast collection at Nong Lam University (NLU) and SOFRI. Most of the isolated yeast strains exhibited an alcohol content of 8%, consistent with the other six yeast strains. However, the most favored banana wine was produced using the SDA 578 strain from NLU, which also had 8% alcohol content and a mild aroma. Additionally, the impact of varying Brix degrees (18, 20, 22, 24, and 26 °Brix) on the fermentation process and banana wine quality using the SDA 578 strain was investigated. Among the tested samples, the 24°Brix condition yielded the highest alcohol content (16% v/v) and emerged as the preferred banana wine.

**Keywords:** Yeast strains; *Saccharomyces*; Cavendish banana; isolation; banana wine

## BIOLEATHER FROM BIO-BASED WASTE AND STUDIES ON BIODEGRADATION

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### Abstract

The purpose of this study develops the technology to produce Bioleather with ingredients such as spent coffee grounds, sugarcane bagasse, banana peel and dragon fruit peel. The process includes the following steps: mix dried and finely crushed biomass with Sodium Alginate (SA-to-biomass ratio of 1:2), aqueous, glycerine, vegetable oil; then, the mixture was spread on the mold, 300ml CaCl<sub>2</sub> (7%) was added to form ionic crosslinking gel in 20 minutes; after that, samples were washed with water and the last step, it was dried at 50°C. Dried biocomposites were analyzed for mechanical properties and biodegradability testing in water and soil. The chemical and physical structures of bioleathers were measured using Texture Analyzer TA-XTplus, Fourier transform-infrared spectroscopy. The rheological behavior of the mixture was analyzed using a rheometer (DV2TCP, Brookfield, USA). The durability of Bioleather was improved by the addition of SA, however, the higher viscosity, the more difficult the ingredient mix to be. Bioleather was biodegradable after 21 days incubated in soil and water.

**Keywords:** bio-leather; biomass; biodegradable; durability



## EFFECTS OF RECOVERY AND PURIFYING METHODS ON MORPHOLOGY AND PROPERTIES OF ALPHA-AMYLASE TREATED RICE STARCHES

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### Abstract

Agricultural biocatalysis is of immense scientific interest nowadays owing to its increasing importance in the efforts for more sustainable agriculture while optimizing environmental impacts. In this study, normal rice starch was hydrolyzed with alpha-amylase for production of modified rice starches with various degree of dextrose equivalent (DE 3.9-37.7). The differences in DE values of modified rice starches were significantly affected by the specific recovery and purifying method. At same alpha-amylase treatment conditions, the freeze-dried modified rice starches have higher DE values, lower bulk densities and viscosities, lower moisture contents, higher hygroscopicity and water solubility compared to those obtained from the precipitation and purifying method using solvents. The solvent precipitation and purifying modified rice starch (DE 10.2) have larger particle size and more condense microstructure compared to the freeze-dried modified rice starch of almost similar DE (DE 13.5). These findings showed that the solvent precipitation and purifying method resulted in lower DE modified rice starches with distinct morphological and physicochemical properties compared to the modified rice starches obtained from the freeze-drying method.

**Keywords:** alpha-amylase; dextrose equivalent (DE); modified rice starch; morphology; physicochemical properties

## RESEARCH ON PRODUCTION OF FREEZE-DRIED KEFIR YOGURT SUPPLEMENTS WITH *CORDYCEPS MILITARIS*

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### Abstract

The gastrointestinal system, often referred to as the second brain of the human body. Enhancing the immune system of the digestive system is crucial for improving health and supporting the prevention and treatment of gastrointestinal-related diseases. Therefore, this research aims to produce freeze-dried Kefir yogurt supplemented with *Cordyceps militaris*, diversifying fermented foods, while offering convenient storage and consumption options, along with health benefits. To improve the structure and flavor of the product, ingredients such as maltodextrin, skimmed milk powder and gelatin were incorporated. Experiments also included by addition of sucrose to further enhance these attributes. The optimal formulation for the freeze-dried Kefir yogurt supplemented with *C. militaris* was determined as containing of Kefir and 5% *C. militaris* powder, while maintaining a lactic acid bacteria (LAB) count of  $7.4 \times 10^7$  CFU/g. This formulation also received the highest sensory scores and positive feedback on its structure, flavor, and moisture content, which remained below 5%. The study revealed that the addition of *C. militaris* powder to Kefir yogurt did not significant impact the LAB count. Furthermore, the inclusion of maltodextrin and skimmed milk powder in the formulation was effective in sustaining the viable LAB count. In conclusion, the research successfully formulated an innovative freeze-dried Kefir yogurt supplemented with *C. militaris*, a promising product with significant health benefits.

**Keywords:** *Cordyceps militaris*; Kefir; lactic acid bacteria; maltodextrin; probiotics

## PHYSICOCHEMICAL AND ANTIBACTERIAL PROPERTIES OF CHITOSAN EXTRACTED FROM BLACK SOLDIER FLY IN DIFFERENT LIFE STAGES

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### Abstract

Chitosan extracted from insects, especially black soldier fly (BSF) (*Hermetia illucens*), is currently considered a potential source. In our study, we employed a chemical method to extract chitin and chitosan from various life cycle stages of the BSF. This method involved deproteinization with 5% NaOH, demineralization with 4% HCl, decolorization with KMNO<sub>4</sub> 1%, and deacetylation with NaOH. The chitin recovery efficiency varied across life cycle stages, ranging from 8.21% to 35.50%. Notably, the chitin recovery efficiency from BSF cocoons was the highest among all life cycle stages, at approximately 35.50%. We then transformed the chitin into chitosan by treating it with 70% NaOH at a temperature of 80°C for 8 hours. This process yielded chitosan with the highest recovery efficiency in the BSF cocoons, at about 77.88%. Notably, the chitosan produced met commercial chitosan standards, with low mineral and protein content (<1%). The physicochemical properties of extracted chitosan were evaluated through deacetylation (DA), solubility, molecular weight (MW), viscosity, FTIR spectrum, and SEM images. From the results of FTIR spectrum and SEM images, BSF-derived chitosan is  $\alpha$ - chitosan. The DA, solubility, MW, and viscosity of chitosan were 71.9 – 72.3%, 93.2 – 94.1%, 164.6 – 194.9 kDa, and 13.5 – 14.3 cP, respectively. Using the agar diffusion method, the antibacterial activity of CS was examined against gram-positive *Staphylococcus aureus* and gram-negative *Vibrio alginolyticus* bacteria. The result showed that chitosan has antibacterial activity against gram-positive and gram-negative bacteria.

**Keywords:** black soldier fly; chemical method; chitin; chitosan; *Hermetia illucens*

## USING RICE BRAN HYDROLYSATE AS FERMENTATION MEDIUM TO PRODUCE ENZYMES FROM BACILLUS SP.

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### Abstract

Rice bran, a by-product of rice processing, is a rich source of carbohydrates, proteins, lipid, and minerals, making it an ideal medium for proliferating microorganisms. Enzymatic hydrolysis of rice bran provided available nutrients for culturing *Bacillus* sp. and to obtain its secreted enzymes. The combination of Flavourzyme and Alcalase gave an effective hydrolysis with a reducing sugar yield of 383.88 mg/g and a soluble protein production of 119.58 mg/g after 12 hours that was higher than using individual enzymes. The rice bran hydrolysate was used as a culture medium for *Bacillus licheniformis* and *Bacillus subtilis*, resulted in bacterial viable count at  $1.03 \times 10^{11}$  CFU/mL and  $1.18 \times 10^{11}$  CFU/mL, respectively, after 36 hours, which were comparable to bacteria grown on the LB medium. The crude phytase activity obtained from *B. licheniformis* and *B. subtilis* was 795.31 U/L and 394.17 U/L, respectively. While crude protease activity has reached values of 84.44 U/L and 43.13 U/L, respectively. Interestingly, the enzymes obtained by the *Bacillus* fermentation with rice bran hydrolysate performed much higher activity than with the LB medium. This study demonstrated that rice bran hydrolysate could be considered a potential and cost-effective feedstock source for industrial fermentation.

**Keywords:** rice bran; enzymatic hydrolysis; *Bacillus* fermentation; protease; phytase

## MICROBIAL FERMENTATION FOR CHITIN RECOVERY FROM SHRIMP BY-PRODUCTS

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### Abstract

The rapid expansion of shrimp farming and processing has resulted in a significant increase in the discharge of shrimp byproducts into the environment. Approximately 45-60% of whole shrimp are discarded as waste or byproducts. However, these shrimp byproducts contain diverse bioactive compounds, including protein, astaxanthin, minerals, and chitin, which can be harnessed to create high-value products in various domains such as pharmaceuticals, functional foods, human consumption, animal feed, and fertilizers. The combination between protein and chitin within the shrimp exoskeleton forms a robust protein-chitin matrix, subsequently undergoing substantial mineralization to yield a rigid shell. Chitin recovery involves two essential steps: protein removal (deproteinization) and mineral removal (demineralization). This process can be executed using either chemical or biological approaches. Notably, microbial approaches have demonstrated greater efficacy in chitin recovery compared to chemical methods, as they prevent chitin degradation under harsh chemical conditions. Researchers have explored biological alternatives to replace chemical agents in chitin recovery from shrimp waste, aiming to obtain stable, high-quality chitin without environmental pollution. In this review, we discuss two prevalent microbial fermentation methods for chitin recovery from exoskeleton byproducts: lactic fermentation and non-lactic fermentation. Lactic fermentation involves lactic acid-producing bacteria, such as *Lactobacillus* spp. or *Pediococcus* sp., to dissolve calcium carbonate within the exoskeleton and release the protein-chitin matrix. Non-lactic fermentation, on the other hand, relies on protein degradation, which is contributed by protease-producing bacteria such as *Bacillus licheniformis*, *B. amyloliquefaciens*, and *B. subtilis*.

**Keywords:** chitin recovery; shrimp by-products; demineralization; deproteinization; by-product valorisation

## DEVELOPMENT OF FOOD AND BEVERAGE PRODUCTS FROM COFFEE PULP: A PRELIMINARY STUDY

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### Abstract

Coffee pulp is one of the most by-products of coffee processing. The production of value-added products from agricultural residues is an essential step toward sustainable agricultural development. The objective of this study was to evaluate whether coffee pulp can be applied as an ingredient in food and beverage processing. The results showed that all products made from this material such as fruit leather, tea bags, syrup, and fermented drinks achieved high sensorial quality, with a score of 7.84, 6.88, 6.93, and 7.2/9. Moreover, all products contained beneficial compounds such as total phenolic content of 85.55, 316.83, 123.70, and 50.21 mg GAE/100g, and antioxidant activity of 76.07, 174.87, 300.195, and 132.17 mg AAE/100g, inline with the categories. Almost all products were produced from a simple process with common equipments, which allowed for favorable implementation of these products at companies, especially small and medium manufacturers. To improve the quality of the mentioned products, in-depth research should be carried out in the next studies.

**Keywords:** agricultural residue; beverage; coffee pulp; food; value-added product

## EVALUATING THE GABA PRODUCING CAPACITY OF LACTIC ACID BACTERIA AND THEIR APPLICATION ON COCONUT MATRIX

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### Abstract

Gamma-aminobutyric acid (GABA) is a non-protein amino acid that plays an important role in the nervous system. GABA is produced from Glutamic acid (Glu) by Glutamate decarboxylase, which is an enzyme excreted by some kinds of microorganisms. This study focused on the bioconversion of Glu in old-coconut-water and young-coconut-meat to develop GABA enriched food. First, seven strains of lactic acid bacteria (LAB) were screened for their GABA producing capacity on de Man-Rogosa-Sharpe medium fortified with Glu. Both thin layer chromatography and spectrophotometric results showed the capacity of LAB to convert Glu to GABA. *Lactobacillus plantarum* was chosen to apply on the coconut substrate. The growth of colonies and the decrease of pH proved the possible survival of *L. plantarum* on this food matrix. The fermentation of the mixture of old-coconut-water:young-coconut-meat (2:1, v/w) obtained an amount of  $926.18 \pm 25.71$  mg GABA/L. This result showed the potential of enhancing using value of the coconut substrate, that could develop GABA enriched fermented food, like coconut yogurt, by using GABA producing LAB.

**Keywords:** coconut substrate; fermentation; gamma-aminobutyric acid; lactic acid bacteria

## ANTIFUNGAL ACTIVITY OF PHENOLIC-RICH PLANT EXTRACTS AGAINST FUSARIUM OXYSPORUM

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### Abstract

Polyphenols are secondary compounds occurring widely in plants which are highly effective in controlling plant pathogenic microorganism. This study aimed to select polyphenolic-rich plant extracts displaying potential of antifungal capacity against *Fusarium oxysporum*. Several plant materials including *Ricinus communis*, *Anacardium occidentale*, *Garcinia mangostana*, *Sapindus saponaria*, *Calotropis gigantea*, *Coffea arabica* were investigated for their total phenolic content. The results showed that cashew leaves and mangosteen peel contained superior level of polyphenols of 108.23 and 124.14 mg GAE/g, respectively. Main phenolic compounds found in cashew leaves were gallic acid and protocatechuic acid at 377.29 mg/100 g and 56.44 mg/100 g, respectively; mangosteen peels contained 16.22 mg/100 g protocatechuic acid and 55.75 mg/100 g chlorogenic acid. Antifungal capacity of cashew leaves and mangosteen peels extracts against *F. oxysporum* were 32.92 – 77.08% and 68.33 – 83.75%, respectively at extract concentrations from 2% to 10%. The inhibitory effect of the combination of cashew leaves and mangosteen peels on *F. oxysporum* was 2.3 and 1.1 times higher than individual extracts. Cashew leaves and mangosteen peels are potential materials for producing bio-fungicides, which are not only effective but also safe for human and the environment.

**Keywords:** antifungal activity; phenolic compound; *Fusarium oxysporum*; mangosteen peels; cashew leaves



## EFFECTS OF BUTYRIC ACID SUPPLEMENTATION IN FEED ON GROWTH RATE AND RESISTANCE TO AEROMONAS HYDROPHILA OF COMMON CARP (CYPRINUS CARPIO) RAISED IN A BIOFLOC SYSTEM

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### Abstract

During an 8-week feeding trial, the study determined the amount of butyric acid supplement in the feed of common carp raised in the biofloc system. The experiment was designed completely randomly with 3 treatments based on the content of butyric acid added in commercial feed (Holdone H9040, 32% protein), respectively: 0, 5 and 10 g/kg. Carp were acclimatized for 2 weeks with commercial feed before starting the experiment. After two weeks of adaptation, 90 healthy carp ( $45,2 \pm 2,8$  g/fish) were selected and randomly distributed to 9 experimental tanks (corresponding to 3 treatments with three repetitions), with a stocking density of 10 fish/tank (150 L). Fish were fed to satiety twice a day for 8 weeks. The findings revealed that butyric acid supplementation improved carp growth and feed efficiency, lysozyme enzyme activity, and resistance to *Aeromonas hydrophila*, with the optimal level being 5 g/kg of feed. The conclusions of this study can be used in actual carp farming models and farms to increase safety, economic efficiency, and sustainability.

**Keywords:** common carp; butyric acid; biofloc; *Aeromonas hydrophila*

## FORMULATION AND SENSORY EVALUATION OF SUNSCREEN CONTAINING MORINGA (*MORINGA OLEIFERA*) LEAF EXTRACT AND MOISTURIZER CONTAINING MORINGA (*MORINGA OLEIFERA*) SEED OIL

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### Abstract

Sunscreen containing Moringa (*Moringa oleifera*) leaf extract and skin moisturizer containing moringa (*Moringa oleifera*) seed oil were the two types of cream studied for stability and sensory analysis. The research included testing the stability of base formulation without active agents (either leaf extract or seed oil) for sensory and storage experiments. Base formulae were studied based on the ratio of oil to water phase as well as concentration of surfactants. The oil/water ratio of 25/75 was appropriate formulation according to sensory results. Besides, different Cetyl alcohol ratios were studied in order to achieve a Glyceryl stearate : Stearyl alcohol : Cetyl alcohol ratio of 2 : 2.5 : 4.1 resulting in the base formulation with best stability. Varied amount and types of added active agents was used to formulate either sunscreen or moisturizer and the two types of cream gave satisfying feeling to evaluators when evaluating before and after-use sensory properties. Also, stability study showed that physicochemical properties of these creams was not significantly changed after twelve continuous heating-cooling cycles and isothermal storage at 14 °C, 30 °C for 28 days. However, sample storage at 45 °C showed that cream containing moringa seed oil was stable up to 28 days but cream containing moringa leaf extract was separating after 7 days. In addition to the traditional centrifugation method, the texture analysis method was applied in this study to measure the stability of the cream base and gave equivalent results. Therefore, this study suggests a new option to measure cream stability using texture analysis in addition to centrifugation.

**Keywords:** Formulation; sensory evaluation; sunscreen; moringa leaf extract; moisturizer; moringa seed oil; *Moringa oleifera*

## EFFECT OF GELATIN CONTENT, FERMENTATION TEMPERATURE, MICROBIOLOGICAL RATIO AND ON ACIDITY, RHEOLOGICAL PROPERTIES, AND TEXTURE PROPERTIES OF PEANUT KEFIR

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### Abstract

Peanuts, the scientific name *Arachis hypogaea*, are an important nutritional source because they are a rich source of nutrition, especially essential amino acids and protein, which can help prevent malnutrition, reduce heart disorders, and prevent certain types of cancer. Kefir is one of the fermented dairy products containing probiotics, a food miracle when it comes to its beneficial effects on human health. Kefir is a popular fermented milk product worldwide; however, it is fermented from plant milk and has yet to be popular. Moreover, Kefir is a new product in the Vietnamese market and is less popular than yogurt. In order to promote the development of vegetable kefir products in the domestic market, we researched peanut kefir.

The objective of the experiment was to evaluate the effects of gelatin concentration (0.3, 0.5, 0.7%), fermentation temperature (23, 25, 27, 29°C), and microorganism ratio (1, 3, 5, 7%) on acidity, the rheological properties, texture properties, and SEM of Peanut kefir. The result can be seen that the Ostwald-de Waele described the rheological properties of Peanut kefir as pseudoplastic ( $0 < \eta < 1$ ) and weak gel properties. Peanut kefir's rheological characteristics (viscosity, shear stress) and texture properties (hardness and stickiness) change with gelatin content, fermentation temperature, and microorganism ratio. The FTIR spectrum of the gel peanut kefir sample is similar to that of the control sample. Besides, research results show that experimental samples with optimal parameters (0.5% gelatin content, fermentation temperature of 25°C with 14h, and 5% microorganism ratio) have a smooth kefir surface structure and bind ability tightly in the kefir gel. The SEM results in the experimental sample having a stable gel texture and no layer separation compared to the control sample. Generally, gelatin content, microorganism ratio, and fermentation temperature influenced the quality of peanut kefir.

**Keywords:** Kefir, rheology; viscosity; shear stress; hardness; stickiness; FTIR; SEM

## ANTIMICROBIAL ACTIVITY OF TESTA EXTRACT OF CASHEW NUT (ANACARDIUM OCCIDENTALE L.)

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### **Abstract**

The by-product of cashew nut (*Anacardium occidentale* L.) processing, known as cashew nut testa, is rich in polyphenols. This research focused on the antimicrobial effects of the cashew nut testa extracts using a mixture of 0.22% cellulase and pectinase (1:1, v/v) with a ratio of raw material to solvent of 1:55, the extraction temperature of 49°C and a pH 4.0 for 60 minutes. Subsequent phytochemical screening revealed the presence of various polyphenolic compounds within the testa extract, including saponins, coumarins, triterpenoids, tannins, flavonoids, and alkaloids. The extract's antimicrobial efficacy was assessed against 4 bacterial strains notorious for food poisoning: *Bacillus aureus*, *Shigella* spp., *Staphylococcus aureus*, and *Salmonella typhimurium*. Remarkably, the extract demonstrated inhibitory action against *Staphylococcus aureus*, producing an inhibition zone diameter of 1.00 mm at a concentration of 25 mg/mL and a largest diameter of 12.93 mm at 800 mg/mL. The Minimum Inhibitory Concentration (MIC) values were determined to be 200 mg/mL for *Salmonella typhimurium*, 100 mg/mL for both *B. aureus* and *Shigella* spp., and 25 mg/mL for *Staphylococcus aureus*.

**Keywords:** *Anacardium occidentale* L.testa; antibacterial activity; MIC; phytochemical screening; polyphenols

## IMPACT OF DRYING METHODS AND STORAGE CONDITIONS ON THE ATTRIBUTES OF BLUEBERRY LEATHER

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### Abstract

This study investigated the effects of hot air drying (55 oC, 65 oC, and 75 oC) and heat pump drying (30 oC and 40 oC) on the physicochemical properties of blueberry leather. The results showed that vitamin C content, total phenolic content, and antioxidant activity of the samples dried by hot air drying were higher than those dried by heat pumps drying. The increase in drying temperature gave a noticeable boost to effective moisture diffusivity, allowing a remarkable reduction in drying time. However, the high temperature impacted negatively on the stable of bioactive compounds in the blueberry.

Moreover, the moisture sorption isotherm was determined with the equation  $y = -0.3264x^2 + 3.3073x - 0.0052$  on the blueberry leather. The results also found that the BET equation ( $R^2 = 0.97$ ) could be used for estimation of the mono-water layer value of the product ( $M_0 = 5.43\%$ ). Additionally, the loss of vitamin C, polyphenols, and antioxidant activity of blueberry leather during storage was dependent on the temperature. The kinetic parameters such as  $k$ ,  $t_{1/2}$ ,  $D$ ,  $E_a$ , and  $z$  were estimated by using the first-order, Arrhenius, and Ball models. Generally, blueberry leather is a product rich in antioxidant activity and has a long shelf life.

**Keywords:** Blueberry leather; bioactive compound; drying method; storage condition

## SAM (CYCLEA BARBATA WALL.) LEAVES PECTIN EXTRACTS AS CARRIER MATERIAL FOR SPRAY DRYING OF PROBIOTICS

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### Abstract

Sam (*Cyclea barbata* Wall.) is distributed in Southern Vietnam and normally used for food and medicinal purposes. Sam contains high amount of valuable substances such as soluble dietary fibre exerting several physiological benefits. The aim of this research was to examine the conditions of pectin extraction from leaves and apply in spray drying encapsulation of *Lactobacillus acidophilus*. The results show that from *Cyclea barbata* (Wall.) was a high methoxyl pectin with a minimum degree esterification of 54.7%. The highest extraction yield was 12.7%, using hydrochloric acid 0.1 N with controlled particle size of dried leaves of 0.15 mm. The concentration of 0.25% (w/v) extracted pectin was mixed with maltodextrin for spray drying of the probiotic *Lactobacillus acidophilus*. The spray dried powder was characterised with a white colour with an average particle size of 20.2  $\mu\text{m}$  observed under SEM microscopy. The encapsulated probiotics showed their viability after culturing and plate counting. However, the temperature of spray drying strongly affected the viability of the probiotics which reduced from 5.99 log CFU/g (pre –spray drying) down to 3.02 log CFU/g (at inlet/outlet temperature 140°C/70°C) and 2.86 log CFU/g (at inlet/outlet temperature 180°C/85°C). Overall, of the extracted pectin from Sam leaf is potential as wall material for encapsulation of probiotic. Further optimization of drying conditions should be implemented for synbotic production.

**Keywords:** Pectin; *Cyclea barbata* (Wall.); spray drying; probiotics; carrier material

## EXTRACTION OF INULIN FROM DANDELION (*TARAXACUM OFFICINALE*) LEAVES UNDER ULTRASOUND ASSISTED TREATMENT AND INITIAL APPLICATION FOR SYNBIOTIC PRODUCTION

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### Abstract

Dandelion (*Taraxacum officinale*) leaves have been reported as a rich source of prebiotic inulin. Ultrasound-assisted extraction (UAE) is regarded as one of the most effective techniques enhancing the extraction efficiency. This study aimed to extract inulin from the dandelion leaves by using an alternative ultrasound assist technique. The synbiotic spray drying *Lactobacillus acidophilus* with extracted inulin as wall material was also investigated. The hot water (70, 80, and 90°C) in the combination of ultrasonic treatment (at the power of 30, 60, and 90 W) was experimented for the extraction. The material and water ratio of 1:10 and extraction time of 20 minutes were used for all treatments. The results showed that water temperature and ultrasonic power significantly affected inulin extract concentration. The highest inulin (0.79 mg/mL) was obtained by the extraction condition of 60 W ultrasound power at 80°C. UAE increased the extraction yield of inulin in dandelion leaves by 9.48% compared to the conventional extraction. *Lactobacillus acidophilus* cells showed their survivals at high spray drying temperatures (inlet temperature of 140°C and 180°C), suggesting resistance to heat during the spray drying process. Overall, the extracted inulin from dandelion showed its potentials of a wall material for spray drying of probiotics. Spray drying conditions should be further optimized for synbiotic production.

**Keywords:** Inulin; synbiotic; dandelion; ultrasound-assisted extraction; *Lactobacillus acidophilus*

**INHIBITORY ACTIVITY AND MECHANISM OF (E)-3-(2,3-DIHYDROXYPHENYL)-1-(3-FLUOROPHENYL)PROP-2-EN-1-ONE AGAINST  $\alpha$ -GLUCOSIDASE**

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**Abstract**

A new fluorinated chalcone named (*E*)-3-(2,3-dihydroxyphenyl)-1-(3-fluorophenyl)prop-2-en-1-one (DHFP) was synthesized using Claisen-Schmidt condensation reaction under solvent free, assisted-microwave condition. Its structure was elucidated by MS and NMR spectroscopic analysis. Upon evaluation of the  $\alpha$ -glucosidase inhibitory activity, compound DHFP exhibited a promising activity with an  $IC_{50}$  value of  $6.86 \pm 0.33 \mu\text{M}$  compared with acarbose ( $IC_{50} = 69.58 \pm 2.04 \mu\text{M}$ ), a positive control. The inhibitory mechanism against  $\alpha$ -glucosidase of DHFP was explored using Lineweaver – Burk and Dixon plots. DHFP inhibited  $\alpha$ -glucosidase via a non-competitive inhibition mode, while acarbose displayed a competitive inhibition type. Furthermore, the fluorescence intensity of  $\alpha$ -glucosidase/8-anilino-1-naphthalenesulfonic acid (ANS) complex was reduced with increasing the DHFP concentration, indicating a hydrophobic interaction between enzyme and inhibitor.

**Keywords:** chalconoid;  $\alpha$ -glucosidase; Dixon plot; inhibition mechanism; Lineweaver – Burk and Dixon plots



## EXPERIMENTAL STUDY TO DETERMINE OF DRYING TECHNOLOGY FOR GUAVA LEAF

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### Abstract

*Psidium guajava L.*, commonly known as guava, belongs to the Myrtle family and is grown in tropical and subtropical climates. In some countries, Guava leaves have been used as a medicine for its many health benefits. This study presents the results of determining the drying method and the drying regime of guava leaves through sun, hot air, heat pump, and vacuum drying. The drying methods are carried out at three temperature levels: 45°C, 50°C, and 55°C. Controlling moisture reduction, Tanin content, and leaf color after drying are essential in selecting the appropriate drying method and drying regimen. The results confirm that the heat pump drying method is suitable for drying guava leaves at 45°C for 200 minutes, resulting in dried leaves with a moisture content meeting the standard of  $11 \pm 0.5\%$ . Guava leaves after drying, the tannin content of the guava leaves reaches 7.7%. The color difference index  $\Delta a^*$  is -5.7. The overall color difference  $\Delta E^*$  is 18.04. The leaves have a characteristic aroma, suitable for preparing herbal medicine such as guava leaf powder or tea.

**Keywords:** Guava leaves; heat pump dryer; Tannin; hot air drying; sun drying

## OPTIMIZATION OF TECHNOLOGICAL PARAMETERS OF AUTOMATIC QUAIL EGGS PEELING MACHINE

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### Abstract

The objective of the experiment was to determine the optimal operating parameters of the automatic quail egg peeling machine model in food production and processing facilities, such as bakeries and restaurant kitchens. Optimizing the automatic quail eggshell peeling machine to achieve the best eggshell peeling rate, lowest egg damage rate, and food safety and hygiene. Based on the automatic quail egg peeling machine model was manufactured, using the experimental design method with a “black box” model and statistical analysis using the method of linear regression. The study has determined two quadratic regression equations describing the influence of working parameters including the velocity of peeling shaft pairs ( $v$ , m/s) and the frequency of pressing and holding eggs ( $t$ , times/minute) on the technical indicators of the peeling process, namely the egg peeling rate ( $y_1$ , %) and the egg damage rate ( $y_2$ , %). The optimization problem was solved using a random algorithm and direct search. The optimal operating parameters and criteria for the automatic quail eggshell peeling process have been determined: the maximum egg peeling rate  $y_{1\max} = 96.98\%$  and the minimum egg damage rate  $y_{2\min} = 5\%$  with the velocity of peeling shaft pairs of 0.12 m/s and the frequency of pressing and holding eggs of 63 times/minute.

**Keywords:** peeling; friction; quail eggs; peeling speed; peeling rate.

## ASSESSMENT AND FORECASTING SHORELINE DYNAMICS IN CAN GIO DISTRICT, HO CHI MINH CITY USING REMOTE SENSING

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### Abstract

Coastal erosion poses a significant threat to the Can Gio coast in Ho Chi Minh City, Vietnam, exacerbated by rising sea levels and intensified weather patterns. This study aims to assess and predict shoreline changes from 2013 to 2043 using multi-temporal satellite imagery. Annual coastlines from 2013 to 2023 were delineated by applying Otsu's thresholding method to Automatic Water Extraction Index (AWEI) data extracted from Landsat-8 satellite images. Subsequently, the rate of shoreline change during this period was analyzed using the Digital Shoreline Analysis System (DSAS). Predictions for the shoreline in 2033 and 2043 were made using Kalman filters. During the period from 2013 to 2023, the accretion process occurred mainly in the coastal section from the Soai Rap estuary to the Dong Tranh estuary, with an average rate of 1.58 m/year. In contrast, the two coastal sections of the Nga Bay estuary - Theu estuary and Con Cho islet experienced significant erosion, with average rates of -1.95 m/year and -2.31 m/year, respectively. The remaining coastal sections, including the Dong Tranh estuary - Nga Bay estuary and Thanh An island, were relatively stable. Based on these coastal dynamics, it is predicted that by 2033 and 2043, the region's coastline will significantly expand towards the East Sea. These findings underscore the importance of informed coastal management strategies to mitigate erosion and promote sustainable development in the region.

**Keywords:** Automatic Water Extraction Index; Can Gio district; coastal erosion; Digital Shoreline Analysis System; shoreline dynamics

## WATER HYACINTH: CHALLENGES, SOLUTIONS, AND OPPORTUNITIES IN VIETNAM

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### Abstract

Water hyacinth (*Eichhornia crassipes*), an invasive aquatic plant, has become a significant environmental and economic problem in Vietnam, particularly in the Mekong Delta region. The rapid proliferation of water hyacinth obstructs waterways, hampers navigation, and disrupts aquatic ecosystems by reducing oxygen levels, negatively affecting biodiversity. Additionally, it hinders water flow, exacerbates flooding, and impacts agriculture by blocking irrigation channels. The economic consequences include substantial losses in fisheries, tourism, hydroelectric power generation, and increased costs for waterway maintenance.

There are multiple potential solutions applied to deal with the problem. Mechanical removal provides immediate results but is labor-intensive and costly, with limited long-term effectiveness. Biological control, employing natural enemies like weevils and fungi, presents a more sustainable solution. Additionally, innovative uses of harvested water hyacinth, such as bioenergy production, composting, and as a raw material for crafts and bioproducts, are being explored to mitigate the economic burden of its removal.

However, several solutions still need to produce the desired outcomes. Reliance solely on mechanical removal has often led to rapid reinfestation due to the plant's high reproductive rate. Similarly, poorly managed biological control programs have sometimes failed due to inadequate understanding of the local ecosystem and insufficient monitoring, leading to ineffective control and even unintended damage to non-target species.

This review emphasizes the need for ongoing research and adaptive management strategies to address the challenges posed by water hyacinth in Vietnam effectively. Collaboration among government agencies, local communities, and researchers is crucial to developing and implementing sustainable solutions for water hyacinth infestations.

**Keywords:** Water hyacinth; compost; invasive aquatic plant; obstruct waterways

## INVESTIGATION MECHANIZATION LEVELS IN AQUACULTURE IN SEVERAL COASTAL PROVINCES OF THE MEKONG DELTA.

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### Abstract

The Mekong Delta, a critical region for aquaculture in Vietnam, has experienced significant advancements in mechanization, contributing to increased productivity and sustainability. This survey research investigates the current state of aquaculture mechanization in the Mekong Delta provinces, including Ca Mau, Soc Trang, and Tra Vinh, examining its impact on production efficiency, labor dynamics, and environmental sustainability. Research collects data through in-depth interviews, field observations, and analysis of secondary sources, encompassing a diverse range of aquaculture operations for different species, including shrimp, catfish, and others. Findings indicate that mechanization has substantially improved feed management, water quality control, and harvesting processes, enhancing overall production yields. Adopting automated feeders, aeration systems, and advanced water filtration technologies has reduced labor dependency and operational costs while mitigating environmental impacts such as water pollution and resource depletion. However, the survey also identifies several challenges, including high initial investment costs, technical skill gaps among farmers, and varying levels of technology adoption across different farm sizes and types. The study underscores the crucial role of supportive government policies, financial incentives, and targeted training programs in promoting the widespread adoption of mechanization in the region. It is in the hands of policymakers to create and implement these policies and programs, thereby empowering them to shape the future of aquaculture in the Mekong Delta. Furthermore, the study highlights the need for ongoing research and development to tailor mechanization technologies to local conditions and address small-scale farmers' specific needs. By fostering a more mechanized aquaculture sector, the Mekong Delta can enhance its resilience, sustainability, and competitiveness in the global market, ensuring long-term economic and environmental benefits for the region.

**Keywords:** Aquacultural mechanization; sustainable development; Mekong Delta; aquaculture

**SESSION 4**

**RECENT ADVANCES IN ANIMAL  
BIOSCIENCE AND SUSTAINABILITY**

## EFFECT OF DIFFERENT LEVELS OF DIETARY ENERGY ON GROWTH PERFORMANCE OF BLACK SOLDIER FLY LARVAE REARED IN CONFINEMENT UP TO TARGET WEIGHT OF 220 MG

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### Abstract

An experiment was carried out to investigate the effects of different dietary levels of energy on growth performance and yield of BSFL up to the target weight of 220 mg. The study was arranged in a completely randomized block design with one factor with five replications for each block. For each replication, 300 individuals were randomly selected from an experimental tray. All total of 20 trays were used evaluate the effects of different dietary levels of energy on growth performance and yield of BSFL between 4 treatments. Four iso-nitrogenous diets (23% CP) differing in energy contents were formulated to constitute dietary treatments. Diets for comparison were: (T1) Very low energy density (VLED): ME 2400 kcal/kg, (T2) low energy density (LED): ME 2700 kcal/kg, (T3) moderate energy density (MED): ME 2900 kcal/kg and (T4) high energy density (HED): ME 3100 kcal/kg. The contents of CP, ME, Calcium (Ca) and total Phosphorous in MED diet were fitted with the requirements of Vietnam Standard.

Body weight and body weight gain were improved in HED and MED diets than the BSFL of VLED and LED diet during a rearing period of 5-17 days. Feed consumption increased in BSFL that received HED as compared to VLED, LED and MED groups. Feed conversion ratio decreased in MED and HED dietary group than VLED, LED groups. Similarly, live weight, length, width and growth rate were higher in HED, MED, LED than VLED groups respectively. Profit per BSFL increased with increasing level of the dietary energy densities. Energy levels of diet had no effect on survivability although BSFL belonging to HED suffered more from mortality. It was concluded that a nutrient density of 2900 ME kcal/kg and 23% CP would be enough to optimize growth rate and FCR of black soldier fly larvae.

**Keywords:** energy densities; indigenous; survivability; performance

## EFFECTS OF PROTEIN LEVELS IN REARING MEDIA ON THE BODY SIZE AND GROWTH RATE OF LARVAE OF BLACK SOLDIER FLY (*HERMETIA ILLUCENS*) FED RICE BRAN AS THE BASAL DIET

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### Abstract

This study aimed to evaluate the impact of a by-product containing various proportions of soya waste at 0% (SWM0), 10% (SWM1), 20% (SWM2), 30% (SWM3) and 40% (SWM4) on the body dimensions and weigh gain of black soldier fly larvae (BSFL) fed rice bran as basal diet. The soya waste collected from the Vinasoy Binh duong soya products factory with low dry matter (12%). Completely randomized design was deployed to test those five levels of the soya waste with five replications for each treatment. For each replication, 300 individuals were randomly selected from an experimental tray. All total of 25 trays were used evaluate the effects of different dietary levels of soya waste on growth performance and yield of BSFL between 5 treatments. Each experimental unit consisted of 2 kgs of substrate, which was placed randomly in an tray. BSFL were harvested 12th days after substrate placement. Variables measured were BSFL's fresh and dry weight, length and width of body. Analysis of variance was used in analysis of the data. Results showed that levels of soya waste improved BSFL growth at a quadratic fashion. However, larval weight (0.14-0.18 g), length (15.8-18.5 mm), and DM content (41.0-45.5%) were not effected. It can be concluded that the levels of soya waste in the growth substrate can increase the weight gain of black soldier fly larvae but not the larva's width and length.

**Keywords:** insects; soya waste; rice bran; growth



## EFFECT OF FISH WASTE IN BLACK SOLDIER FLY LARVAE DIET FED BROKEN RICE AS THE BASAL DIET

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### Abstract

The study was carried out from March to May, 2024 at Dairy farm, Research and Technology Transfer Center, Nong Lam University of Ho Chi Minh City to determine the appropriate proportion of fish waste in diets on growth rate of black soldier fly larvae (BSFL). The study was arranged in a completely randomized block design with one factor with four replications for each treatment. For each replication, 300 individuals were randomly selected from an experimental tray. All total of 20 trays were used to evaluate the effect of the ratio of fish waste in diet on growth performance of BSFL between 5 treatments: T1 (100% broken rice + 0% fish waste), T2 (95% broken rice + 5% fish waste), T3 (90% broken rice + 10% fish waste), T4 (85% broken rice + 15% fish waste), T5 (80% broken rice + 20% fish waste).

On the first day of experiment, each treatment was added 10 grams of eggs of BSF with the same laying date and 200 grams of concentrate feed. After 5 days, in the experimental trays, the amount of substrate was added according to the treatment ration formula. The studied parameter were length, width and weight of black soldier fly larvae in 12 rearing days. The results showed that body weight and body weight gain were improved in T5 and T4 diets than the BSFL of T0, T1 and T2 diets during a rearing period of 5-17 days. Feed consumption increased in BSFL that received T5 as compared to T0, T1 and T3 groups. Feed conversion ratio decreased in T4 and T5 dietary group than T0, T1 and T3 groups. Similarly, live weight, length, width and growth rate were higher in T5, T4, T3 than T0 groups respectively. Profit per BSFL increased with increasing level of the dietary fish waste, particularly in T4. Fish waste levels of diet had no effect on survivability although BSFL belonging to T0 suffered more from mortality. It was concluded that BSFL fed a diet with the appropriate proportion of 85% broken rice and 15% fish waste gave the optimize growth rate and FCR the best growth rate.

**Keywords:** black soldier fly larvae; fish waste; broken rice; growth; intake

## FACTORS INFLUENCING BIOACCUMULATION OF TOXIC METALS IN BLOOD COCKLE *ANADARA GRANOSA*

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### Abstract

Living naturally or farming in tidal flats enriched with organic matter near estuaries, blood cockles are at risk of contamination from toxic metals in the aquatic environment. The bioaccumulation of metals in cockles depends on abiotic and biotic factors. This study evaluated the relationships between the size and the concentrations of toxic metals (As, Cd, Hg, and Pb) in blood cockles (*Anadara granosa*) collected in the Mekong Delta, Vietnam. Moreover, the correlations between properties of water (pH, electrical conductivity (EC), and metals), sediment (pH<sub>sed</sub>, organic matter (OC), and metals in two sediment fractions (< 63 µm and 63 – 500 µm)), and metal concentrations in blood cockles were determined. The mean concentration of metals in the sediment and water was Pb > As > Cd > Hg, and that in the cockle was As > Cd > Pb > Hg. A negative correlation was observed between the size of the cockle for Pb, while the content of the other metals in the cockle did not relate to the size. A positive correlation was found between the Pb level in the waters and the tissues of the cockle. In contrast, a negative relationship was obtained between the Cd concentration in the cockle tissue and EC. The Cd level in blood cockles has a positive relationship with the pH<sub>sed</sub> and a negative correlation with the OC content in the sediment. The Cd content in cockle tissue was negatively related to the Cd levels in two sediment fractions. The concentrations of As and Pb in blood cockles were positively correlated with the As level in a 63–500 µm fraction and the Pb content in a <63 µm fraction.

**Keywords:** blood cockle; Mekong Delta; sediment; toxic metal; water

## EFFECTS OF WATER QUALITY PARAMETERS ON GROWTH PERFORMANCE OF INTENSIVE SHRIMP POND (*LITOPENAEUS VANNAMEI*)

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### Abstract

In 2023, the Vietnam shrimp farming industry is witnessing a new normal period with a strong competition in price. Improving the survival of shrimp and maintaining the success rate of shrimp farming by controlling the water quality is a solution to address the issue of low production costs. The objective of the experiment was to evaluate the effectiveness of water quality parameters on shrimp growth rates during rainy and dry seasons. A total of 04 cultures were randomly selected and analyzed daily for 12 critical parameters. The SPSS ver.26 was used to evaluate the correlation between multi-parameter and its influence on performance of shrimp ponds. The results showed that DO concentration were negatively correlated with the other water variables, such as nitrite ( $NO_2^-$ ), alkalinity, phosphate ( $PO_4^{3-}$ ) and total ammonia (TAN) in a production yield. Some parameters that have high fluctuation in ponds are DO and nitrite. The shrimp growth was influenced by nitrite with 65.75% higher than DO, phosphate and TAN.

**Keywords:** Grow rate; *Litopenaeus vannamei*; intensive ponds; water quality

## THE EFFECTS OF VITAMIN C AND VITAMIN E ON GROWTH, HEALTH, AND BODY COMPOSITION OF AQUACULTURE SPECIES

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### Abstract

Vitamin C (L-ascorbic acid) and vitamin E ( $\alpha$ -tocopherol) are essential micronutrients and antioxidants in aquaculture. Many studies have documented their roles in feeds for various aquatic animals. This review compiles and analyzes the studies that focus on the effects and interactions between vitamin C and vitamin E on the growth, health, and body composition of different aquaculture species. As can be seen, vitamins C and E are indispensable nutrients for almost all aquaculture species. Information on their nutritional requirements and effects on aquatic animals has been examined and limited to several aquaculture species. Numerous studies have shown the vital roles of vitamins C and E in antioxidative functions. However, many other studies have also indicated that supplementing vitamins C and E in diets positively affects the growth performance, health, and body composition of aquaculture species. The review summarizes the documented findings related to the roles of dietary vitamins C and E in aquaculture. This study provides valuable information for nutritionists, feed mills, and other related institutions, as well as the effective use of these vitamins in the aquafeed industry.

**Keywords:** Body composition; Growth performance; Health; Vitamin C; Vitamin E

## EMISSIONS OF GASES DURING BIO-CONVERSION OF AGRO-WASTE BY BLACK SOLDIER FLY LARVAE

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### Abstract

This laboratory-scale study was designed to investigate the emissions of carbon dioxide (CO<sub>2</sub>), ammonia (NH<sub>3</sub>), and hydrogen sulfide (H<sub>2</sub>S) gases during the bio-conversion of agro-waste by black soldier fly larvae (BSFL) for 14 days. The study included three experimental treatments: a control group without waste and BSFL (T0, lab-background), treatment 1 containing food and BSFL (T1), and treatment 2 containing only food (T2). Process efficiency was measured by waste reduction and bio-conversion rate. Gas emissions from the process were collected using the static chamber method and determined using the gas absorption method. The results showed a notable BSFL survival rate of 99.7%, indicating the experimental condition for BSFL growth. The waste reduction rate of T1 (74.3%) was 1.9 times higher than that of T2 (38.8%), showing that BSFL treatment efficiency was higher than that of treating without BSFL. Compared to T0, gas emissions from T1 and T2 were higher. Furthermore, the total emissions of CO<sub>2</sub>, NH<sub>3</sub>, and H<sub>2</sub>S in T1 were 141.8 kg, 5727.8 mg, and 911.62 mg, respectively, whereas T2 was recorded 141.5 kg, 7004.5 mg, and 197.27 mg, respectively. The CO<sub>2</sub> and H<sub>2</sub>S emissions in T1 were higher than those in T2, while NH<sub>3</sub> emissions decreased 1.2 times when treated by BSFL. The estimated gas emissions in the BSFL bio-conversion trial revealed that this method could produce 120 kg CO<sub>2</sub> and 284 kg H<sub>2</sub>S per ton of organic waste. The preliminary results presented here could be the basis of future studies on gas emission via BSFL treatment of agro-waste.

**Keywords:** ammonia; black soldier fly; carbon dioxide; *Hermitia illucens*; hydrogen sulfide

## CAPTIVE BREEDING OF DENISON BARB (SAHYADRIA DENISONII) IN HO CHI MINH CITY, VIETNAM

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### Abstract

Denison Barb (*Sahyadria denisonii*) is one of the most popular ornamental fish species in Vietnam. In order to induce spawning in these fish, an experiment was conducted using 8 different treatments: HCG 1,000; 1,500; 2,000; and 3,000 UI/kg for females, and Ovaprim 0.4; 0.5; 0.6; and 0.7 mL/kg for females. Each treatment involved at least 10 females, with a male-female ratio of 1:1. The males were injected with half the dose given to the females. The injections were administered twice into the abdominal cavity, with an 8-hour interval between injections. The first injection consisted of 1/3 of the total dose. The results showed that all fish spawned except for those in the HCG 1,000 UI/kg female treatment. The latency time varied between 6 hours and 30 minutes to 8 hours and 40 minutes after the second injection at a temperature of 30°C. The highest spawning rate of 95.5% was achieved with Ovaprim doses of 0.5 and 0.6 mL/kg for females. The fertilization rate was 91.1% and the hatching rate was 82.2%. The real fecundity ranged from 358.5 to 850.9 eggs per female. The hatching time ranged from 26 to 28 hours at a temperature of 30°C. At hatching, the average length of the larvae was 3.4±0.4 mm, with a large yolk that occupied most of the body. It took 3-4 days for the yolk to be fully digested.

**Keywords:** captive breeding; denison barb; egg hatching; hormone; *Sahyadria denisonii*

## ECOLOGICAL AND HUMAN HEALTH RISK ASSESSMENT OF COLIFORM AND TOXIC CYANOBACTERIA IN TRI AN RESERVOIR, VIETNAM

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### Abstract

Human beings are frequently exposed to a mixture of chemical pollutants through the ingestion of contaminated drinking water. The present study aimed to assess the ecological and human health risks associated with the contamination of coliform bacteria and cyanotoxins in a drinking water supply reservoir, the Tri An Reservoir (TAR) in Vietnam. Results demonstrated that the water was contaminated with *Escherichia coli* (*E. coli*) and total coliform bacteria representing high fecal bacterial contamination. The presence of *E. coli* and coliform bacteria in 87% and 100% of samples, respectively. This contamination was greater than the permissible limit (0 CFU/100 mL in any 100 ml sample) proposed by the World Health Organization (WHO), and the Vietnam's national technical regulation (QCVN 01/2009/BYT). Toxic cyanobacteria and microcystins (MCs) frequently occurred in TAR with the highest density of  $198.7 \times 10^3$  cells/mL, and 7.8 µg/L, respectively, indicating a high level of probability of acute health effects. The contamination of cyanotoxins in the surface water posed a potential noncarcinogenic risk to both adults and children through direct ingestion and dermal absorption. Our results highlight the presence of cumulative risks from exposure to a mixture of environmental stressors that should be taken into account in future study.

**Keywords:** Cumulative risk; hazard quotient; multiple environmental stressors; noncarcinogenic risk; Tri An Reservoir

## USING STABLE ISOTOPE ANALYSIS TO ESTIMATE THE DIETS OF WHITELEG SHRIMP REARED IN TANKS WITHOUT WATER CHANGE

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### Abstract

Our study employs a novel approach, utilizing stable isotope analyses (SIA) to measure the contribution of multiple diet sources to shrimp. Specifically, we apply the dual SIA ( $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$ ) and stable isotope mixing models (SIMMR) to estimate the relative contribution of the commercial feeds and sludge sources to the nutrition of whiteleg shrimp (*Penaeus vannamei*) stocked at different densities in a fiberglass tank without water change. The shrimp were fed ad libitum four times daily with one of three commercial feeds: feed 1 (42% protein), feed 2 (40% protein), and feed 3 (38% protein), depending on their growth stage. The shrimp and various diet sources (commercial feeds and sludge) were sampled, and the water quality was checked for a 56-day trial. The SIA was conducted by measuring the  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  of shrimp muscle and the diet sources. Average  $\delta^{15}\text{N}$  values for shrimp, three commercial feeds, and sludge were 5.51 – 7.95‰, 5.37 – 6.59‰, and 9.70 – 10.12‰, respectively. Meanwhile, those of  $\delta^{13}\text{C}$  for shrimp, three commercial feeds, and sludge were -24.6 – -16.3‰, -23.2 – -22.7‰, and -20.1 – -19.8‰, respectively. The SIMMR results indicate that the total contributions of the diet source: feed 1 (18.2 – 22.2%), feed 2 (27.3 – 31.8%), feed 3 (23.4 – 25.6%), and sludge (21.9 – 28.7%), respectively, of the isotopic signal of the shrimp muscle. The results of the present study demonstrate the importance of SIA in calculating the contribution of diet sources in aquaculture nutrition and feed research.

**Keywords:** diet source; *Penaeus vannamei*; stable isotope mixing models; stable isotope ratio



## WHOLE-GENOME RESEQUENCING OF A LUOI YELLOW CATTLE, VIETNAM REVEALS GENE RESOURCES FOR ECONOMICALLY IMPORTANT TRAITS

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### Abstract

The aim of this study is to investigate the economically important traits-related gene resources in A Luoi Yellow cattle (AYC), which is the indigenous cattle characterized by its small body size, high adaptability, and meat quality favored by domestic consumers. As recent advances in next-generation sequencing (NGS) allowing the detection of different types of variants, NGS is commonly used to uncover the role of genetic variants in domestic animals. Thus, in this study, NGS was applied to detect novel variants in the whole genome scale of one DNA sample which is pooled from 10 Yellow cattle samples collected in different communes of A Luoi district, Vietnam. The results indicated a total of 14,097,196 SNPs, 873,301 inserts, and 1,036,067 deletions in the whole genome of AYC. The variants in intergenic accounted for 58% and remaining 48% of variants in genes. The impacts of variants in genes are categorized in order of severity (high, moderate, low and modifier). Of note, the variants including stop-lost, stop-gained, frameshift, donor-splicing and acceptor-splicing are classified as high-impact variants (HIVs) that affect the biological functions of genes, comprising 0.024% of total variants in whole genome sequencing. The percent of non-synonymous SNPs categorized as moderate variants accounted for approximately 0.29%. In addition, enrichment analysis of GO and KEGG pathways by using DAVID discovered HIVs and non-synonymous SNPs in genes related to meat quality, growth traits, heat tolerance, and disease resistance. This is the first report about the genetic characteristics of A Luoi Yellow cattle, Vietnam on a whole genome scale that is useful for future breeding programs of this cattle breed.

**Keywords:** A Luoi Yellow cattle; economically important traits; Gene Ontology; KEGG pathway; next generation sequencing

## CO-INFECTED PORCINE CIRCOVIRUS TYPE 3 AND MYCOPLASMA SUIIS CAUSING REPRODUCTIVE FAILURE IN A LARGE FARM

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### Abstract

Reproductive failure is a major problem in the swine industry and causes high economic loss. A farm in Southern Vietnam shown abnormally increasing in stillborn and mummified piglets. To investigate, at farrowing, 85 clinical sows were collected different samples in 4 batches. Their weak piglets were marked, whole blood samples were collected every week and also the visceral tissues from dead piglets until weaning. PCR/RT-PCR and Realtime-PCR were performed to detect of ASFV, PRRS, CSF, PRV, PCV4, PCV3, PCV2, PPV, *M. suis*. Genome sequencing was conducted. PCV3 and *M. suis* were highly found in both sows and piglets samples while PCV2 detected at low rate. The coinfection highly detected in sows and in piglets tissues. In sow samples, the detection rate and viral load are in whole blood in sows (42.4%, 35.57±1.88), colostrum (14.1%, 34.91±2.55), oropharyngeal fluid (11.8%, 35.67±1.57), and vulva fluid (5.9%, 30.9±5.47) with p<0.05. PCV3 occurred more in sows than their offerings. In piglets, the detection of PCV3 was decreasing whereas *M. suis* was increasing throughout 4-week period. *M. suis* infection reached 100% in the second week of age. Mummified and stillborn fetus were 100% positive for *M. suis* while 25% and 33.3% positive for PCV3, respectively. Both agents were occurred most in the primiparous sows with p<0.05. This might suggest the source of infection from gilt introduction. PCV3b was identified and the partial 16S rRNA gen of *M. suis* showed high identity with isolates from China and Germany at 99.8% (KF740480, FN391018), Brazil at 97.39% (MK287839), Japan and USA at 96.94% (AB610847, CP002525).

**Keywords:** Mycoplasmas suis; mummification; PCV3; reproductive failure; stillborn

## RISK FACTORS AND PREVALENCE OF COMMON BACTERIAL PATHOGENS CAUSING DIARRHEA IN NEONATAL PIGLETS IN VIETNAM

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### Abstract

Neonatal piglet diarrhea (NPD) is one of the most frequent diseases due to causing a huge impact on industry husbandry, which can be associated with high pre-weaning mortality, decreased growth rates, and increased therapeutic costs. This study aimed to research the involvement of *C. difficile* and *C. perfringens* type C in the aetiology of neonatal piglet diarrhea in Vietnam and to identify preventive factors for them. A total of 40 farms with 114 pooled fecal samples from diarrhea piglets were collected and inoculated on ELUTE cards. A one-step multiplex PCR technique was carried out to detect *C. perfringens* and *C. difficile*. At the farm level, *C. perfringens* type A was the most frequently detected pathogen (100%), followed by *C. difficile* (60%). The co-infection pathogens and their toxin were also identified. The logistic regression model revealed that the average number of weaned piglets (>24) of sows was more likely to occur in *C. difficile*-positive piglets ( $P < 0.05$ ). Also, compared to the Northern and Central regions, the farms in Southern region had fewer *C. perfringens*-positive piglets ( $P < 0.01$ ) and farm model farrow-to-finish had a higher risk of circulating *C. perfringens* ( $P = 0.05$ ). The study has contributed to improving our insights of the common pathogens that cause diarrhea in neonatal piglets and how risk variables relate to their circulation in Vietnam's growing pig farming ecosystem.

**Keywords:** *C. perfringens*; *C. difficile*; co-infection; neonatal diarrhea; risk factor

**GENETIC DIVERSITY ANALYSIS OF VIRULENCE GENES IN SALMONELLA SUBSP. ENTERICA (FLIC, FIMA, STN) AND IN STEC E. COLI (STX2) ISOLATED FROM SWIFTLET HOUSE ENVIRONMENT**

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**Abstract**

This study aimed to analyze the genetic diversity of the virulence genes including *fliC*, *fimA*, *stn* in *Salmonella enterica subsp. enterica* and *stx2* in STEC isolated from swiftlet house in Southern Vietnam. Ninety samples, including 67 fecal samples and 23 surface swabs bird's nest, were collected from 30 swiftlet house in Binh Duong, Dong Nai provinces, and Ho Chi Minh City. *Salmonella enterica subsp. enterica* and STEC *E. coli* were isolated and confirmed using PCR methods. Positive samples were further tested for the presence of *fliC*, *fimA*, *stn*, and *stx2* genes, followed by full-length gene amplification, sequencing, and genetic diversity analysis. The isolation results showed 29/90 (32.22%) samples were presumptively positive for *Salmonella*, and 52/90 samples were positive for *E. coli*. PCR detection revealed 6/90 (6.67%) fecal samples were positive for *Salmonella enterica subsp. enterica*, and 1/90 (1.11%) fecal sample was positive for STEC. The virulence genes *fliC*, *fimA*, and *stn* were present in 50% (3/6), 100% (6/6), and 100% (6/6) of the *Salmonella*-positive samples, respectively. The *stx2* gene was detected in the single STEC-positive sample. Successful primer design allowed for the amplification and sequencing of *fliC* (1488 bp), *fimA* (558 bp), *stn* (750 bp), and *stx2* (1241 bp) genes. Phylogenetic analysis and sequence similarity calculations revealed 99.33-100%, 91.17-100%, 98.4-100%, and 92.67-99.91% nucleotide similarities, and 98.58-100%, 92.93-100%, 94.35-100%, and 92.12-99.75% amino acid similarities for *fliC*, *fimA*, *stn*, and *stx2*, respectively. Amino acid substitutions were observed at 8, 20, 19, and 57 positions in *fliC*, *fimA*, *stn*, and *stx2* genes, respectively. In conclusion, this study successfully amplified and sequenced the full-length virulence genes and analyzed the genetic diversity of *fliC*, *fimA*, *stn* in *Salmonella enterica subsp. enterica* and *stx2* in STEC from swiftlet house in Southern Vietnam.

**Keywords:** Salmonella; STEC; sequencing, *fliC* gene; *fimA* gene; *stn* gene; *stx2* gene

## IMPROVEMENT OF FEED INTAKE AND DAILY WEIGHT GAIN OF CROSS-BRED SINDHI CATTLE FED FERMENTED RICCE STRAW

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### Abstract

This experiment object to determine if fermented rice straw in total mixed ration (TMR) improves dry matter intake (DMI), average daily weight gain, and DM conversion of cattle fed basal diet using soybean meal and dried brewer's malt (DBM). Substrates of fermentation consist of rice straw and 4% DM of dried brewer's malt fermented with microbes BT4 at three levels. Forty cattle at 9 months of age were assigned randomly into four treatments and two replications in a feeding trial, lasted 90 days. The treatments were as follows: (1) Control: basal diet at 62% of DM including soybean meal and dried brewer's malt was mixed ratio at 38% and 24% respectively + rice straw at 38% of DM, (2) FRSM30: basal diet + 38% fermented rice straw at 30 liters of microbes biomass, (3) FRS40: basal diet + 38% fermented rice straw at 40 liters of microbes biomass, (4) FRSM50: basal diet + 38% fermented rice straw at 50 liters of microbial biomass. The results have shown that rice straw could reduce the content of ADF and NDF by fermenting with microbes BT4 and 4% DBM. Total DMI was enhanced by feeding fermented rice straw compared to rice straw, in which the highest feed intake was found in FRSM30. Average daily weight gain and DM conversion of cattle fed fermented rice straw was greater than those fed rice straw, however, there was no difference among FRSM treatments. These findings suggested that rice straws could improve the quality of fiber by using microbes BT4 coupled with 4% DBM. Rice straw fermented with 30 litters of microbes biomass in FRS30 treatment has shown optimal effectiveness in term feed intake, weight gain, and DM conversion.

**Keywords:** Fermented rice straw; microbes BT4; feed conversion rate; biomass; weigh gain

## USING LEECHES (*HIRUDO MEDICINALIS*) IN NON-INVASIVE BLOOD SAMPLING TO REDUCE THE PAINFUL AND STRESS IN EXPERIMENTAL ANIMALS

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### Abstract

The purpose of research was to taking blood using leeches instead of needles. This could reduce the painful and stress in patients further ensuring the animal welfare in veterinary medicine field. The study aimed to develop a process for harvesting specific-pathogen-free leeches (*Hirudo medicinalis*) in the laboratory. It was conducted on 2 groups of rabbits (group 1: taking blood using leeches and group 2: taking blood using needles) to compare hematological and biochemical blood parameters. The results show that the growth of leeches conformed to a strict environment in the laboratory at 28°C/pH 6.5, chloride-free and supplement of 5mg ciprofloxacin. Physiological indicators were largely similar between the two blood collection methods. However, amylase and alkaline phosphatase levels were lower than the reference range in both experiments. The average Amylase value was 151.3 U/L with needles and 155.5 U/L with leeches in the first stage, 125.5 U/L and 141.1 U/L in the second stage. Creatine kinase level was 2.5 times higher than the reference in experiment 1 and 2 times higher in experiment 2 for the needle method. This suggests the leech approach was less stressful for the rabbits. The leech-based blood collection method shows promise in reducing pain and stress for animals, it faces challenges, such as difficulties in positioning the leeches and the need for an extended acclimation period. The process was evaluated through the development and response of leeches in an in vitro environment. The leech blood collection method can reduce pain and stress for animals, promises to become a non-invasive blood collection tool, and is widely used in diagnosis and treatment.

**Keywords:** animal welfare; leeches; rabbit; blood sampling

## ANTIMICROBIAL PROPERTIES OF SPRAY-DRIED EXTRACTS FROM CASHEW NUT (*ANACARDIUM OCCIDENTALE L.*) TESTA

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### Abstract

The cashew nut (*Anacardium occidentale L.*) testa extracts containing mainly phenolic compounds of catechin and epicatechin were spray-dried at a concentration of 15% in a mixture of maltodextrin and gum arabic as carrier agents, using a drying-inlet temperature of 150°C, a flow rate of 60 mL/min, and a pressure of 1.55 kPa. The total polyphenol content (TPC) of the spray-dried powders was measured and the antimicrobial activities of the powders were evaluated against 4 bacterial strains causing food poisoning diseases, including *Bacillus aureus*, *Shigella spp.*, *Staphylococcus aureus*, and *Salmonella typhimurium*. The results showed that the spray-dried extracts with a TPC of 22.28 mg GAE/g DW had minimum inhibitory concentration (MIC) of both *B. aureus* and *Shigella spp.* of 200 mg/mL. In the case of *S. aureus*, at a concentration of 200 mg/mL, the antibacterial activity of the spray-dried extracts was found with a diameter of inhibition zone of 1.36 mm. The strongest antibacterial activity was observed with a 6.00-mm diameter of inhibition zone at a concentration of 800 mg/mL. However, the antibacterial activity was not observed in the case of *S. typhimurium*.

**Keywords:** *Anacardium occidentale L.*; spray-dried extract; phenolic compounds; antibacterial activity; MIC

## INVESTIGATE ANTIBACTERIAL ACTIVITY OF *PIPER BETLE* ON SOME PATHOGENIC BACTERIAL STRAINS ISOLATED ON AQUATIC ANIMALS

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### Abstract

The study aimed to investigate the *in vitro* antimicrobial activity of *Piper betle* extracts on pathogenic bacteria: *Aeromonas hydrophila* (Av), *Aeromonas veronii* (Atx6), *Edwardsiella ictaluri* (E114) isolated on striped catfish, *Streptococcus agalactiae* (SA) on Nile Tilapia and *Vibrio parahaemolyticus* (VP) on Pacific White shrimp. Herbal material was extracted by an ultrasonic microwave-assisted method. The extraction conditions were established in distilled water, solid-liquid ratio 20g:200 ml, irradiation power 90 W, and extraction cycle with 4 mins (Qun Yu và ctv, 2017). Under these conditions, the analyzed extraction yield of polyphenols was 143 mg/g, and saponins was 854,8 mg/g.

Next, well diffusion and serial dilution methods were conducted to determine antimicrobial activity on agar plates and the value of the minimum inhibition concentration (MIC) and minimum bactericidal concentration (MBC) of extracted *P. betle*. The results showed that the tested bacteria were highly sensitive to *Piper betle* with significant difference ( $P < 0.05$ ) in diameter clear zone at the tested concentrations (Table 1). *P. betle* inhibit strain of Av with MIC=6.25 mg/ml, bactericidal at MBC=12.5 mg/ml, Atx6 at MIC=MBC=12.5 g/ml, E114 with MIC=MBC=3.123 mg/ml, VP and SA was killed at MIC=MBC=6.25 mg/ml. These results confirm *Piper betle* as potential used to prevent aquatic animal diseases caused by *E. ictaluri*, *A. hydrophila*, *A. veronii*, *S. agalactiae* and *V. parahaemolyticus*.

Table 1

Concentration (mg/ml)	Diameter zone (mm)				
	Atx6	Av	E114	SA	Vp
200	14,3 <sup>a</sup> ± 1,5	15,0 <sup>a</sup> ± 0,0	24,0 <sup>b</sup> ± 1,7	17,0 <sup>b</sup> ± 1,0	13,0 <sup>a</sup> ± 1,0
400	21,0 <sup>b</sup> ± 1,0	22,3 <sup>b</sup> ± 3,5	27,0 <sup>c</sup> ± 0,0	21,0 <sup>c</sup> ± 0,0	17,0 <sup>ab</sup> ± 0,0
600	24,7 <sup>c</sup> ± 2,3	21,3 <sup>b</sup> ± 1,5	27,0 <sup>c</sup> ± 0,0	22,0 <sup>c</sup> ± 0,0	18,6 <sup>b</sup> ± 0,5
Pos (+)	20,6 <sup>b</sup> ± 0,5	32,0 <sup>c</sup> ± 0,0	22,0 <sup>a</sup> ± 0,0	9,0 <sup>a</sup> ± 2,6	26,3 <sup>c</sup> ± 4,1
Nev (-)	0	0	0	0	0

Data accompanied by letters (a,b,c,d) in the same column represent statistically significant differences based on Duncan test.

**Keywords:** *Hermetia illucens*; *Aeromonas* spp. isolates; BSFL oil; antimicrobial activity



## PREVALENCE OF METAL-RESISTANCE AND ANTIBIOTIC-RESISTANCE GENES IN *SALMONELLA* SPP. ISOLATED FROM CHICKEN FARMS

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### Abstract

*Salmonella* can carry multiple antibiotic-resistant genes and transmit resistance genes among strains worldwide. Other compounds, including metal-resistance genes, may promote antibiotic resistance through co-selection. This study examined seventy-five *Salmonella* isolates from small-scale chicken farms (chicken feces, bedding, feed, wild animals) in Vinh Long province for the prevalence and relationship of antibiotic-resistance genes and metal-resistance genes in those strains. The PCR method was applied to detect seven antibiotic-resistance genes (*blaampC*, *blaTEM*, *dfrA1*, *tetA*, *strA*, *sul2*, *mcr1*) and four metal-resistance genes (*pcoR*, *czcD*, *cnrA*, *silE*). The results indicated that those *Salmonella* isolates harbored several patterns of antibiotic-resistance genes. Genes *blaampC* and *tetA* were the most prevalent (48.00%), while genes *mcr1* and *dfrA* were the most minor (1.33%). Of those *Salmonella* isolates, 97.33% harbored one to five antibiotic-resistance genes, and the *blaampC* + *tetA* + *sul2* pattern was frequently obtained (13.33%). Among metal-resistance genes, gene *pcoR* encoding for copper resistance was the most predominant (53.33%), and gene *cnrA* encoding for cobalt-nickel resistance was the lowest (5.33%). There were diverse patterns of metal-resistance genes, and one *Salmonella* isolates carried four examined genes (1.33%). Moreover, those *Salmonella* isolates had several combined patterns of metal-resistance and antibiotic-resistance genes. Among them, the most popular patterns were the prevalence of genes *pcoR* and *cnrA* accompanied by genes *blaampC* + *tetA* + *sul2*. It indicated the correlation between metal resistance and antibiotic resistance genes. It revealed the potential risk of increasing antibiotic resistance in *Salmonella* isolates in chicken farms in Vinh Long province.

**Keywords:** antibiotic resistance; chicken farm; metal resistance; *Salmonella*; Vinh Long

## EFFECTS OF COATED AND CONVENTIONAL ZINC OXIDES IN DIETS ON GROWTH PERFORMANCE AND INTESTINAL HEALTH OF WEANED PIGLETS

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### Abstract

The objectives of the present study were to evaluate the effects of coated zinc oxide (C-Zinc) and conventional zinc oxide (ZnO) in the diets of weaned piglets on growth performance and intestinal health. A total of 64 weaned crossbred piglets with an average body weight of about 6.5 kg were randomly assigned into 4 diet treatments based on sex; each treatment has 4 replicates and 4 piglets per replicate. The four treatments were the control treatment, in which piglets fed a basal diet without C-ZnO or ZnO; the experimental treatments were T1, T2 and T3, in which piglets fed the basal diet with 3000 ppm ZnO, 1200 ppm C-ZnO, and 1500 ppm C-ZnO, respectively. Supplementation with ZnO or C-ZnO did not affect the growth performance or feed efficiency of weaned piglets ( $p > 0.05$ ). Weaned piglets fed the ZnO and C-ZnO diets had lower diarrhea rates and fecal scores compared to the piglets fed the control diets ( $p < 0.001$ ). There were significant increases ( $p < 0.05$ ) in hematocrit, corrected reticulocyte count, and eosinophils when C-ZnO was added to the feed of weaned piglets. Villus heights were significantly higher in piglets fed C-Zinc at a level of 1500 ppm ( $p < 0.01$ ) compared to the control treatment. Feeding C-Zinc in the diets of weaned piglets improved the apparent digestibility of crude protein ( $p < 0.001$ ). In conclusion, dietary supplementation with C-Zinc did not affect the growth performance, feed efficiency or diarrhea rates compared to conventional ZnO but improved the blood index, villus height and protein digestibility of weaned piglets.

**Keywords:** C-Zinc; gut health; performance; weaned piglets; ZnO

## CURRENT SITUATION OF BEEF CATTLE PRODUCTION ON HOUSEHOLD FARMS IN SOME DISTRICTS OF LAM DONG PROVINCE

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### Abstract

The objective of the current investigation was to assess the current situation of beef cattle production in households in some districts of Lam Dong province. Ninety beef production households were chosen from Cat Tien, Don Duong and Duc Trong districts (10 households from 1 commune with 3 communes per district) to perform the survey by pre-printed questionnaires and directly interviewed as cross-section study model by using the Participatory Rural Appraisal (PRA) method. The results showed that beef husbandry householders have a lot of experience in beef farming (11-15 years at 36,7%;  $P<0.01$ ), although educational levels of beef owners were still low (31,1% at the primary level;  $P<0.01$ ). There were 7.3 cows/household in the total number of herd and 4.7 cows/household in number of beef cows. There was a majority in the distribution of husbandry scale of total herd and beef group from 1-5 cows/household at 60.00% ( $P<0.01$ ) and 69.32% ( $P<0.01$ ), respectively. There was a predominance of high-yielding breeds in the current beef production systems at local households (BBB crossbred breed at 57.95% and 76.84% of interviewed households and total cows, respectively; Charolais crossbred breed at 25.00 and 12.6%, respectively) ( $P<0.01$ ). There was a high level (92.22%) of husbandry and management method as tied stall form ( $P<0.01$ ). There were 76,14% of farms applied the fattening procedure for beef cattle before selling to abattoirs ( $P<0.01$ ), but artificial insemination (AI) application in farms was just 48.86% ( $P=0.763$ ). Average daily gain (ADG) of the beef herd for whole husbandry and finishing periods reached 580.3 and 696.4 g/cow/day, respectively. Briefly, these results suggest that application of scientific advances for raising, feeding and management is necessary to develop sustainably beef cattle farming in households.

**Keywords:** ADG; Beef cattle; breeds; husbandry methods; husbandry scales

## INNATE IMMUNE CELLS ARE IMPORTANT FOR THE EARLY PATHOGENESIS OF *E. TENELLA* INFECTION.

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### Abstract

*Eimeria tenella* displays the strongest pathogenicity leading to bloody diarrhea and severe cecal pathological lesions. The cell-mediated immunity involving the activation of T lymphocytes plays an important role in protective immunity against coccidia. However, the roles of innate immune cells such as macrophage and gamma delta T cells are still unclear. The aim of this study was to evaluate the function of innate immune cells in early *E. tenella*-infection period. Chicks (White Leghorns; n = 27) were randomly divided into three groups; Control group (CT), carrageenan treated group (CAR), and zoledronate and CAR treated group (ZOL+CAR). All chicks were orally infected with *E. tenella* sporulated oocysts ( $1 \times 10^4$  oocysts/chick) at 14 days old. During 4 to 15 days post-infection (dpi), feces were collected to determine oocyst shedding. The histopathological observation and detection of gene expression were performed using cecal tissue samples at 5 dpi. Total number of oocysts significantly reduced in the CAR and ZOL+CAR groups compared with CT group ( $p < 0.05$ ). The lesion score and parasite burden score of the CT group were  $3.32 \pm 0.07$  and  $3.63 \pm 0.10$ , respectively, and were particularly higher than the CAR and ZOL+CAR groups ( $p < 0.05$ ). The lesion and burden scores did not significantly differ between the ZOL+CAR and CAR groups. These results suggest that innate immune cells are important for the early pathogenesis of *E. tenella* infection. The results of gene expression will be presented at the time of conference because of currently analysis.

**Keywords:** *Eimeria tenella*; macrophage; gamma delta T cell; pathogenesis

## CONTRIBUTION OF SELECTIVE BREEDING FOR DISEASE RESISTANCE TO AQUACULTURE SUSTAINABLE DEVELOPMENT IN VIETNAM

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### Abstract

Striped catfish (*Pangasianodon hypophthalmus*) and white leg shrimp (*Penaeus vannamei*) are the two most important aquaculture species in Vietnam with their production of 1.61 and 0.845 million tones in 2023 respectively. Their farming is challenged by heavy disease outbreaks with the most harmful ones which are bacillary necrosis (BN) caused by bacteria *Edwardsiella ictaluri* and white spot syndrome virus (WSSV) respectively. The successful selective breeding for improving growth rate has been carried out in 2001 for striped catfish and in 2014 for white leg shrimp, but their disease resistance to BN and WSSV resistance has just been done in 2012 and 2017 for these species respectively. Both linear and threshold statistical models were used to estimate genetic parameters, the heritability ( $h^2$ ) of binary survival or time to dead traits and their correlations ( $r_g$ ) with harvest weight. For striped catfish,  $h^2$  for BN resistance was from low to high (0.02-0.48) and  $r_g$  between body weights and BN resistance were positive (0.03÷0.27) depending on the selective populations and statistical models. For white leg shrimp,  $h^2$  for WSSV resistance was from low to moderate (0.01-0.31) and  $r_g$  between body weights and WSSV resistance on different stages of infection were negative (-0.33÷-0.63). The genomic predictions for BN resistance of striped catfish using artificial intelligence algorithms, machine learning (ML-KAML) and deep learning (DL-MLP and DL-CNN), were conducted and earned the increase in the prediction accuracies for the trait by 9.1–15.4%. The application of quantitative genetics and genomic selection for these traits will be discussed.

**Keywords:** disease resistance; genetic parameters; genomic selection; striped catfish; white leg shrimp

## PREVALENCE OF COXOFEMORAL DISLOCATION IN DOGS AND APPLICATION OF FEMORAL HEAD AND NECK OSTEOTOMY IN TREATMENT AT NEWPET VETERINARY HOSPITAL

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### Abstract

The research project “Prevalence of coxofemoral dislocation in dogs and application of femoral head and neck osteotomy technique in treatment at Newpet Veterinary Hospital” was carried out at Newpet Veterinary Hospital, from December 2022 to December 2023, with the purpose of surveying cases of coxofemoral (hip) dislocation in dogs and evaluating the treatment effectiveness of femoral head and neck osteotomy. The result recorded 32 cases of dogs with coxofemoral dislocations with 35 dislocated joints out of 2,436 dogs surveyed, accounting for 1,13%. Dogs with coxofemoral dislocation are common in adult dogs and highest in ages 6 months to 3 years old. Small dog breeds weighing less than 9kg are more susceptible to dislocation than large and heavy dog breeds. Most dogs had craniodorsal unilateral dislocation; the most common causes of hip dislocation were traffic accidents and falls from height, respectively. The study also applied femoral head and neck osteotomy on 19 dogs with coxofemoral dislocation. The results showed that animals had high levels of pain after surgery and were required to use painkillers continuously. For animals to recover movement, it took an average time of 58.07 ( $\pm$ ) 11.53 days after surgery with post-operative complications including loss of muscle mass, shortening of the surgical leg and reduced joint range of motion. Clinical evaluation showed that only 54% of animals met the requirements for locomotion recovery after surgery. However, 100% of surveyed owners commented that they were satisfied with the results of the surgery thanks to helping reduce pain and improve the quality of life of the animals.

**Keywords:** Dogs; Femoral Head and Neck Osteotomy (FHNO); Hip dislocation

## EFFECTS OF A SACCHAROMYCES CEREVISIAE FERMENTATION PRODUCT ON INTESTINAL ESCHERICHIA COLI OF BROILER CHICKEN

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### Abstract

The study was designed to evaluate the effects of feeding broiler chicken a diet containing a *Saccharomyces cerevisiae* fermentation product (SCFP; Diamond V XPC) on the total number of *Escherichia coli* in the intestines and the minimum inhibitory concentration (MIC) of 11 antibiotics against *E. coli* isolates. Day old chicks were divided into two groups: the experimental group (SCFP) received feed supplemented with a *S. cerevisiae* fermentation product, and the control group (CON) received antibiotics as per the farm's standard protocol. At 21 and 35 days of age, 200 cecal samples were collected to examine the total *E. coli* and MIC for *E. coli* isolates using the broth microdilution method. The results showed that at 21 days of age, the SCFP group had a higher total *E. coli* count compared to the CON group ( $P < 0,001$ ), but at 35 days of age, there was no difference in this parameter between the two groups ( $P > 0,05$ ). Additionally, *E. coli* from the SCFP group had lower MIC<sub>50</sub> and MIC<sub>90</sub> for streptomycin, azithromycin, and colistin compared to *E. coli* from the CON group. Moreover, *E. coli* from the CON group showed higher resistance rates to streptomycin and florfenicol than *E. coli* from the SCFP group (55% vs. 44% for streptomycin and 87% vs. 78% for florfenicol). Whereas 32% of *E. coli* from the CON group were resistant to colistin, only 1% of *E. coli* showed resistance against colistin in the SCFP group. However, *E. coli* from the control group had a lower resistance rate to enrofloxacin (68%) compared to the experimental group (82%). Although the total *E. coli* count in the cecum was not altered, the MIC results suggest the potential of *S. cerevisiae* fermented product to limit the growth of resistant bacteria.

**Keywords:** *Saccharomyces cerevisiae*; *E. coli*; broiler chicken; SCFP

## INVESTIGATION OF COCOA POD HUSK ENSILAGE REPLACEMENT IN DIET FOR GROWTH PERFORMANCE OF WEANING-FINISHING PIGS

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### Abstract

The growth rate, feed intake, feed to gain ratio and cost of gain of growing pigs fed diets containing cocoa pod husk ensilage used up to 60% in the diets were investigated in a feeding trial set up as a observation in 6 small holder farms, in two provinces of Ba ría – Vung Tau and Vinh Long, with replicated three periods and lasting average 140 days for each period. The variances at the two locations proved to be homogenous and as such data from the two locations was pooled with the analysis being handled as a single-factor design with treatment as the only observation. There was difference between three periods for average daily weight gain, average daily feed intake and feed conversion ratio. The third period trial used black soldier fly meat to replace fish meal shown higher with daily weight gain, cocoa pod husk ensilage, but lower concentrate and feed conversion ratio. For the three periods, the income benefit the result shown 324% compared with the control when the farmers used the commercial feed. It was concluded that feeding fermented cocoa pod husk to growing pigs, up to 322 g kg<sup>-1</sup> of the diet has no deleterious effects on the pigs.

**Keywords:** feeding trial; fermented cocoa pod husk; growing pigs; growth rate; feed to gain ratio



## PARTICIPANT OF FARM WOMEN IN BLACK SOLDIER FLY LARVAE PRODUCTION

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### Abstract

Black soldier fly larvae (BSFL) production provides employment, economic support and improves environment to rural families in rural areas who are landless or those possess some land. Many of the important tasks in BSFL rearing activities are performed by women besides fulfilling their responsibilities as home work. The role of women in agriculture and other activities has however been under estimated and undervalued. This survey was conducted with an objective to study the role of women in BSFL production in rural or urban. The study was conducted among 50 farm women practicing BSFL farming in some provinces of the South, Vietnam. They participated, shared their experiences in small scale production and expressing their enthusiasm for adopting this technology, not only for their work of BSFL production in the fields but also in the management of organic waste at home. They participated in this sensitization event, some are members of youth organizations active in organic waste management and the production of BSFL, and others are entrepreneurs or graduate students interested in rearing this fly. The data were collected by using family directly interview. In the participation, actual doing of the work was more in egg harvesting with 82.5%, feeding with 61.5%, BSFL care with 58.5% and less management with 24.5%. Their participation was very low in marketing, selection of BSF enterprises, availing credit facilities and record maintenance.

**Keywords:** black soldier fly production; engagement; women; management

## CASSAVA PULP BY-PRODUCTS AND SOYA BEAN WASTE AS THE BASAL DIET FOR BLACK SOLDIER FLY LARVAE: EFFECTS ON INTAKE, GROWTH AND BODY SIZE

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### Abstract

The study was carried out from February to May, 2024 at Dairy farm, Research and Technology Transfer Center, Nong Lam University of Ho Chi Minh City to determine the appropriate proportion of cassava pulp by-products and soya bean waste in diets on growth rate of black soldier fly larvae (BSFL). The study was arranged in a completely randomized block design with one factor with four replications for each treatment. For each replication, 300 individuals were randomly selected from an experimental tray. All total of 20 trays were used to evaluate the effect of the ratio of soya bean waste in diet on growth performance of BSFL between 5 treatments: T1 (100% cassava pulp by-products + 0% soya bean waste), T2 (75% cassava pulp by-products + 25% soya bean waste), T3 (50% cassava pulp by-products + 50% soya bean waste), T4 (25% cassava pulp by-products + 75% soya bean waste), T5 (0% cassava pulp by-products + 100% soya bean waste).

On the first day of experiment, each treatment was added 10 grams of eggs of BSF with the same laying date and 200 grams of concentrate feed. After 5 days, in the experimental trays, the amount of substrate was added according to the treatment ration formula. The studied parameter were length, width and weight of black soldier fly larvae in 12 rearing days. The results showed that body weight and body weight gain were improved in T5 and T4 diets than the BSFL of T0, T1 and T2 diets during a rearing period of 5-17 days. Feed consumption increased in BSFL that received T5 as compared to T0, T1 and T3 groups. Feed conversion ratio decreased in T4 and T5 dietary group than T0, T1 and T3 groups. Similarly, live weight, length, width and growth rate were higher in T5, T4, T3 than T0 groups respectively. Profit per BSFL increased with increasing level of the dietary soya bean waste, particularly in T4. Soya bean waste levels of diet had no effect on survivability although BSFL belonging to T0 suffered more from mortality. It was concluded that BSFL fed a diet with the appropriate proportion of 85% cassava pulp by-products and 15% soya bean waste gave the optimize growth rate and FCR the best growth rate.

**Keywords:** black soldier fly larvae; soya bean waste; cassava pulp; growth; intake; FCR

## QUANTIFYING BIOFOULING IMPACT ON LOBSTER CAGES: A STUDY IN XUAN DAI BAY, PHU YEN PROVINCE, VIETNAM

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### Abstract

This study aimed to investigate the composition and biomass of fouling algae and fauna on lobster cages in Xuan Dai Bay. Monthly samples were collected from the sides and bottom of five lobster cages in Xuan Dai Bay, Phu Yen Province, from July to December 2017. The results revealed that the fouling algae consisted of 20 genera from two families. Bacillariophyceae was the dominant group with 19 genera, accounting for 95% of the total, while one genus belonged to Chrysophyceae. The fouling fauna comprised 21 species belonging to three classes. Among these, 14 species were classified under seven families of bivalve mollusks (Anomiidae, Arcticidae, Limidae, Mytilidae, Ostreidae, Pinnidae, and Veneridae), representing 67% of the total. Additionally, six families of Gastropoda (Cystiscidae, Buccinidae, Neritidae, Thiaridae, Pyramidellidae, and Vermetidae) accounted for 28% of the total fouling fauna. The highest biomass of fouling algae was observed in September, with 25,140 cells per square decimeter (dm<sup>2</sup>), while the lowest biomass was recorded in November, with 4,169 cells/dm<sup>2</sup>. In terms of fouling fauna, the highest density was observed in July, with 81 individuals/dm<sup>2</sup>, whereas the lowest density was recorded in December, with 10 individuals/dm<sup>2</sup>. Canonical correlation analysis (CCA) revealed that the biofouling communities were influenced by various factors, including pH, salinity, NH<sub>3</sub>, NO<sub>2</sub>, total nitrogen, soluble phosphorus, and total phosphorus.

**Keywords:** Algae; bivalve mollusc; fouling; lobster cage; Phu Yen Province; Vietnam

## EFFECTS OF ANTIBACTERIAL PEPTIDES IN NON-ANTIBIOTIC FEEDS ON THE PRODUCTIVITY OF GROWING PIGS

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### Abstract

To evaluate performances of growing pigs as being fed diets which are contain only two kinds of antibiotics or no antibiotics but supplemented of organic materials to enhance gut health status such as combination of phytogenics plus organic acid plus probiotics or plus a new preparation of anti-bacterial peptides (trade name Halor Tid), a total of 48 weaned 3-blood piglets were chosen to be randomized assigned into four treatments with 6 replicates per treatment, two pigs, one barrow and one female per replicate. Treatment I was the negative control group, pigs were fed basic feed with no supplementation of antibiotics nor other organics feed additives. Treatment II was a positive control group, pigs were fed diet supplemented of two kinds of antibiotics as Colistin 1% and BMD 10% to prevent most *E.coli* and *Clostridium perfringens*. Pigs in Treatment III were fed basal diet but supplemented with a combination of phytogenics plus organic acid plus probiotics; and pigs in Treatment IV were fed similar diet of Treatment III but the probiotics were replaced by the anti-bacterial peptides. Pigs in Treatment I expressed worst performance on body weight gain, feed conversion ratio (FCR) and especially on problem of diarrhea risk and mortality. Pigs in Treatment III or in Treatment IV gained body weight and FCR better than pigs in Treatment II although this difference is not statistically significant at  $P > 0.05$ . The feed cost per kg of live weight of pigs in Treatment III and Treatment IV was improved significantly.

**Keywords:** antibacterial peptides; antibiotics; organic compounds; growing pigs

**EFFECTS OF ANTIBIOTIC, ACIDIFIER AND PROBIOTIC  
SUPPLEMENTATION ON THE LEVELS OF INFECTIOUS BURSAL DISEASE  
VIRUS ANTIBODIES AND HISTOPATHOLOGY OF BURSA OF FABRICIUS IN  
BROILER FARMS.**

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**Abstract**

The present study aimed to investigate the antibody titers to infectious bursal disease and histopathology of the bursa of Fabricius in broilers in field trips. A total of 225 Ross 308 chickens were randomly selected from ten farms with different diets and medical care programs. Birds were sacrificed at 1; 7; 14; 28 days old to determine, bursa/body weight ratio. Bursal tissues were fixed in 10% buffered formalin and used for the evaluation of Bursa histological properties. Blood samples were analyzed by ELISA for the presence of antibody against IBD virus. Results showed that all birds had protective antibody titers against IBDV from 1 day to 14 days old, except birds at day 14 of Farms 3 and 5 (245.6 and 342.2, respectively). Likewise, no birds of this study had protective antibody titers against IBDV on day 28, except Farms 6 and 10 ( $821.8 \pm 452.2$  and  $425.1 \pm 229.4$ , respectively). In the present study, the Bursa weights of broilers were gradually increased from 1-to-28 days old. At 28 days of age, the lowest Bursa weight and Bursa index were 1.61 grams and 0.12%, while the highest ones were 2.70 grams and 0.21%. The histopathological score of the bursa was not significantly different across all farms. In general, antibody titers against IBD and histopathological score of the bursa do not appear to be affected by dietary supplementation in broiler chickens, therefore, it is difficult to explain whether feed supplementation on broiler farms can boost antibodies to IBD disease

**Keywords:** antibody; Bursa; IBDV

## ASSESSMENT OF THE IMMUNITY GAP OF TWO VACCINATION PROGRAMS AGAINST GUMBORO DISEASE IN LUONG PHUONG CHICKENS

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### Abstract

The study was conducted to evaluate the immunity gap between 2 vaccination programs against infectious bursal disease (IBD) in Luong Phuong chickens. Maternal derived antibodies (MDA) are the priority protection prevent environmental IBDV in the first weeks old. Passive immunity decrease but active immunity is not enough to protect chick, so shortening the high risk period is crucial to IBD control. Total 34600 chicks were administered subcutaneous injection by IBD vaccine dose 0.1 ml at the hatchery. At 12d, 18000 chicks were vaccinated with M.B strain vaccine and 16600 chicks were vaccinated with 228E strain vaccine by drinking water. IBD and ND antibody titer evaluations based on Elisa technique. Parameters were recorded until slaughter include the body weight, average daily gain, feed conversion rate and mortality. The IBD MDA titers at 1d were quite high and uniform (3809 and 45.3%), which could protect from 1 to 2 weeks old. At 28d, the average IBD antibody titers of MB vaccine were higher than 228E vaccine, the significant difference between 1133 and 161 ( $P < 0.01$ ). Beside, M.B vaccine created the faster and stronger immune response, various proportions of samples exceeding 1000 titers were 40% and 0%, shortening the immune gap and protecting earlier chicks. The humoral immune response to the ND vaccine was good with no antibody titer difference between 2 groups, which proved that M.B virus did not cause immunosuppression. Production parameters of the experimental chickens were equivalent. In summary, M.B vaccine made the short immune gap and did not cause immunodeficiency.

**Keywords:** antibody titer; M.B strain; IBD; immunity gap; 228E strain

## DIETARY *SACCHAROMYCES CEREVISIAE* SUPPLEMENTATION FOR IMPROVING FEED INTAKE AND MILK QUALITY IN LACTATING COWS

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### Abstract

The objective of this study was to evaluate the effects of daily dietary supplementation of *saccharomyces cerevisiae*-contained product (SCP) on feed consumption, milk yield and quality of milking cows from November, 2022 to January, 2023 at the dairy farm of ANOVA Binh Duong. The study was conducted on a total of 94 HF crossbred cows with at least 3/4 HF blood, with days in milk (DIM) at 31-128 days, and lasted 30 days (the first 15 days for the control treatment without SCP supplementation, control and the next 15 days for the SCP treatment with SCP addition at 5 g/cow/day, SCP). Results showed that the average feed intake (as fed) of cows in the control period was significantly lower than that of cows in the SCP period ( $P < 0.01$ ). SCP supplementation does not affect ( $P > 0.05$ ) the milk productivity and milk fat, while milk protein, lactose, and SNF from the milk of cows in the SCP group were significantly improved ( $P < 0.01$ ). SCP supplementation also significantly enhanced the body condition score (BCS) of dairy cows. Briefly, these results suggest that the dietary SCP addition of 5 g/cow/day seems to significantly improve the feed intake, BCS, and milk quality parameters of lactation cows.

**Keywords:** BCS; dairy cows; feed consumption; *saccharomyces cerevisiae*; milk yield and quality

## FEED INTAKE AND DAILY WEIGHT GAIN OF CROSS-BRED SINDHI CATTLE FED FERMENTED RICE STRAW VERSUS RICE STRAW

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### Abstract

This study aims to compare the effects of feeding cattle with rice straw versus fermented rice straw with different levels of microbes. The fermentation process using microbes were A and B, which was raised biomass in diluted molasses for 3 days before adding it to rice straw. Forty cross-bred Sindhi cattle were randomly assigned to four treatments as follows: (1) Control: mixing 38% soybean meal and 24% dried brewer's malt as a basal diet + rice straw fed at 38%, (2) FRS30: Basal diet + 38% rice straw fermented with 30 liters of microbes biomass, (3) FRS40: Basal diet + 38% rice straw fermented with 40 liters of microbes biomass, (4) FRS50: Basal diet + 38% rice straw fermented with 50 liters of microbes biomass. Each treatment had ten cattle and the feeding trial lasted for 90 days. The results showed a positive effect on total dry matter intake and total CP intake in cattle fed fermented rice straw compared to rice straw. Fermented rice straw intake was highest in the FRS30 treatment at 18.25 kg/day per group, followed by FRS40 at 17.98 kg/day per group, but reduced to 16.44 kg/group/day in FRS50 and the control group at 15.56 kg/day per group. Average daily weight gain (ADG) and DM conversion also improved with fermented rice straw, with the highest ADG found in FRS30 and reduced linearly in FRS40 and FRS50. In summary, treating rice straw with 30 liters of microbes biomass consisting of A and B can effectively improve the intake and daily weight gain of cross-bred Sindhi cattle.

**Keywords:** Fermented rice straw; microbes; feed conversion rate; daily weigh gain; feeding trial



## ISOLATION AND RAPID IDENTIFICATION OF SALMONELLA BY MULTIPLEX POLYMERASE CHAIN ASSAY ON SWIFTLETS HOUSES ENVIRONMENTS IN SOUTHERN VIETNAM

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### Abstract

Salmonellosis is an infection caused by *Salmonella* bacteria that usually affects the intestines and is a significant public health concern causing millions of human cases worldwide every year including thousands of deaths. Currently, *Salmonella* is divided into 2 species, consisting of *Salmonella enterica* and *Salmonella bongori* based on differences in their 16S rRNA sequence analysis. *Salmonella enterica* was recorded in intestinal diseases. This study was performed to investigate the presence of *Salmonella* via isolation from feces and nest surface samples collected from 30 swiftlet houses in Southern Vietnam. Further identification by two multiplex PCR confirmed the bacteria to be *Salmonella enterica* subsp. *enterica*, *Salmonella enterica* serovar Typhimurium, *Salmonella enterica* serovar Enteritidis through . The optimal conditions for mPCRs was: annealing temperature at 56°C, the concentration ratio of primer was 1:1 (0.2 μM: 0.2 μM) for mPCR #1 and 2:3 (0.4 μM: 0.6 μM) for mPCR #2. The limit of detection was in the range of 1\*10<sup>-7</sup> ng/μL to 1\*10<sup>-6</sup> ng/μL. In this study, *Salmonella*-like bacteria was isolated in 29 out of 90 samples investigated (32.22%). Subsequently, 6.67% (6 isolates) was further confirmed to be *Salmonella enterica* subsp. *enterica*. by PCR method. For subspecies identification, 3 isolates were *S. Typhimurium*, and the other three isolates were *S. Enteritidis*. Our study successfully established an mPCR to detect and identify subspecies of *Salmonella* and indicated that *Salmonella* does exist in the environment of swiftlet farms.

**Keywords:** mPCR; *Salmonella* spp.; *Salmonella enterica* subsp. *Enterica*; *S. Typhimurium*; *S. Enteritidis*; swiftlet

## PASSIVE SURVEILANCE OF SALMONELLA SPP. PREVALENCE FROM DIFFERENT SOURCES IN BROILER FARMS

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### Abstract

*Salmonella spp.* are important food borne pathogens worldwide that frequently infect chicken flocks. Chicken may be infected with *Salmonella spp.* by different ways such as direct contact with infected birds, consumption of contaminated feed, water or through the environment. The objective of this survey was to passively investigate the prevalence of *Salmonella spp.* colonization in broiler flocks from a variety of sources during the period from May 2021 to April 2024. Total of 4995 samples originated from broiler farms in some provinces neighboring Ho Chi Minh city ; including 210 samples of yolk sac, liver and spleen in day-old chicks (DOC), 873 swabs of drinking nipples, 751 samples of feed, 632 swabs of the housing floor, 1985 samples of rectal swabs and 544 swabs of feeders, were cultured to detect suspected colonies of *Salmonella spp.* then followed by PCR detection to confirm the *Salmonella spp.* The procedure of culture was followed by Vietnamese national standard for microbiology analysis (TCVN 11039-3:2015). The *Salmonella spp.* infection was found at 15.1% (95% CI: 13.51 – 16.71) in rectal swabs, 11.9% (95% CI: 7.6 – 16.4) in DOC, 10.76% (95% CI: 8.36 – 13.16) in the swab of housing floor, 4.47% (95% CI: 3 – 6) in the drinking nipples, 1.86% (95% CI: 0.86 – 2.86) in feed and none of infection found in feeders. The detection of *Salmonella spp.* in different sources inside the housing indicates the complication and difficulty of management and control the risk of *Salmonella* infection in farms and human salmonellosis from broiler chicken consumption.

**Keywords:** Passive surveillance; prevalence; *Salmonella spp.*; broilers; Vietnam

## EVALUATING THE EFFECTS OF 17 $\alpha$ -METHYLTESTOSTERONE AND NANO CHITOSAN ON MASCULINIZATION RATE, AND GROWTH PERFORMANCE IN NILE TILAPIA (*OREOCHROMIS NILOTICUS*) USING THE IMMERSION METHOD

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### Abstract

The study was carried out to evaluate the effectiveness of a combination of 17  $\alpha$ -methyltestosterone (MT) and nano chitosan on the survival rate, masculinization rate, and growth performance of Nile tilapia (*Oreochromis niloticus*) using the immersion method. The experiment utilized a completely randomized design with five treatments involving different mixed concentrations of MT and nano chitosan including chitosan + 1 mg MT/L (1MC), chitosan + 1.5 mg MT/L (1.5MC), chitosan + 2 mg MT/L (2MC), chitosan + 2.5 mg MT/L (2.5MC), and chitosan + 3 mg MT/L (3MC). control group was included, and each treatment was replicated three times. Seven-day-old fingerlings were exposed to the MT + chitosan solution for 2 hours before being transferred to nurseries in hapas in earthen ponds at a density of 1.000 fish/m<sup>2</sup> for 60 days.

After hormone treatment and 60 days of rearing, the control group demonstrated the highest survival rate. Male ratios in the 17  $\alpha$ -methyltestosterone (MT) treatments ranged from 76.7% to 83.3%, significantly higher than the control group's ratio of 66.7% ( $P < 0.05$ ). Specifically, the male ratios in the 2.5MC and 3MC treatments were 82.2% and 83.3%, respectively, which were significantly higher than those in the other MT treatments ( $P < 0.05$ ). Additionally, the study found a direct relationship between the average weight of experimental fish and the hormone concentration. Based on these results, the recommended dose for achieving maximum mono-sex male tilapia is 2.5 mg 17  $\alpha$ -MT/L.

**Keywords:** 17  $\alpha$ -methyltestosterone; *Oreochromis niloticus*; sex reversal; immersion method

## EFFICACY OF 17 $\beta$ -ESTRADIOL ON SURVIVAL, MATURATION, AND GROWTH IN CLIMBING PERCH (*ANABAS TESTUDINEUS*) USING THE IMMERSION METHOD

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### Abstract

This study aimed to evaluate the efficacy of estradiol on the survival rate, maturation rate, and growth performance of climbing perch (*Anabas testudineus*) using the immersion method. The experiment employed a completely randomized design with three E2 treatments at concentrations of 1 mg/L (1E2), 1.5 mg/L (1.5E2), and 2 mg/L (2E2), alongside a control group, each replicated three times. Seven-day-old fingerlings were exposed to the E2 solution for 2 hours before being transferred to nurseries in hapas in earthen ponds at a density of 200 fish/m<sup>2</sup> for 60 days. After the hormone treatment and 60 days of rearing, the highest survival rate was observed in the control group (86.7%). The female ratios in the 17 $\beta$ -estradiol (E2) treatments ranged from 72.0% to 90.0%, which were significantly higher than the ratio of the control group (55.6%) ( $P < 0.05$ ). The 2E2 treatment demonstrated the highest female percentage, which was statistically greater than those observed in the 1E2 and 1.5E2 treatments ( $P < 0.05$ ).

The mean weight and length of fish in the E2 treatments were greater than those in the control treatment, although the differences were not statistically significant ( $P > 0.05$ ). Additionally, the study revealed a direct proportionality between the average weight of experimental fish and the hormone concentration. Based on these findings, the recommended dose for achieving maximum mono-sex female climbing perch is 2 mg/L of 17 $\beta$ -estradiol.

**Keywords:** 17 $\beta$ -estradiol; *Anabas testudineus*; maturation rate; immersion method

## CONSTRUCTION OF MULTIPLEX-PCR TO DETERMINE THE PRESENCE OF ZO-1, CLAUDIN, AND OCLUDIN GENE IN PIG'S INTESTINE

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### Abstract

Tight junction (TJ) proteins play a critical function in creating a strong intestinal barrier that protects against ingested pathogens and agents. This study aimed to utilize multiplex PCR to ascertain the presence of Zo-1, Claudin, and Ocludin in the intestines of pigs using specific primer pairs yielding amplicons of 167 bp, 500 bp, and 235 bp, respectively. The multiplex PCR protocol underwent optimization for annealing temperature and primer concentrations, assessing primer specificity, and determining the limit of detection. Subsequently, the optimized multiplex PCR was employed to detect these genes in 48 pig intestinal samples, including swine ileum, duodenum, and ileal sections collected from Dong Nai and Binh Duong Provinces. After optimization, the multiplex PCR demonstrated specificity for these genes and adhered to the thermal cycling conditions, with an annealing temperature at 58°C. The primer pair ratios for Zo-1, Claudin, and Ocludin were 0.4 µM: 0.4 µM: 0.4 µM (2:2:2), respectively. The application of optimized multiplex PCR in the field samples revealed detection rate for Zo-1, Claudin, and Ocludin genes at 83.33% (40/48), 4.17% (2/48), and 29.17% (14/48), respectively. Intriguingly, one sample tested positive for all three genes, while negative results for these genes were observed in 12.5% of the samples. Conclusively, in the present study, the mPCR was successfully established to detect Zo-1, Occludin, and Claudin genes in swine tissues.

**Keywords:** Zo-1; Claudin; Ocludin; mPCR; intestine

## INHIBITION OF GLUTATHIONE S-TRANSFERASE P1-1 ENHANCES BENZYL ISOTHIOCYANATE-INDUCED ANTI-PROLIFERATION

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### Abstract

Glutathione S-transferase P1-1 (GSTP1-1) has emerged as a promising target due to its involvement in drug resistance and tumor progression. This study investigated the enhancing effect of a GSTP1-1 inhibitor, NBDHEX, on benzyl isothiocyanate (BITC)-induced anti-proliferation in human colon cancer HCT-116 cells. To check the toxicity of BITC and NBDHEX, BITC or NBDHEX was treated with the cells for 24 h. Both BITC and NBDHEX significantly decreased the cell viability from the concentrations of 5  $\mu$ M and 0.5  $\mu$ M, respectively. In addition, the combined treatment of BITC and NBDHEX significantly inhibited cell proliferation compared to each compound alone. We next evaluated the molecular mechanism for this effect using the western blot analysis. The co-treatment of BITC and NBDHEX synergistically enhanced the c-jun phosphorylation via the c-jun N-terminal kinase pathway. The cleavage of caspase-3 was also induced by the co-treatment, suggesting that apoptosis induction is involved in the enhanced anti-proliferation by the combination of BITC and NBDHEX. Taken together, targeting GSTP1-1 could be a novel therapeutic strategy for colorectal cancer by natural compounds such as BITC.

**Keywords:** Colorectal cancer; glutathione S-transferase; benzyl isothiocyanate; drug resistance; apoptosis induction

## CYTOPROTECTIVE EFFECT OF PHENOLIC ACID ON ALDEHYDE-INDUCED CYTOTOXICITY IN MOUSE HEPATOCYTES

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### Abstract

The purpose of this study was to investigate the toxic effects of aldehydes on hepatocytes and the cytoprotective effect of phenolic acid against aldehydes toxicity. To evaluate the toxicity of formaldehyde (FA), acetaldehyde (AA), and propionaldehyde (PA), each aldehyde was treated with Hepa1c1c7 mouse hepatoma cells for 3 hours, and then the cell survival rates were determined using the MTT assay. We observed that the cell viability of Hepa1c1c7 cells decreased by AA and PA in a concentration-dependent manner. FA also showed the significant cytotoxicity, which was more severe than that of other aldehydes. We next investigated the cytoprotective effects of 3,4-dihydroxyphenylacetic acid (DOPAC), the major intestinal catabolite of flavonoids, on aldehyde toxicity in Hepa1c1c7 cells. DOPAC was pretreated with the cells before the AA treatment. The toxic effect of AA on the cells were inhibited as the concentration of DOPAC increased. The total activity of aldehyde dehydrogenase, the main enzyme responsible for aldehyde detoxification, was significantly increased by the DOPAC treatment, suggesting that the enhancement of the total ALDH activity might be involved in the cytoprotection against aldehyde toxicity by DOPAC.

**Keywords:** Aldehyde; DOPAC; aldehyde dehydrogenase; hepatocyte

## CELL PROLIFERATION DYNAMICS OF BOVINE UTERINE GLAND EPITHELIUM DURING THE ESTROUS CYCLE

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### Abstract

In this study, we examined the cell proliferation dynamics of bovine uterine gland during the estrous cycle. The bovine uterus was classified into four stages: 1-4 days (stage I), 5-10 days (stage II), 11-17 days (stage III), and 18-20 days (stage IV) after ovulation. The epithelium was histologically classified into luminal (LE) and uterine epithelium (GE). GE was further divided into a uterine gland opening, which was invaginating from the LE, and the superficial, middle, and basal gland between the LE and myometrium. Cell proliferation in each part was evaluated for the ratio of cells positive for Ki67 by immunostaining. Moreover, the co-localization of SSEA-1, a stem cell marker, and Ki67 was also evaluated. The ratio of Ki67-positive cell was significantly higher ( $P < 0.05$ ) in the LE (I, II, and IV), the opening (I, II, and IV), and the superficial (I) when comparing among the stages. In the middle, it was significantly higher in I than in III or IV ( $P < 0.05$ ). No significant differences were observed in the basal. In comparison among parts, at I, there was significantly higher in the opening than basal ( $P < 0.05$ ). At II, it was significantly higher in the opening than basal, and significantly higher in the LE than superficial, middle, and basal ( $P < 0.05$ ). No significant differences were observed at III. At IV, it was significantly higher in the opening than LE and middle ( $P < 0.05$ ). SSEA-1 was strongly expressed only in LE but did not co-localize with Ki67-positive cells in the openings.

**Keywords:** cattle; endometrium; proliferation; uterine gland



## THE EFFECT OF TOKISHAKUYAKUSAN, A CHINESE MEDICINE, ON BOVINE OVIDUCTAL FLUID FLOW

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### Abstract

In this study, we investigated the effect of TSS on bovine oviductal fluid flow. The stages of the estrous cycle were classified as stage I (days 1–4 after ovulation), II (5–10 days), III (11–17 days), and IV (18–20 days), based on observation of the ovary. The transport speed of beads was measured to determine the effects of TSS on fluid flow by ciliary beating. The ampulla of oviduct was incubated in the culture medium described below. The movement of the beads was recorded at 30 seconds and 20 minutes post TSS treatment and beads transport speed was calculated. We used KRS with (KRS+) or without (KRS-) Ca<sup>2+</sup> as the culture medium in experiment 1 and KRS+ with or without G-15 (G protein-coupled estrogen receptor 1 antagonist) in experiment 2. In KRS-, TSS didn't affect the beads speed at all stages. In KRS+, oviducts at stage I showed a significant increase in speed at 20 minutes ( $P<0.05$ ) and tendency to increase at 30 seconds ( $P=0.06$ ) post TSS treatment compared to the control. Oviducts at stage IV showed a significant increase in speed at 30 seconds post treatment ( $P<0.05$ ). There were no significant differences between control and post treatment at the other stages. G-15 inhibits the increase at 20 minutes post TSS treatment at stage I, but not at 30 seconds post treatment at stage IV. These results suggest that TSS increases fluid flow speed in bovine oviducts in the presence of extracellular Ca<sup>2+</sup> via GPER1.

**Keywords:** bovine; oviductal fluid flow; Chinese medicine

## ILEITIS VACCINE'S SAFETY AND QUICK, LONG-LASTING IMMUNE RESPONSE IN PIGS WITH TWO SCHEDULES AT 3 AND 5 WEEKS OF AGE

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### Abstract

Ileitis, or proliferative enteritis, represents a significant issue in contemporary pig farming on a global scale and specifically within Vietnam. This study sought to assess the safety and immunogenicity of the inactivated Porcilis® Ileitis vaccine when administered at 3 and 5 weeks of age on a commercial pig farm. The results indicated that the vaccine is highly safe when administered at these ages, exhibiting minimal local and systemic reactions. Notably, mild systemic responses (1%) were recorded in the experimental groups V-3-A and V-3-B within 2 hours post-injection. Antibody levels in the vaccinated groups increased rapidly, reaching the positive threshold (PI>30%) within 2 weeks post-vaccination. Even with a vaccination schedule delay to 5 weeks (V-5-A and V-5-B), antibody levels rose swiftly after vaccination, turning positive in slightly over a week. Additionally, the antibody response was more pronounced in the group vaccinated at 5 weeks compared to the group vaccinated at 3 weeks (groups V-3-A and V-3-B) at 11 weeks of age (6 weeks post-vaccination). The antibody titer in experimental pigs remained consistently elevated (PI=70-80%) until slaughter and did not peak during the post-vaccination observation period. These findings suggest that the inactivated Porcilis® Ileitis vaccine is highly safe and induces a rapid, strong, and enduring antibody response when administered to pigs at 3 and 5 weeks of age. Importantly, it achieves a high antibody level during the critical period when post-weaned pigs are most vulnerable to *Lawsonia intracellularis*.

**Keywords:** safety; antibodies; ileitis; pig

## TRANSMISSION, CLINICAL AND PATHOLOGIC CHARACTERISTICS IN SOW HERDS NATURALLY INFECTED WITH LOW VIRULENT AFRICAN SWINE FEVER VIRUS

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### Abstract

This study aimed to describe the characteristics and course of the outbreak at an industrial sow farm with a scale of 2,160 animals, infected with low virulence strain of African Swine Fever virus (ASFV) genotype II. Outstanding characteristics of transmission, clinical signs and lesions were monitored over a period of more than 2 months during the outbreak. Whole blood and internal organ tissue samples from sick pigs were collected for Realtime PCR (qPCR) testing, evaluating gross and microscopic lesions. The results showed that ASFV was present and transmitted subclinically for a period of time before the first clinical cases. The main clinical signs recorded in sows were loss of appetite, intermittent fever, miscarriage and stillbirth (about 20% of pregnant sows). Extensive multifocal necrosis of udder tissue was recorded in lactating sows, accounting for 5-6% of sows per farrowing week. The recorded mortality rate was quite low (<1%) and most cases recover after 3 to 5 days of illness. Lesions appear at mild to moderate levels, mainly on lymph nodes, spleen, lungs, and breast tissue. In addition, low viral load (Ct value >30) was common in blood (40%) and organ tissue (60%). Transmission, clinical signs and lesions in sows are characteristic of low virulence forms of ASFV. In the context of the circulation of low-virulence strains of ASFV gradually becoming more common, the results of the study are an important scientific basis to support veterinarian and technicians in early detection of the disease, to effectively control ASF.

**Keywords:** African Swine Fever; low virulence; sow; pathology; transmission

## EXPRESSION OF CONTRACTILE MARKER GENES IN CULTURED BOVINE UTERINE SMOOTH MUSCLE CELLS.

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### Abstract

In this study, we examined changes in the expression of contractile marker genes in uterine smooth muscle cells (USMCs) cultured on various types of ECMS *in vitro*.

USMCs were isolated from myometrial tissues classified 11-17 days after ovulation by enzymatical method (E-USMCs) and explant method (T-USMCs; migrating cells from the myometrium tissues were harvested). E-USMCs were passaged and gene expression of *OTR*, *MYH11*, *ACTA2*, and *SRF* were measured by qRT-PCR at each passage. T-USMCs were passaged under 1% Matrigel or 2% type I collagen coating conditions, and gene expression was measured in the same manner.

In E-USMC, *ACTA2* expression was significantly increased in the first passage (P1) ( $P<0.01$ ), while *OTR* and *MYH11* expression were significantly decreased in P1 ( $P<0.01$ ) and *SRF* expression showed a decreasing tendency in P1 ( $P=0.05$ ) compared to uncultured USMCs.

In T-USMC, *ACTA2* expression was upregulated in P2 regardless of coating ( $P<0.05$ ), and in P4 without coating and 2% type I collagen coating ( $P<0.05$ ), compared to USMCs in P0. In P6, *OTR*, *SRF*, and *ACTA2* expression significantly increased in the 1% Matrigel-coating ( $P<0.05$ ). There was no significant effect of ECM coating in the same passage.

These results suggested that gene expression patterns during *in vitro* culture were influenced by the cell harvest methods and passage. It was also shown that typeIcollagen coating does not affect contraction marker gene expression in T-USMCs, but Matrigel coating may result in a delay in the peak of some genes expression compared to without coating.

**Keywords:** uterine smooth muscle cell; contractile marker gene

## REPRODUCTIVE PERFORMANCE OF CROSSBRED BEEF HEIFERS AND COWS IN SMALLHOLDER PRODUCTION SYSTEM IN LONG AN PROVINCE, VIETNAM

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### Abstract

This study was conducted to assess the reproductive performance of crossbred beef heifers and cows in smallholder beef farms in Long An province, South Vietnam. A total of 207 Brahman x Laisind, Angus x Laisind and Charolais x Laisind crossbred beef cows (152) and heifers (55) from nine beef farms were observed. The overall means for age at first service, age at first conception and age at first calving of heifers were 609.4 days (20.3 months), 653.8 days (21.8 months) and 931 days (31 months), respectively. Average number of service per conception was 1.78 in average. The breed didn't have a significant effect on reproductive performance of heifers. The overall mean for waiting period, days open and calving interval of cows were 107.2, 165.7 and 450.4 days, respectively. The mean for number of service per conception of cows was 2.51. Breed, retained placenta and metritis significantly affected waiting period and calving interval. Dystocia, retained placenta and metritis significantly affected the number of service per conception of cows.

**Keywords:** Reproductive performance; crossbred beef cattle; Smallholder; Vietnam

**ANTIBACTERIAL ACTIVITY OF CHITOSAN MEMBRANE INCORPORATED  
WITH *EXCOECARIA COCHINCHINENSIS* LOUR EXTRACT ON  
*STAPHYLOCOCCUS AUREUS* AND *PSEUDOMONAS AERUGINOSA***

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**Abstract**

The study was carried out to evaluate the antibacterial activity of chitosan membrane (CH) incorporated with ethanolic extract of *Excoecaria cochinchinensis* extract (EC) on *Staphylococcus aureus* and *Pseudomonas aeruginosa*. The antibacterial activity of EC at various concentrations from 40 mg/mL to 200 mg/mL was tested by the Kirby-Bauer disk diffusion method. Inhibition zone was ranked from 19 mm to 23 mm for *S. aureus*, from 18 mm to 22 mm for *P. aeruginosa*, and from 17,67 mm to 23,67 mm for the mixture of *S. aureus* and *P. aeruginosa*. Determination of the Minimum Inhibitory Concentration (MIC) and Minimum Bactericidal Concentration (MBC) of EC on *S. aureus* was 1,25 mg/mL, and 10 mg/mL, respectively; 10 mg/mL, and 35 mg/mL for *P. aeruginosa*. Chitosan membrane incorporated with *Excoecaria cochinchinensis* extract (CH-EC) was light brown in color, and free of wrinkles and air bubbles. The bacterial inhibition zone of CH-EC was ranked from  $12,33 \pm 0,58$  mm for *S. aureus*;  $11,33 \pm 0,58$  mm for *P. aeruginosa* and  $11,33 \pm 0,58$  mm for the mixture of two bacteria. Evaluation of the antibacterial activity of CS-EC membrane over storage time at 4°C showed that the growth of *S. aureus* and *P. aeruginosa* were significantly inhibited. However, the antibacterial activity of CS-EC membrane decreased gradually with storage time for both *S. aureus* and *P. aeruginosa*.

**Keywords:** Antibacterial activity; chitosan; *Excoecaria cochinchinensis* Lour; *Staphylococcus aureus*; *Pseudomonas aeruginosa*

## **BLACK SOLDIER FLY (*HERMETIA ILLUCENS*) AS A TOOL TO IMPROVE ANIMAL FEED SUPPLY, ENVIRONMENTAL SAFETY, SUSTAINABILITY AND CIRCULAR ECONOMY IN VIETNAMESE RURAL DEVELOPMENT**

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### **Abstract**

Application of the black soldier fly larvae (BSFL) rearing technology based on the use to treat organic wastes presents a practical option for organic waste management by producing feed materials such as protein and fat content in the animal feed formulation, using BSFL manure as organic fertilizer for crop production, reducing methane mitigation by translating the low water use in the agricultural system, particularly in the circular economy in vietnamese rural development. Therefore, BSF organic wastes recycling is a sustainable and cost-effective process that promotes resource recovery, and generates valuable products, there by creating new economic opportunities for the industrial sector and entrepreneurs in rural areas, even urban where the waste could not solve or cost. Specifically, we debated the significance of BSFL in the recycling of almost the biowaste such as agricultural by-products, food waste in families...

Results shown that BSFL may consume a variety of wastes materials such as chicken and pig manures; oppositely, dairy and beef or goat and sheep manures are deficient in nutrients which might slow BSFL development. And so, the nutritional value of larval feeding substrates in many reports may be improved by mixing in nutrient-rich substrates like chicken manure, soya waste, fish waste, slaughter waste... Similarly, use the microbial fermentation in substrate may be used to digest waste, releasing nutrients that are needed for BSFL. The report also give the gaps and challenges on the direction to the efficient application of BSF for waste management and the commercialization of its by-products. More study have to going on not only research but also translating science to practice and policy.

**Keywords:** black soldier fly larvae; food or feed waste; manure; waste management

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