THE 3rd TRILATERAL SYMPOSIUM ON SUSTAINABILITY

STRATEGIES FOR CLIMATE ACTION AND MITIGATION OF CLIMATE CHANGE IMPACTS

27th – 29th AUGUST, 2024

CHIANG MAI UNIVERSITY

KAGAWA UNIVERSITY

THE 3rd TRILATERAL SYMPOSIUM ON SUSTAINABILITY

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Content

Message from The President of Chiang Mai University

Dear Esteemed Colleagues and Participants,

It is with great pleasure that I welcome you to the 3rd Trilateral Symposium, a collaborative effort between Chiang Mai University, Kagawa University, and National Chiayi University. This event marks another milestone in our joint commitment to academic excellence and international cooperation, which began with the signing of our Memorandum of Understanding in 2021.

Our journey together started amidst the challenges of the COVID-19 pandemic, with our first online symposium in 2021. We then progressed to an in-person event hosted by Kagawa University in 2023, focusing on new strategic approaches towards SDGs beyond the pandemic. This year, we are honored to host this significant gathering at Chiang Mai University.

The theme of our symposium, "Strategies for Climate Action and Mitigation of Climate Change Impacts," could not be more timely or crucial. As we face unprecedented global challenges, the collaboration between our institutions becomes ever more vital in developing innovative solutions and fostering a shared understanding of these critical issues.

Our symposium offers a diverse range of sessions, covering Health, Science and Technology, Food, Social issues, Tourism, Climate Action, and a special Student Session. This multidisciplinary approach reflects our commitment to addressing climate change and sustainability from various angles, recognizing the interconnected nature of these global challenges.

The primary aim of this collaboration is to build and strengthen research networks between our three universities. By bringing together our collective expertise and resources, we create a powerful platform for knowledge exchange, innovation, and the development of practical strategies to combat climate change and its impacts.

To our participants, I encourage you to engage fully in the discussions, share your insights, and seize this opportunity to form new collaborations. The challenges we face are significant, but so too is the potential of our combined efforts.

As we embark on this symposium, I am filled with optimism for the outcomes of our discussions and the future of our trilateral collaboration. May this event be productive, inspiring, and a stepping stone towards meaningful action in our shared goal of creating a more sustainable world.

I wish you all a successful and enriching symposium.

Professor Dr.Pongruk Sribanditmongkol, M.D.
President, Chiang Mai University

Message from The President of Kagawa University

It is my great pleasure to congratulate you on the opening of the CMU-KU-NCYU "The 3rd Trilateral Symposium on Sustainability: Strategies for Climate Action and Mitigation of Climate Change Impacts." I am delighted to see Chiang Mai University, National Chiayi University, and Kagawa University joining forces to address the urgent issue of sustainability through this important symposium.

Among the various challenges we face, climate change mitigation is undoubtedly one of the most critical issues. It is a global issue causing problems such as meteorological disasters and food shortages. At COP26 in the UK in November 2021, a global agreement was reached to strive towards limiting the average global temperature increase to 1.5 degrees Celsius. Japan has set a goal to achieve carbon neutrality by 2050, and regional empowerment is essential to achieving this target.

At Kagawa University, we consider climate change mitigation, particularly carbon neutrality, as an important policy and are promoting diverse initiatives to prevent further global warming by balancing greenhouse gas emissions with absorption and utilization. We are addressing challenges related to energy conservation, storage, and creation while also advancing various measures for climate change adaptation through research and study.

I am confident that this symposium will provide an excellent platform for experts and researchers from Thailand, Taiwan, and Japan to share their insights and discover innovative solutions for sustainability issues, including the "Climate Crisis Emergency." It is my sincere hope that the discussions and presentations over these three days will be fruitful and lead to concrete outcomes. Furthermore, I look forward to this symposium deepening the cooperative relationships among our three universities and serving as a foundation for future joint research and
educational exchanges.

Finally, I sincerely hope this symposium will succeed and wish you all continued success in your future endeavors.

Natsuo Ueda

Professor Dr.UEDA Natsuo, M.D.
President, Kagawa University

Message from The President of National Chiayi University

Sincere regards to our esteemed partners from Japan and Thailand. On behalf of National Chiayi University, I would like to extend our heartfelt gratitude to Chiang Mai University for the exceptional hospitality in hosting the 3rd Trilateral Symposium on SDGs from August 27th to 29th, 2024.

Climate action is imperative for addressing global change and securing a sustainable future. The UN's Sustainable Development Goals (SDGs) offer a comprehensive framework for tackling these challenges. Collaborations between educational institutions across Asia and globally are crucial. By sharing resources and knowledge, we can develop innovative solutions to issues in health, food security, social welfare, education, and overall human well-being. The partnership among Kagawa University, Chiang Mai University, and National Chiayi University has strengthened our rigorous research, promoted interdisciplinary exchanges, and supported sustainable practices aimed at building a climate-resilient and eco-friendly future.

National Chiayi University, represented by delegates from seven colleges, including the Teachers College, College of Humanities and Arts, College of Management, College of Agriculture, College of Science and Engineering, College of Life Sciences, and College of Veterinary Medicine, is honored to be part of this Trilateral Symposium on SDGs in Chiang Mai, Thailand. We hope to share and collaborate with you on this significant occasion.

As researchers, educators, and global citizens, it is our duty to foster a sustainable environment and future for humanity and the next generation. This symposium serves as an excellent platform for us to make this vision a reality. I congratulate everyone on the success of the 2024 Trilateral Symposium and anticipate strengthening our partnership and cooperation through this event. We look forward to seeing this collaboration continue to grow and deepen. The next symposium will be held in Chiayi, Taiwan in 2026, and we eagerly anticipate welcoming you all in Chiayi, Taiwan.

Professor Dr.Lin, Han-Chien
President, National Chiayi University

Symposium Report from The Vice President of Chiang Mai University

President of Chiang Mai University (CMU), Professor Dr.Pongruk Sribanditmongkol,
President of Kagawa University (KU), Professor Dr.Natsuo Ueda,
Trustee of KU, Professor Dr.Kazuya Akimitsu,
Advisor to the President of KU, Professor Dr. Masaaki Tokuda,
Vice President of National Chiayi University (NCYU), Professor Dr.Chun-Hsien Chang

Distinguished Participants, Ladies and Gentlemen,

On behalf of Chiang Mai University, it is my great honor to welcome our esteemed colleagues from Kagawa University and National Chiayi University to this trilateral symposium.

Our collaboration with Kagawa University, initiated in 2008, has been instrumental in fostering academic and research exchange. We expanded this partnership to include National Chiayi University in 2022, aiming to further strengthen our collective impact.

This symposium serves as a platform for not only sharing research findings but also cultivating a collaborative ecosystem of partnerships among our Universities. By focusing on strategies for climate action and mitigation across seven key areas, namely,

- Health Session
- Science and Technology Session
- Food Session
- Social Session
- Tourism Session
- Climate Action Session, and
- Student Session

In this regards, we hope to generate innovative solutions and drive meaningful changes by allowing the participants either academic staffs or students to exchange their knowledges, improve critical thinking, and create fruitful partnerships. These partnerships can be multifaceted and eventually yield the desired results including joint research works, joint publications to enhance scholarly outputs and respective citations, as well as searching of joint international funding. In fact, the most important of all are our long lasting and treasured friendships.

The symposium attracted almost 200 participants from three Universities; 68 participants from Kagawa University, 50 participants from National Chaiyi University, and 80 participants from Chiang Mai University.

Eight Faculties and two Research Institutes of Chiang Mai University form the organization committee which help facilitating this event including Faculty of Agro-Industry, Faculty of Mass Communication, Faculty of Political Science and Public Administration, Faculty of Public Health, Faculty of Social Sciences, Faculty of Science, Faculty of Humanities, Faculty of Economics, Research Institute of Health Sciences, and MultiDisciplinary Research Institute.

The activities on the first day of this Symposium consists of Keynote Lecture from each University, namely,

Professor Dr.Toru Terao from Faculty of Education, Kagawa University on the topic of "Status of Asian Climate Change and Climate Actions in Asian Universities"

Professor Dr.Wen-Lii Huang from College of Agriculture, NCYU on the topic of "Establishment of an Integrated Low-Carbon Footprint Production System in Rice"

Associate Professor Dr.Sirichai Koonaphapdeelert, Director of Research and Development Institute Nakornping from CMU on the topic of "Chiang Mai University: Towards Carbon Neutrality"

This activity will then be followed by a Poster Session with 8 academic staffs and 24 students presenting their works which will be run in parallel with three student Oral Presentation Sessions on the topics of "Agriculture" with 7 students participating, "Chemistry and Engineering" with 5 students, as well as "Education, Law, Mass Communication, Digital Innovation" with 10 students. Therefore, an impressive total number of 46 students from three Universities will be participating on both oral and poster presentation sessions. Three best poster and three best oral presentation awards will be granted to the presenters based on the assessment by selected experts in the relevant fields. In addition, some concessions in registration fee or waivers are also given to selected students who perform in the oral presentation.

On the second day, the symposium featured academic activities organized in collaboration with seven CMU units which act as hosts. These include

- Senior Wellness Center (SWC)
- Materials Science Research Center (MSRC)
- Science and Technology Park (STeP)
- Faculty of Agro-Industry (FAI)
- Center for the Promotion of Art Culture and Creative Lanna (ACCL)
- Energy Research and Development Institute-Nakornping (ERDI)
- Lanna Rice Research Center (LRRC), and
- MultiDisciplinary Research Institute (MDRI)

The second day of the symposium has been structured to facilitate engagement of participants in each session using the conducive on - site environment allowing for effective networking and efficient knowledge exchange.

I would like to express my appreciation to the organizing committee as well as sub-committees for their tireless efforts, spending many work - hours in meetings and coordinating, as well as all superb arrangements to make this symposium happens.

I am confident that this symposium will foster new collaborations, deepen our friendships, and strengthen academic ties among our three Universities.

Without further ado, it is my pleasure to welcome the President and Vice President of each University who will deliver the opening addresses.

Winita Punyodom

Associate Professor Dr.Winita Punyodom
Vice President, Chiang Mai University

Session Coordinators
Chiang Mai University

1. Health Session
CMU Chair: Associate Professor Kriengkrai Srithanaviboonchai, M.D. M.P.H.
Research Institute of Health Sciences
E-mail: kriengkrai.s@cmu.ac.th

2. Science and Technology Session
CMU Chair: Assistant Professor Dr.Chaiyasit Banjongprasert
Faculty of Science
E-mail: chaiyasit.b@cmu.ac.th
CMU Chair: Associate Professor Dr.Ukrit Mankong
Faculty of Engineering
Email: ukrit.m@cmu.ac.th

3. Food Session
CMU Chair: Associate Professor Dr.Yuthana Phimolsiripol
Faculty of Agro-Industry
E-mail: yuthana.p@cmu.ac.th

4. Social Session
CMU Chair: Associate Professor Dr.Pornchai Wisuttisak
Faculty of Law
E-mail: pornchai.w@cmu.ac.th

5. Tourism Session
CMU Chair: Assistant Professor Dr.Pairach Piboonrungroj
Faculty of Economics
E-mail: pairach.p@cmu.ac.th

6. Climate Action Session
CMU Chair: Associate Professor Dr.Apinpus Rujiwatra
Faculty of Science
E-mail: apinpus.rujiwatra@cmu.ac.th

7. Student Session
CMU Chair: Assistant Professor Dr.Worakanya Buranaphatthana, D.D.S.
Faculty of Dentistry
E-mail: worakanya.b@cmu.ac.th

Session Coordinators
Kagawa University

1. Health Session
KU Chair: Associate Professor Dr.UYAMA Toru
Faculty of Medicine
E-mail: uyama.toru@kagawa-u.ac.jp

2. Science and Technology Session
KU Chair: Professor Dr.HIRAMI Naotaka
Faculty of Engineering and Design
E-mail: hirami.naotaka@kagawa-u.ac.jp

3. Food Session
KU Chair: Professor Dr.NOMURA Mika
Faculty of Agriculture
E-mail: nomura.mika@kagawa-u.ac.jp

4. Social Session
KU Chair: Professor Dr.TAKAGI Yumiko
Faculty of Education
E-mail: takagi.yumiko@kagawa-u.ac.jp

5. Tourism Session
KU Chair: Associate Professor Dr.FUTATSUYAMA Tatsuro
Faculty of Economics
E-mail: futatsuyama.tatsuro@kagawa-u.ac.jp

6. Climate Action Session
KU Chair: Professor Dr.TERAO Toru
Faculty of Education
E-mail: terao.toru@kagawa-u.ac.jp

7. Student Session
KU Chair: Associate Professor TAKAMIZU Toru
International Student Center
E-mail: takamizu.toru@kagawa-u.ac.jp

Session Coordinators
National Chiayi University (NCYU)

1. Health Session
NCYU Chair: Professor Dr.Chang, Hsin-I
Department of Biochemical Science and Technology, College of Life Sciences
E-mail: hchang@mail.ncyu.edu.tw

2. Science and Technology Session
NCYU Chair: Professor Dr.Su, Chiung-Wu
Department of Electrophysics, College of Science and Engineering
E-mail: cwsu@mail.ncyu.edu.tw

3. Food Session
NCYU Chair: Assistant Professor Dr.Wang, Hsiao-Wen
Department of Horticultural Science, College of Agriculture
E-mail: hswwang@mail.ncyu.edu.tw

4. Social Session
NCYU Chair: Associate Professor Dr.Lai, Meng-Lung
Department of Early Childhood Education, Teachers College
E-mail: menglung@gmail.com

5. Tourism Session
NCYU Chair: Associate Professor Dr.Chang, Shu-Yun
Department of Marketing of Tourism management, College of Management
E-mail: emily@mail.ncyu.edu.tw

6. Climate Action Session
NCYU Chair: Associate Professor Dr.Chiou, Show-Jen
Department of Applied Chemistry, College of Science and Engineering
E-mail: genechiou@mail.ncyu.edu.tw

7. Student Session
NCYU Chair: Professor Dr.Yang, Cheng-Cheng
Department of Education, Teachers College
E-mail: yccjason@mail.ncyu.edu.tw

THE 3rd TRILATERAL SYMPOSIUM on Sustainability
(Strategies for Climate Action and Mitigation of Climate Change Impacts)

August 27th, 2024 (Day 1): Kantary Hills Hotel

11:30 AM – 12:00 PM	**Registration** Doi Luang & Doi Nang Room
12:00 PM – 01:00 PM	**Lunch** Nimman Bar and Grill & Party Room

Opening Ceremony & Keynote Lecture:

01:00 PM – 01:40 PM	**Open** Ceremony
01:00 PM – 01:10 PM	**Symposium Report by The Vice-President of CMU** Assoc. Prof. Dr.Winita Punyodom
01:10 PM – 01:20 PM	**Opening Address by The President of KU** Prof. Dr.Natsuo Ueda, M.D.
01:20 PM – 01:30 PM	**Opening Address by The Vice-President of NCYU** Prof. Dr.Chun-Hsien Chang
01:30 PM – 01:40 PM	**Opening Address by The President of CMU** Prof. Dr.Pongruk Sribanditmongkol, M.D.

Opening Ceremony & Keynote Lecture:
Doi Luang & Doi Nang Room (2nd Floor)
MC: Lect. Dr.Pornchanok Ruengvirayudh

01:40 PM – 02:10 PM	**Keynote Lecture 1: Prof. Dr.Toru Terao, Faculty of Education, KU** Title: "Status of Asian Climate Change and Climate Actions in Asian Universities"(What is Occurring in Asia, and What Shall We Do?)
02:10 PM – 02:40 PM	**Keynote Lecture 2: Prof. Dr.Wen-Lii Huang, College of Agriculture, NCYU** Title: Establishment of an Integrated Low-carbon Footprint Production System in Rice
02:40 PM – 03:10 PM	**Keynote Lecture 3: Assoc. Prof. Dr.Sirichai Koonaphapdeelert, Energy Research and Development Institute-Nakornping, CMU** Title: Chiang Mai University: Towards Carbon Neutrality

Poster Session (Student and Non-student):
Front Area of Doi Luang & Doi Nang Room (2nd Floor)

03:10 PM – 04:30 PM	**Poster Presentation (to be run in parallel with oral sessions)** (Break served during the session)

THE 3rd TRILATERAL SYMPOSIUM on Sustainability
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Student Oral Presentation Room 1: Agriculture (7)
Doi Luang (2nd Floor)
Chair: Assistant Professor Dr.Pennapa Jaksomsak (CMU)
Co-chair: Dr.Jakchaiwat Kaweewong (CMU)

03:30 PM – 03:45 PM	Effect of ferritin on nitrogen fixation and growth of *Lotus japonicus* inoculated with *Mesorhizobium loti* and grown under nitrogen-free conditions. by **Ms.Michelle BAFEO (KU)**
03:45 PM – 04:00 PM	Effect of high temperature on flower coloration and pigmentation in *Ranunculus* 'Koharu Temari'. by **Ms.Yuna KITAMURA (KU)**
04:00 PM – 04:15 PM	Role of cysteinyl-tRNA synthetase in root nodule symbiosis. by **Ms.Asuka IKUTA (KU)**
04:15 PM – 04:30 PM	Mating pattern and ecology of diving beetle *(Eretes griseus)*. by **Mr.Seita TAKEUCHI (KU)**
04:30 PM – 04:45 PM	Thermal behavior of salt-soluble proteins recovered from cricket muscle. by **Mr.Takeru FUJITA (KU)**
04:45 PM – 05:00 PM	Analysis of the chemical composition and molecular structure of grains from different rice varieties, and the quality changes during the Storage. by **Mr.Chih-Wei Chu (NCYU)**
05:00 PM – 05:15 PM	Inheritance pattern and high-throughput phenotyping of flower color in periwinkle (Catharanthus roseus). by **Mr.Ting Hsuan Huang (NCYU)**

Student Oral Presentation Room 2: Chemistry and Engineering (5)
Doi Suthep 1 & 2 Room (1st Floor)
Chair: Professor Dr.Yang Cheng-Cheng (NCYU)
Co-chair: Associate Professor Dr.Ukrit Mankong (CMU)

03:30 PM – 03:45 PM	A novel physical technique to enhance the stability of starch gels against retrogradation using ultra-fine bubbles. by **Mr.Kazuki SHIRAYAMA (KU)**
03:45 PM – 04:00 PM	Effect of the rare sugar D-allulose on the texture properties of sourdough bread. by **Ms.Haoto KAWABE (KU)**
04:00 PM – 04:15 PM	Downregulation of XRCC3 expression enhances EGCG induced cytotoxicity and growth inhibition in nonsmall lung adenocarcinoma A549 cells. by **Ms.Pei-Jung Chen (NCYU)**
04:15 PM – 04:30 PM	Synthesis and Application of Pyrene Derivatives with α-Ketoamide: Roussin's Red Ester as Nitric Oxide Donors. by **Mr.Yu-Chi Liu (NCYU)**
04:30 PM – 04:45 PM	An accurate mango fruit maturity feature estimation using 3D photogrammetry technique. by **Mr.Yu-Jen Shiau (NCYU)**

THE 3rd TRILATERAL SYMPOSIUM on Sustainability
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Student Oral Presentation Room 3: Education, Law, Mass Communication, Digital Innovation (10)
Doi Nang Room (2nd Floor)
Chair: Associate Professor TAKAMIZU Toru (KU)
Co-chair: Assistant Professor Dr.Worakanya Buranaphatthana, D.D.S. (CMU)

03:30 PM – 03:45 PM	The role of primary and secondary education in understanding hansen's disease. by **Ms.Kaho SHIRAKAWA (KU)**
03:45 PM – 04:00 PM	Background and resources for special education students in rural areas in Taiwan. by **Ms.Yi Chia Wu (NCYU)**
04:00 PM – 04:15 PM	The present situation and strategies of special education teachers in rural areas in Taiwan. by **Ms.Pei-chin Hsueh (NCYU)**
04:15 PM – 04:30 PM	Promoting peace and justice: A comparative analysis of legal systems in Japan and Thailand. by **Ms.Sakura SUGIMURA (KU)**
04:30 PM – 04:45 PM	Connecting policies to people: How Thai government policy goes viral on TikTok through storytelling. by **Ms.Katesinee Rattanaphan (CMU)**
04:45 PM – 05:00 PM	MONKWELL: Empowering Monks Through Line Official Account as a Personal Health Diary for Enhanced Health Literacy on Non-Communicable Disease (NCD) Prevention. by **Ms.Nutchaya Worapanyasakulchai (CMU)**
05:00 PM – 05:15 PM	Tha Phae Gate Ice Cream: Promoting Northern Thai Culinary Heritage through 3D Printed Technology. by **Ms.Khao Marukapitak (CMU)**
05:15 PM – 05:30 PM	LARY: Prototype for Developing an Application to Detect Voice Quality. by **Ms.Kornkamol liebsuetragul (CMU)**
05:30 PM – 05:45 PM	Storeon: Empowering Student Creativity through a Virtual Showcase and Business Hub. by **Ms.Witchavee Noinivorn (CMU)**
05:45 PM – 06:00 PM	Video Games and Sustainability: Minecraft as a Platform for Education Using Minecraft as a Low Code Engagement Tool for the Youth in Teaching SDGs. by **Mr.Chanchai Chan (CMU)**

THE 3rd TRILATERAL SYMPOSIUM on Sustainability
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August 27th, 2024 (Day 1): Kantary Hills Hotel

Welcome Party:
Doi Suthep 1 & Doi Suthep 2 (1st Floor)
MC: Lect. Dr.Pornchanok Ruengvirayudh

06:30 PM – 08:40 PM	**- Welcome remark (CMU)**
	- Toast remark (NCYU&KU)
	- Khan Dok Dance
	- CMU Student Performance Show
	- Northern Fans Dance
	- KU Traditional Japanese Song and Dance: The Faculties of Law and Economics will sing "Furusato," a Japanese ballad that evokes nostalgia of a more traditional time, while the Faculty of Agriculture will perform "Soran Bushi", a lively dance of the fishermen and the sea.
	- Thai Folk Dance
	- NCYU Student Performance Show

THE 3rd TRILATERAL SYMPOSIUM on Sustainability
(Strategies for Climate Action and Mitigation of Climate Change Impacts)

August 28th, 2024 (Day 2): Break-out Sessions
(Each session has its own dependent schedule and is available in separate tables)

Session 1: Health Session
Host: Senior Wellness Center (SWC), Research Institute for Health Sciences (RIHES)
Venue: SWC

Chairs	Assoc. Prof. Dr.Kriengkrai Srithanaviboonchai, M.D. M.P.H (CMU)
	Assoc. Prof. Dr.Uyama Toru (KU)
	Prof. Dr.Chang Hsin-I (NCYU)

Session 2: Science and Technology Session
Host: Materials Science Research Center, Science and Technology Park (STeP)
Venue: Exhibition Hall, RSP North Building, STeP

Chairs	Asst. Prof. Dr.Chaiyasit Banjongprasert (CMU)
	Prof. Dr.Hirami Naotaka (KU)
	Prof. Dr.Su Chiung-Wu (NCYU)

Session 3: Food Session
Host: Faculty of Agro-Industry
Venue: Faculty of Agro-Industry

Chairs	Assoc. Prof. Dr.Yuthana Phimolsiripol (CMU)
	Prof. Dr.Nomura Mika (KU)
	Asst. Prof. Dr.Wang Hsiao-Wen (NCYU)

Session 4: Social Session
Host: Chiang Mai University
Venues: Chiang Mai Housing Museum

Chairs	Assoc. Prof. Dr.Pornchai Wisuttisak (CMU)
	Prof. Dr.Takagi Yumiko (KU)
	Assoc. Prof. Dr.Lai Meng-Lung (NCYU)

THE 3rd TRILATERAL SYMPOSIUM on Sustainability
(Strategies for Climate Action and Mitigation of Climate Change Impacts)

August 28th, 2024 (Day 2): Break-out Sessions
(Each session has its own dependent schedule and is available in separate tables)

Session 5: Tourism Session
Host: Center for the Promotion of Art Culture and Creative Lanna (ACCL)
Venues: ACCL, Queen Sirikit Botanic Garden (QSBC), Jirung Health Village

Chairs	Asst. Prof. Dr.Pairach Piboonrungroj (CMU)
	Assoc. Prof. Dr.Futatsuyama Tatsuro (KU)
	Assoc. Prof. Dr.Chang Shu-Yun (NCYU)

Session 6: Climate Action Session
Host: Energy Research and Development Institute Nakornping (ERDI), Lanna Rice Research Center (LRRC)
Venues: ERDI, LRRC

Chairs	Prof. Dr.Chanakan Prom-u-thai (CMU), Assoc. Prof. Dr.Sirichai Koonaphapdeelert (CMU), Assoc. Prof. Dr.Apinpus Rujiwatra (CMU), Asst. Prof. Dr.Pruk Aggarangsi (CMU)
	Prof. Dr.Terao Toru (KU)
	Assoc. Prof. Dr.Chiou Show-Jen (NCYU)

Session 7: Student Session
Host: Multidisciplinary and Interdisciplinary School, Faculty of Engineering, International Relations Division
Venues: CMU Main Campus, Kaomai Lanna Hotel and Resort

	Assist. Prof. Dr.Worakanya Buranaphatthana (CMU)
Chairs	Assoc. Prof. TAKAMIZU Toru (KU)
	Prof. Dr.Yang Cheng-Cheng (NCYU)

THE 3rd TRILATERAL SYMPOSIUM on Sustainability
(Strategies for Climate Action and Mitigation of Climate Change Impacts)

August 29th, 2024 (Day 3): Kantary Hills Hotel	
08:30 AM – 09:00 AM	**Registration** Doi Luang & Doi Nang Room
Concluding Session: **Doi Luang & Doi Nang (2nd Floor)** **MC: Lect. Dr.Pornchanok Ruengvirayudh**	
09:00 AM – 10:45 AM	**Lesson learned from break-out sessions & discussion** **Session 1: Health Session** **Session 2: Science and Technology Session** **Session 3: Food Session** **Session 4: Social Session** **Session 5: Tourism Session** **Session 6: Climate Action Session** **Session 7: Student Session**
10:45 AM – 11:00 AM	**Break**
11:00 AM – 11:30 AM	**Announcement of Students' Poster and Oral Presentation Awards** Up to 3 (Three) Best Poster Presenter Awards and up to 3 (Three) Best Oral Presenter Awards (Total of 6 (Six) Awards) will be granted to the presenters based on the assessment by selected experts in the relevant fields
Symposium Closing Ceremony	
11:30 AM – 11:40 AM	**Closing Address by The President of KU** **Prof. Dr.Natsuo Ueda, M.D.**
11:40 AM – 11:50 AM	**Closing Address by The Vice-President of NCYU** **Prof. Dr.Chun-Hsien Chang**
11:50 AM – 12:00 PM	**Closing Address by The President of CMU** **Prof. Dr.Pongruk Sribanditmongkol, M.D.**
12:00 PM – 01:00 PM	**Lunch**

Note: CMU will arrange transportation during your stay at symposium.

The certificate of appreciation for participating of all participants could be downloaded digitally from the following QR Code after Closing Ceremony →

Your comments on Symposium Organization are valuable for us, please help us improve by filling the evaluation form at →

AUGUST 28th, 2024 (DAY 2): BREAK-OUT SESSIONS

HEALTH SESSION

Activity Program

Environmental health and elderly health for sustainability development

Morning Activity

There will be 9 oral presentations, 3 from each university. The presentation will be divided into 2 session. The first session comprises 4 oral presentations related to environmental health and the second session comprises 5 oral presentations related to ageing.

Location: Meeting room at SWC

Time	Activities
08:30 AM – 09:00 AM	Pick up at Kantary Hills Hotel
09:00 AM – 09:15 AM	Opening, orientation of the oral sessions, and housekeeping messages **Dr.Kriengkrai Srithanaviboonchai, CMU**
09:15 AM – 10:15 AM	1st oral session Chair: **Dr.Toru Uyama; Co-Chair Dr.Hiromi Suzuki, KU**
09:15 AM – 09:30 AM	Invasive animals and their parasites: connecting Taiwan to the world: **Dr.Hsuan-Wien Chen,** **Department of Biological Resources, NCYU**
09:30 AM – 09:45 AM	Knowledge, awareness, and perception of local villagers in high seasonal pollution area in Northern Thailand: **Dr.Linda Aurpibul,** **Research Institute for Health Sciences, CMU**
09:45 AM – 10:00 AM	Dermal lipogenesis inhibits Adiponectin production in human dermal fibroblasts while exogenous Adiponectin administration could prevent UVA-induced cutaneous photoaging: **Dr.Hsin-I Chang,** **Department of Biochemical Science and Technology, NCYU**
10:00 AM – 10:15 AM	Assessment of the annual acute number of patients with pharyngitis disease attributable to ambient $PM_{2.5}$ in Northern Thailand: **Ms.Pakaphorn Ngamsang** **Research Institute for Health Sciences, CMU**
10:15 AM – 10:45 AM	Break

HEALTH SESSION

Time	Activities
10:45 AM – 12:00 PM	2nd oral session Chair: **Dr.Hsin-I Chang, NCYU**
10:45 AM – 11:00 AM	Air pollution exposure and age-related macular degeneration: **Dr.Shun-Ping Huang, Department of Biochemical Science and Technology, NCYU**
11:00 AM – 11:15 AM	Role of blood coagulation system and Proteinase-activated Receptor 1 in aging: **Dr.Katsuya Hirano, Faculty of Medicine, KU**
11:15 AM – 11:30 AM	Analysis of physiological functions of phospholipid-metabolizing PLAAT enzymes using their knockout mice: **Dr.Sumire Sasaki, Faculty of Medicine, KU**
11:30 AM – 11:45 AM	The association between choline intake and fibrosis among U.S. adults with metabolic dysfunction-associated steatotic liver disease: results from 2017 - 2020 NHANES: **Dr.Siraphat Taesuwan, Faculty of Agro-Industry, CMU**
11:45 AM – 12:00 PM	Therapeutic assessment of chronic pain: A case study: **Dr.Tadayuki Hashimoto, Faculty of Medicine, KU**

HEALTH SESSION

Afternoon Activity

The afternoon activities will be organized by SWC. These include SWC facilities tour and parallel group activities in which each participant select to participate from the following 3 activities: Thai Traditional Massage, Thai Hermit Traditional Exercise, and Healthy Knee. Health precautions of each activity have been informed to the participants. The activities will be guided and supervised by the physical therapists of SWC.

Location: SWC facilities

Time	Activities
01:30 PM – 03:45 PM	SWC activities
01:30 PM – 01:45 PM	Welcome message and overview of SWC: **Dr.Chaiwat Bamrungkit, Director of SWC**
01:45 PM – 02:15 PM	Tour of SWC facilities: **Ms.Sirapeach Ruxmanee, Mr.Chalermwongkorn Pingpittayakul**
02:15 PM – 03:45 PM	Parallel group activities (pre-select 1 activity by each participant) 1. Thai Traditional Massage (5 people) **Ms.Thananya Utsom, Ms.Pichamon Chaiwong** 2. Thai Hermit Traditional Exercise (5 people) **Ms.Hatthamanee Phumas** 3. Healthy Knee (2 people) **Mr.Ayuwat Mondech**
03:45 PM – 06:00 PM	Tour of Chiang Mai's sights
06:00 PM – 08:00 PM	Dinner at Parc Thai Eatery

Dinner: Parc Thai Eatery

SCIENCE AND TECHNOLOGY SESSION

Activity Program

The Regional Challenges and Opportunities of Sustainable Science and Technology

Morning Activity

Oral Presentation: By Staff and Students from CMU (2 pax), KU (4 pax) and NCYU (3 pax)

Locations: Exhibition Hall, RSP North Building, STeP

Time	Activities
Room 1:	**Exhibition Hall**
09:15 AM – 09:30 AM	Enhancing Carboxymethyl Chitosan Film Properties through High Substitution Synthesis: The Role of Particle Size Dependency. by **Dr.Sarinthip Thanakkasaranee: CMU**
09:30 AM – 09:45 AM	Novel phosphor materials for next-generation white LEDs or full-color-afterglow indicators. by **Prof. Dr.Hayato Miyagawa: KU**
09:45 AM – 10:00 AM	A Machine Learning Based Estimation of the Proportion of Anthracnose on mango fruit surfaces - Using 2D and flatten Mango Images as Training Set. by **Prof. Roy Chaoming Hsu: NCYU**
10:00 AM – 10:15 AM	CM Water Forecast Mobile Application Version 1.0 by **Asst. Prof. Dr.Tawee Chaipimonplin: CMU**
10:15 AM – 10:30 AM	Development of supported iridium catalysts for the green synthesis of N-containing chemicals. by **Prof. Dr.Kenji Wada: KU**
10:30 AM – 10:45 AM	Refreshment Break
10:45 AM – 11:00 AM	Deep Research of Wind Power Techniques and Ocean Wave-Driven Electricity Generation for Promoting Advanced Science Education. by **Prof. Chiung-Wu Su: NCYU**
11:00 AM – 11:15 AM	Design Support Technique for Industrial Equipment to Reduce Environmental Impact. by **Mr.So Fukuhara: KU**
11:15 AM – 11:30 AM	Wind in digital: anemometer data analysis. by **Asst. Prof. Dr.Yusi Shih: NCYU**
11:30 AM – 11:45 AM	Maintenance Technology for Extending the Lifespan of Highways to Promote Sustainable Infrastructure (Reproduction of Damaged Concrete in Computer Simulation) by **Mr.Hyuta Ki: KU**
11:45 AM – 13:00 PM	Lunch

Remark: The program is subjected to change as appropriate.

SCIENCE AND TECHNOLOGY SESSION

Afternoon Activity

Locations: RSP North Building, STeP

Time	Activities
01:00 PM – 01:30 PM	"Regional Challenges and Opportunities in Sustainable Science and Technology Futures" by **Assoc. Prof. Dr.Pitiwat Wattanachai**
01:30 PM – 04:00 PM	Technical Visit (STeP): Group 1: FoodFabr / ABPlas / CIMO / FABLAB / INNO Store Group 2: FABLAB / CIMO / ABPlas / FoodFabr / INNO Store
04:00 PM – 04:20 PM	Refreshment Break
04:30 PM – 04:50 PM	Travel from RSP North Building to hotel by van
05:00 PM – 06:00 PM	Preparing for dinner
06:30 PM – 08:00 PM	Dinner at Thajene Chomchan Seafood restaurant

Remark: The program is subjected to change as appropriate.

Dinner: Thajene Chomchan Seafood restaurant

FOOD SESSION

Activity Program

Research Sharing in Food Session and Workshop: When Science Meets Creative Foods

Morning Activity

Locations: Meeting Room 4, Faculty of Agro-Industry, Chiang Mai University

Time	Activities		
Room: Meeting Room 4, Faculty of Agro-Industry, Chiang Mai University			
09:00 AM – 09:15 AM	**Welcome speech and greeting from Chiang Mai University (CMU), Kagawa University (KU) and National Chiayi University (NCU)** 1. Assoc. Prof. Dr.Yuthana Phimolsiripol (CMU) 2. Prof. Dr.Mika Nomura (KU) 3. Asst. Prof. Dr.Hsiao-Wen Wang (NCYU)		
	Topic	**Speaker**	**Chair/ Co-chair**
09:15 AM – 09:30 AM	Advancing the texture and functionality of plant-based meat: Investigating the synergistic effects of gluten quality, quantity, and food additives on cereal-based protein structures through innovative material engineering techniques	Asst. Prof. Dr.Pavalee Chompoorat Tridtitanakiat (CMU)	**Chair:** Asst. Prof. Dr.Chun-Chi Chen (NCYU) **Co-chair:** Dr.Kridsada Unban (CMU)
09:30 AM – 09:45 AM	How to improve crop productivity for sustainable agriculture	Prof. Dr.Mika Nomura (KU)	
09:45 AM – 10:00 AM	Effect of harvest maturity on passion fruits quality	Asst. Prof. Dr.Hsiao-Wen Wang (NCYU)	
10:10 AM – 10:15 AM	Combinatorial effects of longan peel extract and food additives on oxidative stability of edible oils	Asst. Prof. Dr.Kanyasiri Rakariyatham (CMU)	
10:15 AM – 10:30 AM	Primary resin acids are involved in amber color formation of aged pine fatwood woodwork	Prof. Dr.Toshisada Suzuki (KU)	
10:30 AM – 10:45 AM	Break and networking		

FOOD SESSION

Time	Activities		
Room: Meeting Room 4, Faculty of Agro-Industry, Chiang Mai University			
	Topic	**Speaker**	**Chair/ Co-chair**
10:45 AM – 11:00 AM	*Saccharomyces* isolated from traditional fermented tea (Miang) and its feasible applications	Dr.Kridsada Unban (CMU)	**Chair:** Prof. Dr.Mika Nomura (KU)
11:00 AM – 11:15 AM	AI system image analysis to detect strawberry fruit development	Mr.Seigo Miya (KU)	**Co-chair:** Asst. Prof. Dr.Kanyasiri Rakariyatham (CMU)
11:15 AM – 11:30 AM	Proteomic analysis of *Mesona chinensis* polysaccharides-induced aggregation of milk proteins	Asst. Prof. Dr.Chun-Chi Chen (NCYU)	
11:30 AM – 11:45 AM	Enhancing functionality of whey protein concentrate (WPC) with galacto-oligosaccharide (GOS) via the Maillard reaction	Ms.Nareekan Chaiwong (CMU)	
11:45 AM – 12:00 PM	Selenium biotransformation and bioactivity of polysaccharide extraction from *Pleurotus ostreatus*	W.M.P.B.K. Warnasooriya (CMU)	
12:00 PM – 12:15 PM	Unlocking academic opportunities: Navigating study paths at the Faculty of Agriculture for international scholars & students	Prof. Dr.Peter Lutes (KU)	

Remarks: The program is subjected to change as appropriate.
The presentation will be 10-12 min and Q&A for 3-5 min

FOOD SESSION

Afternoon Activity

Locations: Future Food Lab, Food Innovation and Packaging Center (FIN), Faculty of Agro-Industry

Time	Activities
01:00 PM – 01:15 PM	Registration for the event "When Science Meets Creative Foods"
01:15 PM – 02:15 PM	Demonstration and Hands-on Activity to create "Bouillabaisse de Chiang Mai" by **Mr.Pathapee Moonkonkaew, Chef and owner of L'éléphant.** Inspiration for creating Local to Global menu: French-style fish stew featuring seasonal fish, prawns, Chom Thong black-red native chicken, and Chiang Mai purple rice.
02:15 PM – 03:30 PM	Workshop: Local Food Creation
03:30 PM – 04:30 PM	Chef Special taste: Pairing food with beverage
04:30 PM – 05:00 PM	Discussion in Topic "The Science behind fusion cuisine: Bouillabaisse de Chiang Mai" by **Dr.Shitapan Bai-Ngew and Dr.Ponjan Walter, Lecturers of Faculty of Agro-Industry, Chiang Mai University** • The culinary chemistry and the reaction behind "Bouillabaisse de Chiang Mai" • Local ingredients meet Global technique • The convergence of science and gastronomy
05:00 PM – 05:30 PM	Leisure time on Mae-Hia campus, Leave to the Restaurant
05:30 PM – 08:00 PM	Dinner at The View Village

Remark: The program is subjected to change as appropriate.

Dinner: The View Village

SOCIAL SESSION

Activity Program
Social and Cultural Inclusion and Community Understanding in Northern of Thailand

Oral Presentation Program
- The presentation will be a virtual presentation with cultural field trips.
- The presentation will be broadcast for participants to look up on 28 August 2024

Presenters from National Chiayi University
Voluntary Service Abroad To Promote Education Quality. **Kuo-Hung Huang (NCYU)**, Department of E-learning Design and Management.
Bringing down Urban-Rural Walls: A Preliminary Investigation of Visiting Teachers Program in Taiwan. **Chun-Wen Lin (NCYU)**
Policies and Their Implementations for Rural Education in Taiwan Department of Early Childhood Education. **Meng-Lung Lai (NCYU)**
Presenters from Kagawa University
Management of local industrial clusters in the globally competitive environment: A case study of the glove-related industry in Shikoku. **Atsushi Taira, Faculty of Education (KU)**
University Entrance Examinations in New Zealand and Japan:A Contrast in Two Sustainable Testing Systems. **Paul Batten, Department of English (KU)**
Research on the possibility of sustainable art materials for the Takamatsu City Artists Dispatch, Faculty of Education. **Nobuko Yoshikawa (KU)**
Development of an ICT system using AI to encourage spontaneous activity in people with severe and multiple disabilities. **Eiichi Miyazaki and Satoshi Sakai (KU)**
Taiwan-Japan Comparison of Pedagogical Photo Documentation in Early Childhood Education and Care. **Hiroo Matsumoto, Gota Matsui, Ching-Ching Cheng, and Kuohung Huang, (KU), (NCYU)**
Presenters from Chiang Mai University
Interagency Working Group for Consistent Labour Protection Act Enforcement for Unprotected Migrant Workers Faculty of Humanities. **Songphan Tantrakul & Warangkana Naksen (CMU)**
Cultural Canopies: Bridging Heritage and Urban Green Engagement in Chiang Mai City Faculty of Architecture. **Warong Wonglangka (CMU)**
Forging Culture of Lawfulness through the Lens of Conflict Management Theories in Addressing Environmental Issues. **Chernporn Ruangsawasdi (CMU)**

Locations: Chiang Mai Province

SOCIAL SESSION

Morning and Afternoon Activity

Time	Activities
09:00 AM – 09:30 AM	Pick up from hotel
09:30 AM – 10:30 AM	The Lanna Traditional House Museum, CMU
10:30 AM – 12:30 PM	Three Kings Monument Chiang Mai, Chiang Mai Historical Centre, Lanna Folklife Centre
12:30 PM – 01:30 PM	Lunch at Restaurant in Chiang Mai
01:30 PM – 03:30 PM	Lanna Architecture Center
03:30 PM – 05:30 PM	Muen San Community, Wualai Village
06:00 PM – 07:30 PM	Dinner at Restaurant in Chiang Mai

Dinner: Restaurant in Chiang Mai

TOURISM SESSION

Activity Program
Creative Tourism and Sustainability

Morning Activity

Locations: Center for the Promotion of Art, Culture and Creative Lanna (ACCL)

Time	Activities
Venue: Center for the Promotion of Art, Culture and Creative Lanna (ACCL)	
09:00 AM – 09:30 AM	Welcome address "Creativity and Sustainability" (TBC) by **Professor of Practice Dr.Ekkachai Mahaek** **Vice President of CMU and Acting Director of ACCL CMU**
09:30 AM – 10:30 AM	Visit Lanna House Museum
10:30 AM – 11:00 AM	Refreshment Break (Creative Craft Coffee & Tea Workshop)
11:00 AM – 12:00 PM	Research Seminar on "Sustainability and Creative Tourism for Society"
12:00 PM – 01:00 PM	Lunch at ACCL (Khao Soi and CL Signature dishes)
01:00 PM – 01:45 PM	Depart for Queen Sirikit Botanical Garden Travel by van for 45 min

Afternoon Activity

Locations: QSBC and Jirung Health Village

Time	Activities
Venue: QSBC and Jirung Health Village	
01:45 PM – 03:00 PM	Arrive Queen Sirikit Botanical Garden Sightseeing and canopy walks for 1 hour 15 min
03:00 PM – 03:20 PM	Depart for Jirung Health Village (20 min)
03:20 PM – 05:00 PM	Site visit and short workshop for 1 hour 40 min
05:00 PM – 06:00 PM	Depart for Old Chiang Mai for 45 min
06:00 PM – 08:00 PM	Dinner

Dinner: Chiang Mai Cultural Centre (Chiang Mai Old City)

CLIMATE ACTION SESSION

Activity Program
In Response to Climate Crisis from Two Different Angles: From Waste to Energy and From Rice Fields to Exquisite Thai Desserts

Morning Activity

Locations: Energy Research and Development Institute Nakornping (ERDI)

Traveling from hotel to ERDI (arranged by ORA)		
Room 1: 2nd Floor-Meeting Room of ERDI-CMU **Chair:** Prof. Dr.Chanakan Prom-u-thai **Co-Chair:** Assoc. Prof. Dr.Apinpus Rujiwatra		
Time	**Activities**	**Chair/Co-chair**
09:00 AM – 09:15 AM	**Prof. Dr.Wen-Lii Huang, NCYU** **Title:** Carbon Footprint Assessment of NCYU-TN1, A New Drought Tolerant Rice Cultivar from NCYU.	**Chair:** Prof. Dr.Chanakan Prom-u-thai (CMU) **Co-chair:** Assoc. Prof. Dr.Apinpus Rujiwatra (CMU)
09:15 AM – 09:30 AM	**Assoc. Prof. Dr.Yukitaka Kamino, KU** **Title:** Perception of Elementary School Children on The Best Mix of Electricity Generation Methods and Decarbonization: Report on a Lesson in the 4th Grade Social Studies	
09:30 AM – 09:45 AM	**Asst. Prof. Dr.Kannikar Intawong, CMU** **Title:** Climate-integrated Platforms for Enhancing Public Health Surveillance and Decision Support Systems	
09:45 AM – 10:00 AM	**Asst. Prof. Dr.Yui OYAKE, KU** **Title:** i-Tree Eco in Japan: Quantitative evaluation of the ecosystem service value of street trees	
10:10 AM - 10:30 AM	Break (4th Floor-Meeting Room)	
10:30 AM – 10:45 AM	**Dr.Minoru Tokumasu, KU** **Title:** Groundwater Salinization During the Irrigation Period and Sustainable Water Use under Climate Change in the Saijo Plain, Japan	
10:45 AM – 11:00 AM	**Prof. Dr.Masashi Miyagawa, KU** **Title:** Seto Inland Sea Restoration with Blue Carbon - Development of Seaweed Bed Regeneration Structure	
11:00 AM – 11:15 AM	**Assoc. Prof. Show-Jen Chiou, NCYU** **Title:** Advancing Sustainability and Climate Resilience at National Chiayi University: Integrating Renewable Energy and Smart Resource Management	

CLIMATE ACTION SESSION

Morning Activity

Locations: Energy Research and Development Institute Nakornping

Traveling from hotel to ERDI (arranged by ORA)		
Room 1: 2nd Floor-Meeting Room of ERDI-CMU **Chair:** Prof. Dr.Chanakan Prom-u-thai **Co-Chair:** Assoc. Prof. Dr.Apinpus Rujiwatra		
Time	**Activities**	**Chair/Co-chair**
11:15 AM – 11:30 AM	**Dr.Matthew Robson, CMU** **Title:** Contesting the capitalist state to halt mass extinction? Climate change and the Extinction Rebellion (XR) 'war-machine'	**Chair:** Prof. Dr.Chanakan Prom-u-thai (CMU) **Co-chair:** Assoc. Prof. Dr.Apinpus Rujiwatra (CMU)
11:30 AM – 11:45 AM	**Mr.Kose Nakahara, KU** **Title:** Monitoring of Rainwater Infiltration and Storage in a Rain Garden on the Kagawa University	
11:45 AM – 12:00 PM	Session conclusions (for presentation on 29th August 2024) and selection of "session representative"	
12:00 PM – 01:30 PM	Lunch (4th Floor-Meeting Room)	

Afternoon Activity

Locations: Lanna Rice Research Center

Time	**Activities**
01:30 PM – 02:30 PM	Visits CMU Recycled Plastic Road and Biogas Plant EV
02:30 PM – 04:00 PM	Cooking Workshop: "From rice to Thai dessert at LRRC-CMU"
04:00 PM – 06:00 PM	Rice Cultivation in the Demonstration Field
Traveling back from LRRC to hotel (arranged by ORA)	

Note: The program is subjected to change as appropriate.

Dinner: LRRC (Lanna Style)

STUDENT SESSION

Activity Program
Student Site Visit and Reflection Workshop

Morning Activity

The morning session will begin with a comprehensive campus tour and an insightful overview of the CMU Smart City initiative presented by Assoc. Prof. Wongkot Wongsapai. Participants will gain an understanding of the innovative approaches to urban development and technology integration of Chiang Mai University. Following this, the group will proceed to Kaomai Lanna Hotel and Resort, where they will engage in an in depth exploration of sustainable practices implemented at the resort. This visit will include a guided tour of the facilities, highlighting ecofriendly architecture, renewable energy usage, and sustainable tourism practices.

Locations: CMU Main Campus, Kaomai Lanna Hotel and Resort

Time	Activities
08:00 AM	Depart hotel to CMU Main Campus by CMU bus
08:15 AM – 09:00 AM	Campus Tour and overview of CMU Smart City by **Assoc. Prof. Wongkot Wongsapai (MdRI-CMU)**
09:00 AM – 10:00 AM	Depart from CMU to Kaomai Lanna Hotel and Resort
10:00 AM – 10:15 AM	Coffee and Snack Break at Kaomai Lanna Hotel and Resort
10:15 AM – 11:00 AM	Site visit at Kaomai Lanna Hotel and Resort on Sustainability
11:00 AM – 12:00 PM	Conclude morning site visit activity with integration of insights into afternoon presentations by **Assoc. Prof. Wongkot Wongsapai (MdRI-CMU)**
12:00 PM – 01:00 PM	Lunch break at Kaomai Lanna Hotel and Resort

STUDENT SESSION

Afternoon Activity

In the afternoon, students will be divided into designated groups to reflect on and discuss the insights gained from the morning sessions. Each group will engage in collaborative discussions to brainstorm and develop innovative ideas inspired by the campus tour and the sustainability practices observed at Kaomai Lanna Hotel and Resort. These ideas will be presented through group presentations. A panel of judges will evaluate the presentations and the top 3 groups will be recognized as winners. This activity aims to foster teamwork, critical thinking, and practical application of sustainability concepts.

Locations: Kaomai Lanna Hotel and Resort

Time	Activities
01:00 PM – 01:15 PM	Briefing of Afternoon Activity
01:15 PM – 04:30 PM	Students divided in groups and Brainstorm Activity
04:30 PM – 05:30 PM	Group Presentations
05:30 PM – 05:45 PM	Committee Meeting
05:45 PM – 06:00 PM	Winner Announcement/ Group Photo Session
06:00 PM	Dinner at Kaomai Lanna Hotel and Resort

Dinner: Kaomai Lanna Hotel and Resort

THE 3rd TRILATERAL SYMPOSIUM ON SUSTAINABILITY

STRATEGIES FOR CLIMATE ACTION AND MITIGATION OF CLIMATE CHANGE IMPACTS

KEYNOTE SPEECH

27th – 29th AUGUST, 2024

CHIANG MAI UNIVERSITY

KAGAWA UNIVERSITY

Status of Asian Climate Change and Climate Actions in Asian Universities (What is Occurring in Asia, and What Shall We Do?)

Toru Terao
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Introduction

Climate change is already occurring and giving impact on human's life in Asian countries. The impact of climate change is different region to region on the Earth. To adapt to the risk here and now, we should understand the regional status of climate change. On the other hand, universities in Asian region are strengthening the activity for climate change, climate actions, including both climate change adaptation and mitigation. We can discuss what we can do based on our own recent experiences. Kagawa University is a national university in Shikoku Island adjacent to the Seto-Inland Sea. In this presentation, we would like to show our research seeds and recent research and educational climate actions for further discussion in the Trilateral Symposium on Sustainability.

Status of Asian Climate Change

Figure 1 shows clear temperature rise in Asian region relative to pre-industrial era. It already exceeds 1.5 degree, which is larger than estimated global average. Results of climate model simulations indicate this warming is attributable to the anthropogenic forcing, mainly the greenhouse gasses. Climate change seems to be accelerated after 2000. Increase in extreme weather events, such as droughts, heat waves and floods may cause severe impact on human's life. IPCC reports already identified statistically significant increase of hot extremes, heavy precipitation, and droughts in East Asia (Arias et al. 2021). Climate actions in this region must be accelerated in both of climate change adaptation and climate change mitigation.

Climate Actions in Kagawa University

To further discuss what we have done, and we shall do for the climate actions, I share recent climate actions in Kagawa University.

On 14 July 2023, we had the 1st Carbon Neutral Symposium. We invited Dr. Shiogama, NIES as a keynote speaker. Further we introduced research seeds that can contribute to climate actions. Research activities on decarbonized fuel are now actively conducted in Kagawa University. Our targets are ammonium (Okumura 2024) and hydrogen gases. Energy consumption management systems for houses and buildings are also actively studied. October in 2024, we are planning the 2nd Carbon Neutral Symposium which will target on the Blue Carbon in Seto-Inland Sea. Very recently, Kagawa University have signed a partnership agreement with the Development Bank of Japan for the Blue Carbon project, based on the research on artificial reefs preferrable for seaweed beds (Yamamoto et al. 2022; Suenaga et al. 2001). This is one of the most representative climate action research

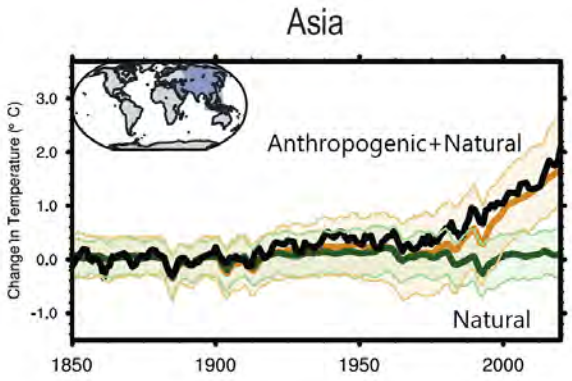

Fig. 1. Simulated near surface temperature change relative to pre-industrial era averaged over Asian region. Thick lines show multi-model mean and thin lines and shade indicate 5-95th percentile ranges. Results including anthropogenic forcing show clear warming in Asian region also. From IPCC AR6 Technical Summary.

projects in Kagawa University facing Seto-Inland Sea, which has huge potential for carbon absorption through the cultivation of blue carbon ecosystems in this shallow water environment.

A research project targeting on climate change adaptation in Asian region, Asian Precipitation Experiment (AsiaPEX) has been led by researchers in Kagawa University (Terao et al. 2023). It aims at understanding of Asian terrestrial precipitation over diverse hydroclimatological conditions for better prediction, disaster reduction and sustainable development.

I expect that we, three Asian universities will lead development of discussion and collaboration that successfully overcome Asian climate crisis in 21st century.

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Establishment of an Integrated Low-carbon Footprint Production System in Rice

Wen-Lii Huang[1*], Yueh-Cheng Lee[1], Tzu-Ying Chuang[2], and Rong-Kuen Chen[2]
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Introduction

Rice is a staple food for over half of the world's population, particularly in Asia, and its cultivation is a significant contributor to greenhouse gas (GHG) emissions, notably methane and nitrous oxides, due to conventional water- and fertilizer-intensive farming practices. The establishment of an integrated low-carbon footprint production system in rice cultivation is a pivotal endeavor in addressing the dual challenges of food security and climate change. Transitioning to a low-carbon footprint production system involves a multifaceted approach that integrates sustainable agricultural practices, advanced technologies, and policy support. Today, I will briefly introduce some approaches and preliminary results of our team in constructing a low-carbon footprint production system for rice. In particular, I will focus on three fields as follow breeding techniques, GHG monitoring systems, and cultivation practices development.

Results and Discussions

Firstly, we used association mapping and linkage mapping strategies to develop DNA molecular markers related to drought tolerance and breed new rice varieties in the past several years. From the segregation progeny of crosses between japonica and upland rice, we selected three new drought-tolerant and good eating-quality rice varieties, which have each obtained plant variety rights in Taiwan and been transferred to farmers for cultivation. Additionally, we conducted further studies using alternate wetting and drying water management and different nutrient management practice to evaluate greenhouse gas emissions during the rice production process. We set up high throughput GHG emissions monitoring system (Licor 7500, 7700, 7820) in rice paddy field to monitor the change of flux and gas levels of carbon dioxide, methane and nitrous oxides during whole growth period. Furthermore, digital breeding system for drought-tolerance and low-carbon emission varieties are further development.

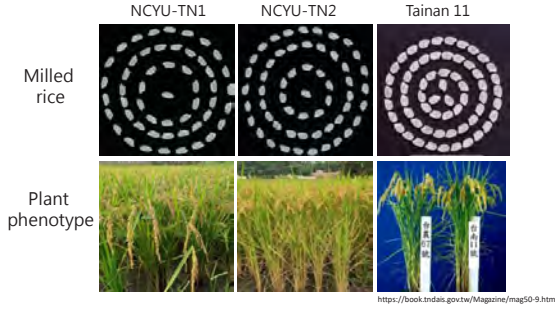

Fig. 1. New rice varieties with drought tolerance and good eating quality released by NCYU.

Table 1. Agronomic characters among different rice varieties under water-saving condition

LINE	Plant height (cm)			Heading date (days)			Growth period (days)		
	Control	Water [a] saving 1	Water [b] saving 2	Control	Water saving 1	Water saving 2	Control	Water saving 1	Water saving 2
NKY982055	73.3	64.6	55.5	84	92	98	130	135	>135
TK11	85.5	78.5	73.3	82	88	92	113	120	130
NCYU-TN1	76.3	77.3	77.1	75	76	76	104	104	111
TK9	93.3	82.9	76.8	92	88	108	130	>135	>135
NCYU-TN2	90.5	88.5	83.3	84	86	88	121	130	135
TKW1	80.4	76.5	74.2	81	85	88	126	130	>135
NCYU-TNW3	89.5	86.3	80.8	74	76	76	106	106	112

[a, b], Water saving 1 and 2 represented 25% and 38% water amount saving compared to control.

In conclusion, establishing an integrated low-carbon footprint production system in rice cultivation is a complex but achievable goal. It requires a holistic approach that combines innovative agricultural practices, technological advancements, supportive policies, and international collaboration. By making these changes, we can ensure sustainable rice production that meets global food demands while mitigating the adverse impacts of climate change, ultimately contributing to a more resilient and sustainable future for all.

Acknowledgment

We would like to thank Tainan District Agricultural Research and Extension Station (DARES) provided the rice cultivation. Agriculture and Food Agency, Ministry of Agriculture, Taiwan for financial support.

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Chiang Mai University: Towards Carbon Neutrality

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Chiang Mai University (CMU) has its comprehensive approach toward achieving carbon neutrality by 2032. CMU, functioning like a small city with three campuses, has embarked on numerous projects to reduce its carbon footprint. These initiatives include the extensive installation of solar rooftops, the development of a green transit system, and innovative waste management practices. Additionally, CMU's efforts in creating carbon sinks through reforestation and efficient energy use have earned it recognition as a Climate Action Leading Organization. The university's multifaceted strategy encompasses mitigation, carbon offsetting, education, and research, positioning it as a model for sustainability in higher education.

Introduction

Chiang Mai University (CMU), a leading educational institution in Thailand, is taking significant strides towards achieving carbon neutrality, aligning with the country's ambitious net zero goals and its NDCs summited to the United Nations Framework Convention on Climate Change [1]. CMU, with its three campuses covering a total area of 8,502 rai, including 4,726 rai of forest area, serves as a small city accommodating 38,180 students, 2,274 teachers, and 11,810 staff. The university also sees a daily influx of 20,000 users and manages over 180,000 car trips and 50,000 motorcycle trips each day. In addition, CMU operates multiple hospitals, contributing to its substantial annual energy consumption of 91.3 million kWh. These activities lead to the total GHG emission of approximately 70,000 tons of CO2eq. To address the issue, CMU has to develop its carbon neutrality goal and a number of policies and measures to response to it.

Results and Discussions

Chiang Mai University (CMU) has established a comprehensive strategy that emphasizes its commitment to social responsibility and sustainable development through innovation. The university goal for achieving its carbon neutrality by 2032 has been clearly stated and linked with its "Biopolis Platform" which is a part of the main strategic objective to create high socio-economic value of 60,000 THB [2]. The strategy for achieving carbon neutrality by 2032 encompasses a comprehensive approach structured around five key themes. These themes include mitigation, organization greenhouse gas (GHG) management, carbon offset and sinks, education, research, outreaches, and climate adaptation and resilience.

There are a range of projects aligned with its five key themes to achieve carbon neutrality by 2032 [3]. Under the theme of Mitigation, CMU has installed 12.68 MW of solar rooftops across 168 buildings, significantly reducing electricity consumption and carbon emissions by over 7,400 tCO2e annually. In the Organization GHG Management theme, the university has implemented a

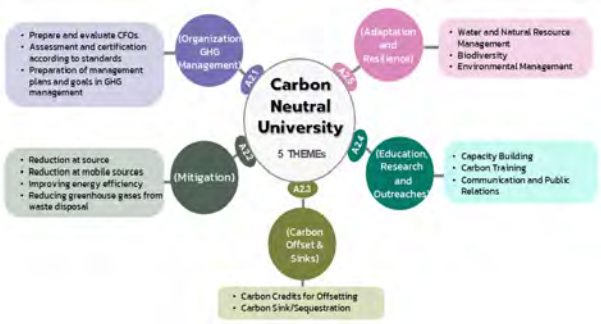

Fig. 1. The Five Themes of CMU Carbon Neutral Strategy.

comprehensive carbon footprint management system, enabling precise tracking and reduction of greenhouse gas emissions. The Carbon Offset and Sinks theme is exemplified by CMU's reforestation projects, which aim to restore 700 hectares of forest, sequestering an estimated 8,000 tCO2eq per year. For Education, Research, and Outreach, CMU has developed training programs and public relations campaigns to raise awareness and build capacity in carbon management among students and staff. Lastly, under the theme of Climate Adaptation and Resilience, the university has undertaken water management projects and biodiversity conservation efforts, enhancing its resilience to climate change impacts.

These integrated projects not only reduce CMU's carbon footprint but also foster a culture of sustainability and environmental responsibility within the university community. CMU is a key member of the Net Zero Campus, a coalition of higher education institutions in Thailand committed to achieving carbon neutrality and promoting sustainability. This network includes state-own universities, Rajabhat universities, Rajamangala universities of Technology, and various private universities. By working together, these universities aim to set a benchmark for sustainability in the education sector and contribute significantly to national and global climate goals.

Acknowledgment

The authors would like to thank the Agenda 2 Carbon Neutrality programs of Chiang Mai University for their invaluable financial support.

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THE 3rd TRILATERAL SYMPOSIUM ON SUSTAINABILITY

STRATEGIES FOR CLIMATE ACTION AND MITIGATION OF CLIMATE CHANGE IMPACTS

ORAL PRESENTATION

27th - 29th AUGUST, 2024

CHIANG MAI UNIVERSITY

KAGAWA UNIVERSITY

ORAL PRESENTATION (82)

HEALTH SESSION (9)

CMU | KU | NCYU

SCIENCE AND TECHNOLOGY SESSION (9)

CMU | KU | NCYU

FOOD SESSION (11)

CMU | KU | NCYU

SOCIAL SESSION (11)

CMU | KU | NCYU

TOURISM SESSION (11)

CMU | KU | NCYU

CLIMATE ACTION SESSION (9)

CMU | KU | NCYU

STUDENT SESSION (22)

CMU | KU | NCYU

STUDENT SESSION (22)

CMU | KU | NCYU

• HEALTH SESSION

Air Pollution and Age-related Macular Degeneration

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Introduction

Air pollution has emerged as a significant environmental risk factor with potential impacts on various health conditions, including ocular diseases. Recent literature has increasingly focused on the relationship between air pollution and age-related macular degeneration (AMD), a leading cause of vision loss among older adults. Cumulative evidence indicates that exposure to air pollutants may accelerate or exacerbate the prevalence and severity of AMD.

Results and Discussion

Epidemiological studies suggest that air pollutants, including particulate matter (PM2.5 and PM10), nitrogen dioxide (NO2), and ozone (O3), can contribute to AMD development through several pathogenic mechanisms. These mechanisms include oxidative stress, inflammation, immune response, and lipid peroxidation. Air pollutants can penetrate the alveolar wall, enter the bloodstream, cross the blood-retinal barrier, and induce pathological changes associated with AMD.

Exposure to air pollution may result in increased pro-inflammatory reactions, complement system dysregulation, and lipid accumulation. In dry AMD, persistent damage to the retinal pigment epithelium (RPE) and choriocapillaris leads to degeneration. In wet AMD, the breakdown of the blood-retinal barrier facilitates immune cell infiltration into the retina, promoting angiogenesis and neovascularization, ultimately causing photoreceptor damage and visual impairment. Additionally, cigarette smoke, a well-known air pollutant, is linked to choroidal dysfunction and structural changes associated with AMD.

Furthermore, animal models and in vitro studies have provided insights into the biological pathways through which air pollutants may exacerbate macular degeneration. These studies highlight the role of reactive oxygen species (ROS) generation and the subsequent inflammatory response in retinal damage. Genetic predispositions, such as gene variations in oxidative stress response or inflammation regulation, may modulate individual susceptibility to pollution-induced ocular damage. This suggests a multifactorial interplay between environmental and genetic factors in AMD risk, with some individuals being more susceptible to air pollution due to their genetic makeup.

In conclusion, while growing evidence links air pollution to AMD, further research is essential to comprehensively elucidate the mechanisms and effects. Addressing air quality may play a significant role in mitigating the risk and progression of AMD.

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Analysis of physiological functions of phospholipid-metabolizing PLAAT enzymes using their knockout mice

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Introduction

Dysfunction of lipid metabolism is closely linked to various lifestyle-related diseases, including obesity and inflammation, and thus research on lipid metabolism attracts much attention. The phospholipase A and acyltransferase (PLAAT) family functions as lipid-metabolizing enzymes and consists of five proteins in humans (PLAAT1–5) and three proteins in mice (PLAAT1, 3, and 5)[1]. We have examined these enzymatic properties and revealed that these proteins exhibit phospholipase A_1/A_2 and *N*-acyltransferase activities. However, the physiological functions of PLAAT proteins remain unclear. To gain insights into the roles of PLAAT proteins *in vivo*, we generated their knockout mice using the CRISPR-Cas9 system and analyzed their phenotypes under high-fat diet (HFD)-induced obesity and cadmium chloride ($CdCl_2$)-induced testicular inflammation models.

Results and Discussions

HFD feeding caused severe obesity with hepatic lipid accumulation in wild-type (WT) mice. In contrast, body weight gain was lower in *Plaat1*$^{-/-}$ mice and much lower in *Plaat3*$^{-/-}$ mice. The liver of *Plaat1*$^{-/-}$ mice accumulated much less lipids than that of WT mice, whereas severe hepatic lipid accumulation was evident in *Plaat3*$^{-/-}$ mice (Fig. 1A). Since insulin resistance is a key factor in the development of fatty liver, we performed the insulin tolerance test. Insulin injection efficiently decreased the blood glucose levels of WT and *Plaat1*$^{-/-}$ mice, but not those of *Plaat3*$^{-/-}$ mice. We also measured the plasma levels of adiponectin, which suppresses hepatic lipid accumulation, and found its increase in *Plaat1*$^{-/-}$ mice. These results suggested that PLAAT1 deficiency improves HFD-induced hepatic lipid accumulation, whereas it is aggravated by PLAAT3 deficiency[2].

Our previous study showed that PLAAT5 is specifically expressed in testis and exhibits *N*-acyltransferase activity producing *N*-acylethanolamines (NAEs), which are bioactive lipid mediators[3]. Lipidomics analysis of the testis showed a significant decrease in the total NAE levels in *Plaat5*$^{-/-}$ mice. In particular, anti-inflammatory NAEs, palmitoylethanolamide (PEA) and arachidonoylethanolamide (AEA), were remarkably decreased. When *Plaat5*$^{-/-}$ mice were subjected to a $CdCl_2$-induced testicular inflammation model, the expression of an inflammatory gene (*Tnf*) was remarkably increased in the testis of *Plaat5*$^{-/-}$ mice compared to WT mice and its expression was attenuated by the administration of PEA and AEA (Fig. 1B and C). These results suggested that PLAAT5 is responsible for the biosynthesis of anti-inflammatory NAEs in the testis.

In conclusion, members of the PLAAT family play distinctive roles in obesity and inflammation, and the development of small molecules that regulate PLAAT proteins may serve as a therapeutic treatment for various lifestyle-related diseases.

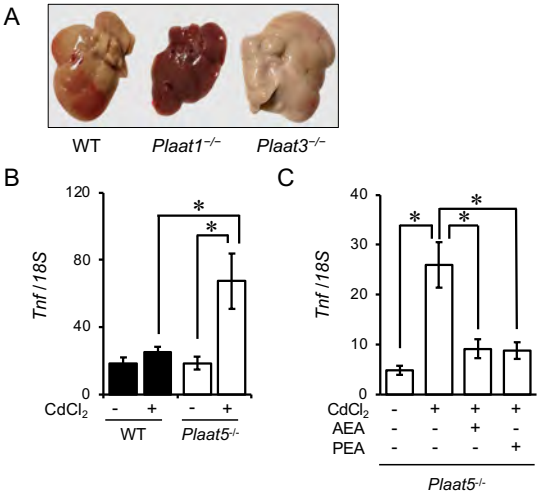

Fig. 1. Analyses of *Plaat1*$^{-/-}$, *Plaat3*$^{-/-}$, and *Plaat5*$^{-/-}$ mice.
(A) Representative images of livers of HFD-fed WT, *Plaat1*$^{-/-}$, and *Plaat3*$^{-/-}$ mice are shown. Fatty liver appears whitish.
(B) Quantitative PCR analysis of *Tnf* expression in testes of WT and *Plaat5*$^{-/-}$ mice in the $CdCl_2$-induced testicular inflammation model. *18S* ribosomal RNA was used as a control.
(C) Anti-inflammatory effects of exogenous AEA and PEA on *Plaat5*$^{-/-}$ mice. (mean values ± SEM, n = 4 – 10). *$p < 0.05$.

Acknowledgment

This work was supported by Grants-in-Aid for Scientific Research (to Uyama T. and Ueda N.) and Kagawa University Research Promotion Program (to Uyama T. and Sasaki S.).

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THE 3rd TRILATERAL SYMPOSIUM ON SUSTAINABILITY
STRATEGIES FOR CLIMATE ACTION AND MITIGATION OF CLIMATE CHANGE IMPACTS
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Assessment of the Annual Acute Number of Patients with Pharyngitis Disease Attributable to Ambient PM2.5 in Northern Thailand

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Introduction

This study focuses on analyzing the impact of PM2.5 on the number of Acute Pharyngitis cases in the Northern Thailand in 2023, utilizing the Environmental Benefits Mapping and Analysis Program (BenMAP) (1) to assess the health outcomes. The methodology of this study involves gathering and analyzing data on PM2.5 concentration from the Department of Pollution Control, population figures for the Northern Thailand, and the number of Acute Pharyngitis cases from the Ministry of Public Health. This data is utilized to analyze the health outcome. The analytical approach emphasizes the creation of health impact maps due to PM2.5, using BenMAP to comprehend and evaluate the health effects on the population in that area. Special attention is given to the impact on Acute Pharyngitis and its distribution across different age groups. The findings from this study will contribute to a better understanding of the health effects of PM2.5 on the population in the Northern Thailand. Furthermore, it will aid in the formulation of policies and measures to address the issue of poor air quality in the right direction.

Results and Discussions

First, we analyzed the daily PM2.5 concentration values of 8 stations in the northern region, each representing a province: 36T (Chiang Mai), 37T (Lampang), 57T (Chiang Rai), 58T (Mae Hong Son), 67T (Nan), 68T (Lamphun), 69T (Phrae), and 70T (Phayao). We found that the average concentration of PM2.5 exceeds both the annual Thailand standards (15 μ/m³) and those set by the annual World Health Organization (WHO) standards (5 μ/m³) (2). As shown in Fig. 1.

In Fig.1, the graph shows the daily average concentration of PM2.5 at each station in 8 provinces, northern of Thailand. It was observed that during March-May 2023, PM2.5 values exceeded both the daily Thailand (37.5μ/m³) and WHO (15μ/m³) (2) standard values at every station.

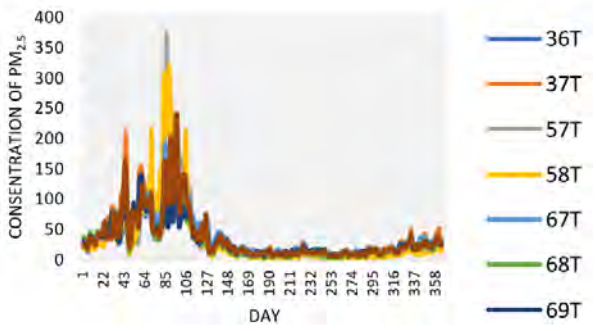

Fig. 1. Average daily concentrations of PM2.5 in northern Thailand stations

The next step, to estimate the impacts of PM2.5 on human health, equation (1) was used to calculate the number of individuals who avoided acute pharyngitis disease (US EPA 2018): $\Delta Y = Yo\ (1 - e^{-\beta \Delta PM}) * Pop$, (1)

It was found that elevated levels of PM2.5 significantly increased the number of acute pharyngitis disease patients. Table I shows in 2023, the northern region recorded a total of 86,504 acute pharyngitis patients, including both males and females. However, upon analysis, it was determined that controlling PM2.5 levels to meet Thai and WHO standards could help reduce the occurrence of respiratory diseases. Specifically, it could decrease the number of patients to 9,134, representing a 10.5% reduction, and to 13,445, representing a 15.5% reduction, respectively. The findings of this study can provide valuable data to support the development of policies and measures aimed at reducing air pollution, thereby sustainably reducing its adverse health impacts on the population in the northern region of Thailand.

Table 1. Number of people who avoid of acute pharyngitis disease illnesses by controlling PM2.5 in 2023.

Province	Control Annual average PM2.5		Total Patient
	Thailand (15μ/m³)	WHO (5μ/m³)	
Chiang Mai	2391	3725	26326
Lamphun	899	1243	7084
Lampang	960	1376	8434
Phrae	1108	1501	8150
Nan	696	1055	7129
Phayao	683	1036	7026
Chiang Rai	1633	2353	14556
Mae Hong Son	764	1156	7798

Acknowledgment

The authors would like to thank the Pollution Control Department (PCD) and Department of Disease Control of Thailand for kindly supplying the air pollutants and the Ministry of Public Health (MOPH) for the acute pharyngitis disease patients data. This work was (partially) supported by the Research Institute for Health Sciences, Chiang Mai University, grant number 018/2566.

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Dermal Lipogenesis Inhibits Adiponectin Production in Human Dermal Fibroblasts while Exogenous Adiponectin Administration Could Prevent UVA-Induced Cutaneous Photoaging

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INTRODUCTION

Ultraviolet (UV) radiation is considered a cause of skin aging and may result in pathological changes in the skin. Particularly, UVA, a long-known aging ray and a significant source of oxidative stress (ROS), plays a major role in the photoaging of human skin [1]. Photoaged skin typically shows the loss of elasticity, slowing of skin cell growth associated with slower wound healing and may, thus, become thin and vulnerable [2]. As we know, excessive exposure to UV irradiation induces damage to the dermal connective tissue and which leads to a large of inflammatory responses, including TNF-α, IL-1α, and a stress response gene cyclooxygenase-2 (COX-2) [3]. Of importance, adiponectin exerts anti-inflammatory activity via inhibition of TNF-α, IL-6, IL-8, VCAM-1, and ROS production on a number of cell types [4]. However, there is a little information available concerning the impact of the adiponectin on UVA-damaged skin and its mechanism of regulation. Therefore, this study will focus on the adiponectin expression under lipogenic conditions and then evaluate photo protective effects of adiponectin on UVA-induced damage in Hs68 human dermal fibroblasts.

METHODS

Here, human dermal fibroblasts, Hs68, were presented as a cell model of dermal lipogenesis through stimulation of adipogenic differentiation medium (ADM). The Young's modulus and cell adhesion strength of Hs68 fibroblasts were measured by atomic force microscope (AFM) and dielectrophoresis, respectively.

RESULTS

Similar to other studies in murine pre-adipocyte models (i.e., 3T3-L1), Hs68 fibroblasts showed a tendency to lipogenesis based on lipid accumulation, triglyceride formation, and the expressions of PPAR-γ, lipoprotein lipase (LPL), and FABP4 mRNA. As expected, ADM-treated fibroblasts displayed a reduction on adiponectin expression. Next, we emphasized the photoprotective effects of adiponectin against UVA-induced damage in Hs68 fibroblasts. UVA radiation can downregulate cell adhesion strength and elastic modulus of Hs68 fibroblasts. Moreover, UVA radiation could induce the mRNA expressions of EGFR, AdipoR1, MMP-1, MMP-3, and COX-2, but downregulate the mRNA expressions of type I and type III collagen. On the other hand, post-treatment of adiponectin indicated the increase of type III collagen and elastin mRNA expression and the decrease of MMP-1 and MMP-3 mRNA expression on UVA-irradiated Hs68 fibroblasts.

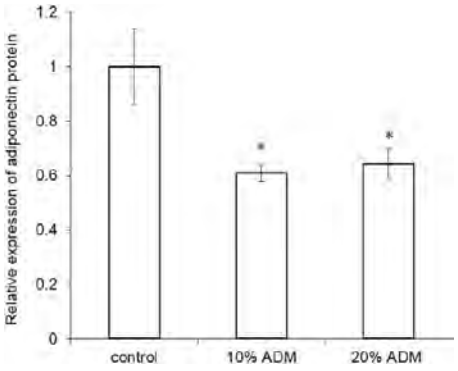

Fig. 1. Adiponectin expression in Hs68 fibroblasts with or without ADM treatment. Hs68 fibroblasts were incubated for 7 days with or without ADM treatment (10% or 20%).

CONCLUSION

Overall, our results suggested that dermal lipogenesis may inhibit the expression of adiponectin while exogenous adiponectin administration prevents against UVA-induced cutaneous photoaging through the up-regulation of ECM synthesis and down-regulation of MMP expressions.

ACKNOWLEDGMENT

This work was supported by a research grant from Ditmanson Medical Foundation Chia-Yi Christian Hospital Research Program (R102-24).

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Invasive animals and their parasites: connecting Taiwan to the world

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Introduction

As a globally significant trading and transportation hub, Taiwan's islands offer a distinctive framework for examining biological invasions. This region is not only a biodiversity hotspot but also a focal point for species invasions posing significant threats. Invasive alien species are often accompanied by co-invaders, such as symbiotic/pathogenic microbes or parasitic worms.

In this context, we present our recent research on two invasive lizard species. The first is the Green Iguana (*Iguana iguana*), native to Latin America, which was introduced to Taiwan via the pet trade several decades ago. The second is the Asian Water Dragon (*Physignathus cocincinus*), also introduced to Taiwan via the pet trade from Southeast Asia.

Results and Discussions

Our findings reveal that the invasive iguanas were heavily infested with parasitic nematodes, with intensities ranging from hundreds to hundreds of thousands. All the parasites identified in the invasive iguanas were novel to the local fauna. It appears evident that these alien nematodes were co-introduced with their iguana hosts from various sources in America.

In contrast, while the Asian Water Dragons were less infested with parasites, all the parasites recovered were already present in local herptile hosts. Therefore, these parasites in the invasive Asian Water Dragons were considered as the result of spillback, rather than spillover (Fig. 1).

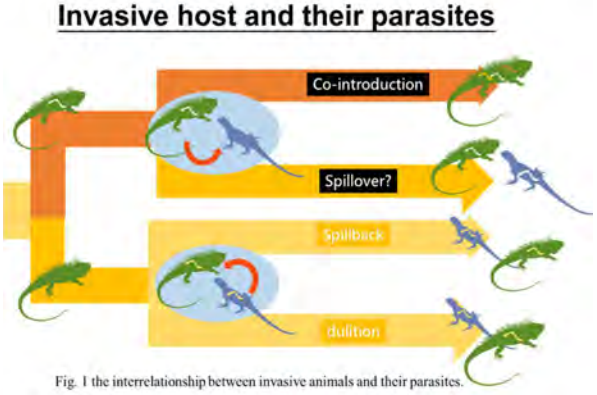

Fig. 1 the interrelationship between invasive animals and their parasites.

The observed discrepancy between invasive animals and their parasites can potentially be explained by the habitat, diet, and phylogeny of the hosts, as well as the life cycle and phylogeny of the parasites. This highlights the complex interplay between invasive species and their associated parasitic organisms.

Acknowledgment

I would like to express my deep gratitude to the Forestry and Nature Conservation Agency and the Chiayi County Government, Taiwan for their generous financial support. Special recognition is due to the local volunteers and the members of the Parasitism Laboratory at NCYU. Their diligent efforts in trapping these invasive lizards and conducting parasitic examinations have been invaluable to this research.

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Knowledge, awareness, and perception of local villagers in high seasonal pollution area in Northern Thailand

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Background

Air pollution is a significant health challenge that is associated with multiple health outcomes, including respiratory, cardiovascular, and metabolic diseases [1]. We assessed knowledge, awareness, and perception of villagers around the seasonal air pollution to gain understanding and inform policymakers regarding the local context. This study contributes to achieving the Sustainable Developmental Goals (SDGs 3 & 11) called for action by the World Health Organization [2].

Methods

We conducted a mixed-method study in December 2023 at a subdistrict in Mae Cham district, Chiang Mai, Thailand which is an area with high seasonal pollution. We invited local Thai villagers aged between 20-70 years who have been living in the study area for at least 2 years to share their opinions. Data was collected using a paper-based questionnaire and focus group discussion. Descriptive statistics was used to analyze participant's characteristics and their knowledge score. The qualitative data was analyzed using thematic analysis.

Results and discussion

Of the 40 participants, 25 (63%) were female. Their median age was 39 years (interquartile range, IQR 34-56). The majority (83%) finished schooling at primary or secondary levels. Thirty- two (80%) were maize agriculturists. Their concurrent chronic disease included hypertension, allergy, and asthma in 15%, 12.5%, and 7.5%, respectively.

• Knowledge

From the questionnaire, we found that the participants' general knowledge and awareness on seasonal air pollution was average (mean score was 6.4 ± 2.1 out of 10). All participants stated that the air pollution affected their health and that of others family members. They mentioned children and elderly were the most vulnerable groups. They also agreed that air pollution might be related to non-communicable disease in some way, although they could not figure out its mechanism.

• Awareness

Participants knew that specific types of facemasks were needed for protection against the fine particles (PM 2.5). However, they used what they could afford i.e., a single layer or fabric. During the season, they tried to avoid exposure by staying indoors. Nonetheless, it did not help much. as their houses were not sealed, ambient and household air quality was similar. They could not use air purifier without air conditioning. Moreover, they still needed to work in their farms.

• Perceptions

Participants emphasized their cooperation with all government policies including making fire barriers around the villages, monitoring for forest fire, refraining from household burning, and limiting agricultural burning within the allowed period. Nevertheless, to prepare the land on the steep area for maize cultivation, there was no other practical method. Villagers would like to plant fruits and vegetables, but sufficient water supply and market price guarantee were required. Participants believed that the air quality could be better if villagers in the next generation could switch from maize cultivation to earning a living by other jobs like handcraft, weaving or achieving higher education and getting employment.

Table 1 Example of quotes from focus group participants

"Smog was from forest fire mostly occurred at the border between our district and neighboring area. When the fire was set with wind swept smoke in, it would come together here as our village is in the valley with poor ventilation." [FG group 1; female >45 years]
"We saw small kids with noisy breathing and needed nebulizer, bed-ridden elders could hardly breath. Those with asthma had difficulty breathing. Healthcare providers would need to be prepared and provide respiratory support instruments to them. We all have irritating red eyes when the smog time comes." [FG group 5; female > 45 years]
"Diabetes may be, it makes their pre-existing illnesses worsen. For healthy people, it might not affect much, but for those with illnesses, they are even sicker." [FG group 5; male > 45 years]
"I think they might be related to worsening health. I have heard from an educator that little PM 2.5 particles can go into our body, into our vessels, lung and finally to the heart. It sounds possible to me." [FG group 2; male 20-44 years]
"We made fire barriers around the village. It helped to protect forest fire from coming into the village area. We also kept an eye on forest fire and put it out. We made fermented cattle feed from maize stalks which can be used and sold too." [FG group 2; female 20-44 years]

Summary

Our finding demonstrated that villagers had knowledge and awareness of seasonal air pollution. They realized that their farming method and certain ways of life partly caused air pollution in the community. However, the solution seemed to be beyond their capability, and they called for sustainable management to minimize seasonal air pollution from higher levels to be implemented and enforced nationwide.

Acknowledgement

We thank the sub-district health center and all villagers who participated in the study.

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Role of Blood Coagulation System and Proteinase-activated Receptor 1 in Aging

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Introduction

Development of strategies to prolong healthy lifespan is an urgent call in the aged societies, especially in Japan with the highest aging rate of 28.8% in the world as of October 1, 2020 (Annual Report on the Aging Society 2021, Cabinet Office, Japan). We need to cope with age-related diseases, including cardiovascular, metabolic, and neurological diseases. Chronic inflammation and oxidative stress are the fundamental conditions promoting age-relate diseases.

It is well known that the blood coagulability increases with aging. Blood coagulation system not only facilitates clot formation thereby contributing to age-related thromboembolic diseases, but also induces cellular effects, such as chronic inflammation, production of reactive oxygen species and blood vessel barrier disruption via a G protein-coupled proteinase-activated receptor 1 (PAR_1) [2, 3]. Here we hypothesize that blood coagulation system and PAR_1 play a critical role as facilitating factors of aging.

Results and Discussions

The age-related body weight gain in PAR_1-knockout mice (PAR_1KO) was lower than in the wild-type mice (WT). However, when fed a high-fat diet, both WT and PAR_1KO developed similar body weigh gain and insulin resistance. Insulin resistance developed with aging in both male and female WT mice. The age-related development of insulin resistance was suppressed in both male and female PAR_1KO mice at 50 weeks of age (Figure 1). The insulin sensitivity in female is higher than in male in both WT and PAR_1KO mice.

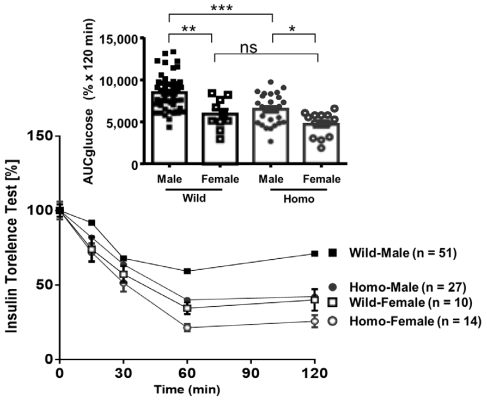

Figure 1. Preserved insulin sensitivity in the aged PAR_1-knockout mice (PAR_1KO) at 50 weeks of age. Summary of changes in blood glucose levels after i.p. injection of 0.75 U/kg human insulin and evaluation of the area under the curve (AUC) in male and female of WT and PAR_1KO. The data are the mean ± SEM of the indicated number of experiments.

Thrombin, a canonical agonist of PAR_1, disrupts barrier function in porcine aortic endothelial cells (PAEC). The peripheral actin bundle formation was an early event during barrier disruption, followed by its reorganization into stress fibers in the later phase in the lower-passaged cells at confluence. Lower-passaged PAEC on early culture days with immature cell-cell contact induced stress fiber formation as an early event. Higher-passaged cells, which exhibited a higher senescence-associated β-galactosidase activity than lower-passaged cells, induced stress fiber formation as an early event.

The Ca^{2+} influx induced by thapsigargin, an inhibitor of endoplasmic reticulum Ca^{2+} pump seen in the higher passaged cells were significantly higher than in the lower passaged cells (Figure 2).

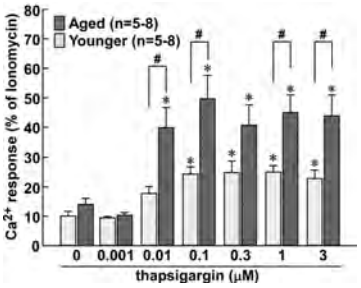

Figure 1. Augmented store-operated Ca^{2+} influx in replication senescent porcine aortic endothelial cells. Summary of the concentration-dependent effects of thapsigargin, an inhibitor of endoplasmic reticulum Ca^{2+} pump, on the Ca^{2+} influx in the lower (5-15 passages) and higher (23-30 passages) passaged cells. The data are the mean ± SEM of the indicated number of experiments.

Conclusions

PAR_1 knockout suppressed the development of age-related insulin resistance, suggesting that blood coagulation system and PAR_1 play a critical role in the development of age-related metabolic dysfunction. Aged endothelial cells exhibited augmented store-operated Ca^{2+} influx, which has been reported to correlate with endothelial dysfunction.

Acknowledgment

This study was supported in part by the JSPS KAKENHI (Nos. 23K24793/22H03536, 23K10890, 20K20663 and 19K11641).

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The association between choline intake and fibrosis among U.S. adults with metabolic dysfunction-associated steatotic liver disease: results from 2017 – 2020 NHANES

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Introduction

Metabolic dysfunction-associated steatotic liver disease (MASLD), formerly known as nonalcoholic fatty liver disease (NAFLD), is the most common liver disease, affecting 38% of the global population in 2016-2019 [1].

Choline is an essential nutrient found mostly in animal-based foods [2]. The majority of choline is used in the assembly and export of lipoprotein vesicles from the liver [2]. Epidemiological evidence between choline intake and the onset and development of MASLD (or NAFLD) is limited. Therefore, the objectives of the current study are to investigate the association of total choline intake with MASLD in 2017–2020 NHANES participants and in participants with fibrosis among people with MASLD.

Results and Discussions

The analytic sample included 5,687 U.S. adults aged ≥ 18y with and without MASLD from 2017–20 NHANES. The crude prevalence of MASLD was 35.5%. Within the MASLD group (n=2,019), the prevalence of fibrosis was 20%.

In a fully adjusted analysis, total choline intake (diet+ supplement) was not associated with MASLD prevalence (Table 1). Specifically, the odds ratio [95% confidence interval] (OR [95% CI]) per 100 mg/d of choline was 0.96 [0.85,1.09] (P=0.55). The ORs for higher choline intake quartiles did not differ from the lowest quartile (P-trend=0.59).

After adjusting for influential covariates, both continuous and quartile intakes of dietary choline showed positive associations with the odds of fibrosis. A 100 mg/d higher dietary choline intake was associated with 20% higher odds of fibrosis (1.20 [1.04,1.39], P=0.01). Similarly, increasing dietary choline intake quartiles tended to be associated with increasing odds of fibrosis (P-trend=0.08).

Table 1. Association between total choline intake and metabolic dysfunction associated steatotic liver disease in 2017–20 national health and nutrition examination survey (N=5,687).

	Mean choline intake±SD	Unadjusted model	Basic model[1]	Full model[2]
Quartiles				
Q1 (n=557)	152.6±42.0	ref	ref	ref
Q2 (n=486)	253.2±24.4	1.01 [0.77,1.33]	0.84 [0.61,1.14]	0.80 [0.56,1.13]
Q3 (n=480)	345.5±32.1	1.31 [1.04,1.65]	0.93 [0.70,1.25]	0.94 [0.67,1.32]
Q4 (n=496)	551.6±166.0	1.14 [0.86,1.52]	0.72 [0.49,1.06]	0.84 [0.50,1.41]
P-trend	-	0.06	0.26	0.59
Per 100 mg/d	-	1.04 [0.98,1.10]	0.93 [0.85,1.01]	0.96 [0.85,1.09]
P value	-	0.17	0.08	0.55

[1] Covariates were age, sex, race, education levels, total caloric intake, and waist circumference.
[2] Covariates in the basic model plus total fat intake, smoking status, physical activity, and alcohol intake.

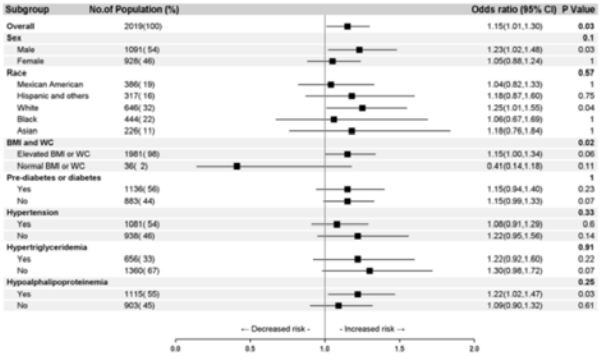

Fig. 1. Association between total choline intake (per 100 mg/d) and odds of fibrosis among people with metabolic dysfunction associated steatotic liver disease in 2017–20 National Health and Nutrition Examination Survey (n=2,019), modified by sex, race, and cardio-metabolic risk factors. Odds ratios (95% confidence interval) were obtained from logistic models, adjusting for complex survey design and age, sex, race, education levels, total caloric and fat intake, waist circumference, smoking status, physical activity, and alcohol intake.

The relationship between total choline intake and fibrosis was modified by sex (P-interaction=0.10) and, body mass index and waist circumference (P-interaction=0.02; Fig 1).

The adverse association between choline intake and fibrosis in people with MASLD may derive from its derivative, trimethylamine N-oxide, which was positively associated with steatosis score, steatohepatitis, and lobular inflammation in hospital-based patients [3].

In conclusion, total choline intake is not associated with MASLD in 2017–2020 NHANES. In men with MASLD, higher total and dietary choline intake is associated with fibrosis compared to a lower intake level. Total choline intake also tends to be positively associated with fibrosis among people with MASLD and elevated BMI or waist circumference. Collectively, these findings suggest that higher choline intake may not be associated with the prevention of MASLD but are associated with the progression to fibrosis.

Acknowledgment

This study was supported by Chiang Mai University and National Research Council of Thailand (NRCT).

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Therapeutic Assessment of Chronic Pain: A Case Study

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Introduction

Finn's (2007/2022) therapeutic assessment represents a practical paradigm that integrates psychological assessment and psychotherapy. This approach transcends the traditional model of assessment, which primarily relies on psychological tests to describe a client's problems. Instead, it repositions feedback sessions as opportunities for clients to gain new insights into their self-perception and interpersonal relationships (Finn & Tonsager, 1997). A unique aspect of this approach is the elucidation of a series of semi-structured procedures.

This case study aims to detail the process of Therapeutic Assessment (TA) conducted with a Japanese elderly woman who has been experiencing chronic pain for three years. Given that 29.0% of Japan's population is currently aged 65 or older, the promotion of mental health in the context of healthy aging is deemed an urgent issue. This case study underscores the significance of such psychological interventions in addressing the mental health needs of an aging population.

Case

The client was 68-year-old female. Her husband had been hospitalized for three years following severe stroke, then she began to complain of pain and numbness in her feet. Her medical doctor conducted thorough medical examinations, but no findings were observed. Her pain intensified after she was asked an advice about abortion from a high school student while volunteering for a telephone counseling service. She said, 'It's like Pandora's box has been opened. I remembered being sexually abused by 60 years ago'. Her doctor suggested, "You might be carrying a heavy burden, right?" However, the psychosomatic aspects of her underlying sorrowful emotions remained unclear. To investigate this aspect in detail, I invited her to participate in TA.

Standardized tests such as BDI-II, IES-R, DES, MMPI, and the Rorschach were administered. BDI-II score was 22 (indicating moderate depression), and IES-R score was 33 (above the cut-off point for PTSD). In addition, MMPI (Fig. 1) showed emotional isolation and anxiety of object loss.

The Thematic Apperception Test (TAT) was also utilized during the Assessment Intervention session. She expressed certain religious beliefs through projective techniques, which appeared to represent her complex experiences. Throughout this process, both she and I came to realize how her lengthy, intricate story influenced her physical pain. She also disclosed her distress over the impending loss of her husband. At times, it was challenging to remind her of these

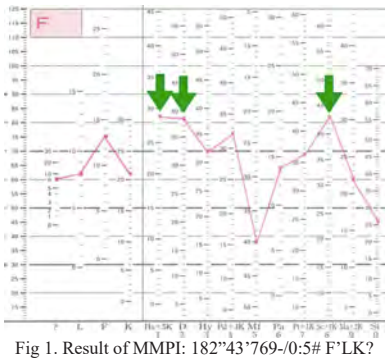

Fig 1. Result of MMPI: 182"43'769-/0:5# F'LK?

experiences, but as we gained a more coherent understanding of her life journey, her pain decreased over the four-month duration of the procedure. Her BDI-II and IES-R scores also showed improvement, and AQ-2 also indicated high "Positive Relationship with the Examiner/Assessor." (Fig. 2) This case illustrates the psychosomatic aspects in the relationship between psychological pain and chronic physical pain, and demonstrates how TA can bring relief to elderly clients by weaving a coherent narrative.

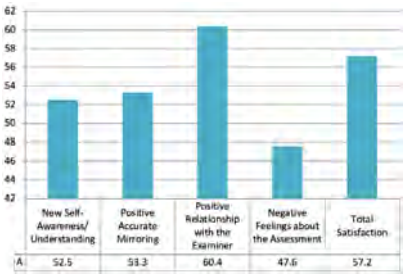

Fig 2. Result of AQ-2 (Assessment Questionnair-2, Finn et al., 1994)

Discussions

As the RCT research of Miller et al. (2013) addressed, a tailored motivational assessment had improved psychosocial functioning. And this study also emphasized how empathy for emotional pain can alleviate physical pain of elderly.

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• SCIENCE AND TECHNOLOGY SESSION

A Machine Learning Based Estimation of the Proportion of Anthracnose on mango fruit surfaces - Using 2D and flatten Mango Images as Training Set

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Mango (Mangifera indica L.) fruits are often damaged by anthracnose during the ripening and storage process. When the anthracnose-affected area on the fruit pericarp reaches a certain extent, the fruit loses its commercial value. To improve efficiency and accuracy of anthracnose occupation ratio (AOR), this study applies machine learning in estimating the AOR of 'Wan Li Xiang' mango. After the whole fruit's image is taken, the flesh is removed, and the flatten pericarp is photographed. The AOR of the whole mango fruit and of the flatten pericarp are calculated by image recognition to establish a training dataset. To account for the curvature of different Mango fruits, linear regression model of machine learning is then learned using the established training dataset such that AOR from photographs of whole 'Wan Li Xiang' mango fruits can be determined.

Introduction

Anthracnose is one of the key research subjects in the post-ripening process of mango's postharvest study. In the past, the calculation of the anthracnose-affected area often relied on manual calculations or judgments based on pixel areas in photographs, which is time-consuming, laborious, and inaccurate. Therefore, this study solves this problem by using computer vision to establish a dedicated training dataset for 'Wan Li Xiang' mango. Utilizing this training dataset, a linear regression model is trained to account for the varying curvatures of mango fruits to estimate the AOR of a mango fruit. Through this machine learning algorithm, rapid and accurate calculation of AOR can be obtained, which provide a useful tool for horticultural researchers and commodity traders as well.

Research Methods

A machine learning based algorithm is designed for estimating the AOR of mango from whole fruit to flatten pericarp mango images in this study. This established algorithm consisted of data pre-processing and image pre-processing, and linear regression and inference. The complete process flow is shown in Figure 1.

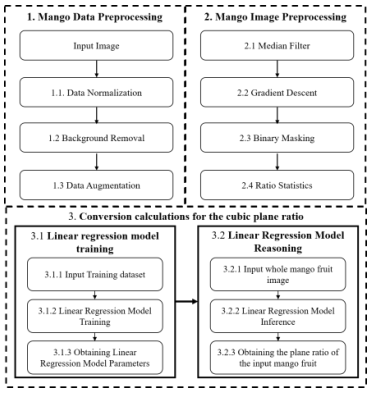

Figure 1. A machine learning based AOR estimation from whole mango fruit image to flatten pericarp Images of mangoes.

After the data pre-processing and image pre-processing, the contrast of the foreground mango fruit is enhanced and a grayscale image with contour only of the mango is created to extract the foreground mango fruit. The total pixels of the removed anthracnose and the remaining healthy pericarp pixels in the masked mango area are hence separately calculated. Finally, the ratio of anthracnose and healthy peel area in the inner and outer circles are calculated and a dedicated training dataset is hence be established for training the linear regression model. In the training step, the ratios of anthracnose-affected area for the whole mango fruit and the flatten mango surface are used to train the linear regression model. Due to the curvature of the fruit's surface, separate whole mango fruit into the inner and outer circles provides results that more closely approximate us the whole fruit image data. The input for the linear regression is the AOR of the inner and outer circles of the entire mango fruit, while the output is the anthracnose-affected area ratio of the flatten pericarp with the flesh removed. Figure 2 shows the linear regression relationships for the AOR of the whole mango fruit and that of the flatten pericarp mango image. Table 1 displays the results of AOR estimates from '*Wan Li Xiang*' mango.

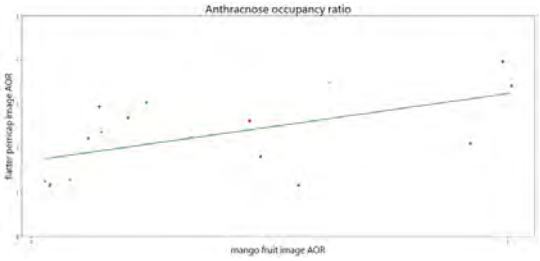

Figure 2. the linear regression relationships for the AOR of the whole mango fruit and that of the flatten pericarp mango image.

Table 1. Inference results of the linear regression model

Results AND discussions

To accurately estimate the actual AOR in mangoes, an machine learning base AOR estimation for converting the AOR from whole mango fruit images to that of flatten pericarp mango images is developed This algorithm not only can infers the relationship between the AOR of the whole mango fruit and that of the flatten pericarp mango image, but it also can effectively infer a more accurate anthracnose-affected area ratio.

File Name	Actual ratio (%)	Estimated ratio (%)	Error (%)	Absolute Percentage Error(%)
Test case A	2.797	3.349	0.552	19.73
Test case B	2.317	1.835	0.482	20.80
Test case C	2.565	1.798	0.767	29.90
Test case D	2.678	1.79	0.888	33.15
Test case E	3.104	2.322	0.782	25.19
Test case F	2.037	1.355	0.682	33.48
Test case G	1.98	1.313	0.667	33.68
Test case H	3.286	2.94	0.346	10.52

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CM Water Forecast Mobile Application Version 1.0

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Introduction

The CM Water Forecast [1] mobile application employs an Artificial Neural Network (ANN) model. This study was designed to develop models to forecast water levels in four time steps (6, 9, 12 and 15 hours) at P.1 station. The dataset utilized spans from 2005 to 2021. Furthermore, the models are calibrated to predict instances when the water level exceeds 3.00 meters. Consequently, only 14 events during which the water level surpassed this threshold were recorded; these events were subsequently used to evaluate the performance of the models.

Results and Discussions

The total number of input variables is 480, which includes water level, additional side flow 5-10%, rainfall and dam outflow. However, the appropriated input variables for forecasting 6 and 9 hours were selecting using Stepwise regression with an added side flow of 5% (32 and 35 variables, respectively), Additionally, the suitable number of hidden nodes is 1 and 2 nodes respectively. For 12 and 15 hours, the most suitable input variables were chosen with Genetic algorithms with an additional side flow of 5 % (218 variables) and 4 hidden noses.

In addition, this application is endowed with four distinct functions (Fig 1.):

1. **Display of Real-Time Water Levels**. It presents the current water level at P.1 station, enabling continuous monitoring.
2. **Predictive Water Level**. This feature forecasts the water level for the subsequent 6, 9,12, 15 hours, categorizing them into three classes for user clarity.
    a. Safe (Green), indicating normal levels where no immediate action is required.
    b. Beware (Yellow), suggesting elevated water levels that could potentially escalate, users are advised to be prepared.
    c. Flood (Red), warning of imminent flooding, necessitating immediate preventive measures.
3. **User Location in Relation to Flood Risk Zone**. It determines and displays whether the user's current location falls within a flood risk zone, thereby facilitating timely and informed decisions.
4. **Flood Warning Notification**. The application provides alert messages regarding flood warnings, enhancing preparedness and response capabilities.

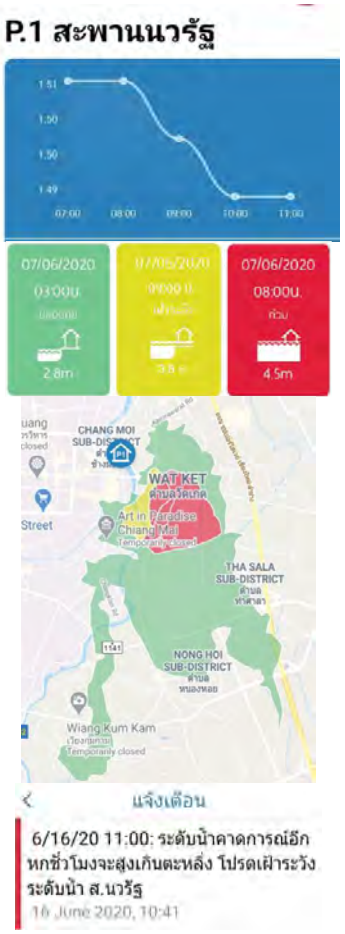

Fig. 1. CM Water Forecast Mobile Application

Acknowledgment

The authors[2] express their gratitude to Agricultural Research Development Agency (Public Organization) for their financial support and to the Royal Irrigation Department, Ministry of Agriculture and Cooperatives for providing the data necessary for this study.

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Deep Research of Wind Power Techniques and Ocean Wave-Driven Electricity Generation for Promoting Advanced Science Education

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Introduction

Taiwan and Thailand share similar geographical environments, both being surrounded by the ocean. Taiwan is particularly abundant in wind power resources, especially in the Taiwan Strait, while the northeastern region of Thailand also has significant wind energy potential. As the world shifts towards zero carbon emissions and considers carbon taxes, new scenarios for global economies are emerging. Harnessing wind power and ocean wave energy offers mutual benefits for both countries and plays a crucial role in protecting the Earth.

Despite significant advancements in wind power technology over the past decades, gaps remain in understanding the underlying principles, especially in the realm of science education. On the other hand, while numerous prototypes of ocean wave-driven electrical generators exist worldwide, none have achieved successful commercialization. Our research focuses on elucidating the fundamental principles of the entire wind turbine system to enhance mastery of wind turbine technology [1]. Additionally, we aim to identify the key factors contributing to the lack of successful commercialization in ocean wave energy technology and to steer research efforts in the right direction.

Results and Discussion

To explain how and why a wind turbine rotates in the wind, we first created a miniature airplane and an explanatory plate with an airfoil-shaped hole, along with a drawing illustrating the relative wind direction, original wind direction, angle of attack, lift, and drag. By mounting the plate on the wing, we can visually demonstrate the lift and drag exerted on the wing. The same wing serves as the sail of a sail vehicle, moving forward when wind blows perpendicularly to its direction. This wing is then used as the blade of a wind turbine, showcasing its ability to rotate in the wind. We use the plate to illustrate the lift force and the conditions under which lift occurs. The series of experiments prove that wind turbines, sails, and airplane wings operate based on the lifting force. Additionally, a thin elastic rope simulates the net force of lift and drag, driving the sail vehicle and turbine without wind. We also developed two innovative instruments. One shows that the net force causing the turbine to rotate has an unusually large backward component, while the other confirms the relative wind direction toward a rotating turbine.

There is an optimal tip speed ratio (TSR) that allows a wind turbine to harness the maximum percentage of wind energy. Figure 1 demonstrates why a turbine rotating at the optimal TSR captures the most wind energy. A series of experimental instruments were also developed to address each design step and related considerations. The gearbox, often misunderstood, allows the wind turbine to be controlled by magnetic damping torque exerted on the electrical generator to rotate at its best TSR. A wind power system should be designed and operated according to the best TSR.

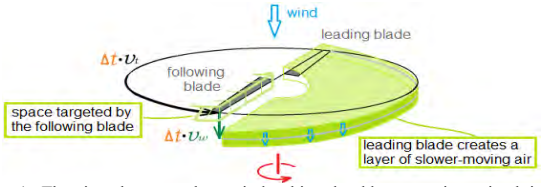

Fig. 1. The pivotal reason why a wind turbine should rotate at its optimal tip speed ratio (TSR) [1].

Regarding ocean wave energy, we investigated why existing wave-driven electrical generators have not been commercialized. According to our design approach, shown in Figure 2, indicates that the working body impacted by ocean waves must be very light. We designed an innovative ocean wave-driven electrical generator comprising a stable platform, managing circuits, energy storage instruments, and linear electrical generators [2].

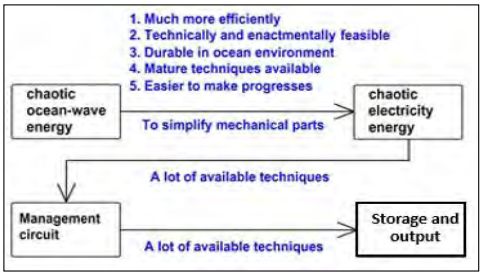

Fig. 2. Strategy diagram for designing a feasible and practical ocean wave-driven electrical generator [2].

Being well-prepared for further research and promotion of science education on wind power techniques and ocean wave energy, we enthusiastically welcome and seek cooperative research institutes and collaboration following SDGs with sister universities in CMU, Thailand and Kagawa-U, Japan.

Acknowledgment

Chiung-Wu Su acknowledged the National Chiayi University, Office of International Affairs for the financial supports of this talk in 3rd Trilateral Symposium on SDGs. Chien-Heng Chou thanks the NSC of Taiwan for financial support on the project NSTC 112-2410-H-238-001.

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THE 3rd TRILATERAL SYMPOSIUM ON SUSTAINABILITY
STRATEGIES FOR CLIMATE ACTION AND MITIGATION OF CLIMATE CHANGE IMPACTS
KU
KAGAWA UNIVERSITY

Design Support Technique for Industrial Equipment to Reduce Environmental Impact

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Finite element analysis is essential tool at the design phase to reduce noise problem for industrial equipment and can be used on premise of reliability of the result. This paper presents a design support technique to obtain accurate analysis result. This technique identifies analysis parameters appropriately with optimization for reliable and accurate result. It is demonstrated using a case study for a component of transformers.

Introduction

The noise in operation of industrial equipment such as motors and transformers is caused by vibrations inside and outside of them. It is important problem, because it is harmful not only to the equipment, but also to human health. In terms of the third and ninth goals of SDGs, design of industrial equipment that does not adversely affect people and environment is an important mission.

Finite element analysis has been used at the design phase to reduce the vibration problems. It enables us to estimate vibration property of equipment and helps to detect noise and other vibration problems before they are manufactured. This analysis can be useful only if some parameters, such as material constants, are reliable. Although the identification of analysis parameters based on some experimental results is required, it takes much time.

In this paper, a technique to solve parameters identification problem, especially material constants identification is introduced as an optimization problem. It enables all designers to identify proper material constants easily and obtain more reliable and accurate analysis result.

Optimization

The material constants identification problem is formulated as an error minimization problem between the analytical natural frequencies $\boldsymbol{f}(\boldsymbol{x})$ and the experimental natural frequencies of the real equipment $\bar{\boldsymbol{f}}$ with the material constants as design variables $\boldsymbol{x}$, as follows. In general, there are multiple natural frequency modes to be considered.

$$\begin{aligned} &\text{Find} && \boldsymbol{x}\,, \\ &\text{minimize} && J(\boldsymbol{x}) = J(\boldsymbol{f}(\boldsymbol{x}) - \bar{\boldsymbol{f}})\,, \\ &\text{subject to} && \boldsymbol{x} \in \boldsymbol{X}\,, \end{aligned}$$

where $J(\boldsymbol{x})$ is objective function. $\boldsymbol{X}$ is the allowable set of design variables.

This is a typical optimization problem and can be solved by several methods such as genetic algorithm. Authors have been proposed 2 main solution methods, surrogate multi-objective optimization method [1] and newton method with adjoint variable method [2], and proved the effectiveness.

Result And Discussions

As a case study, an iron core inside transformers is shown in Fig. 1. Although this equipment looks very simply, it is actually made of multiple layers of thin electromagnetic steel sheets, and it has a total of 18 material constants as design variables. Three experimental natural frequencies which affect noise are selected as objective functions. Three independent runs are performed by newton method [2].

Optimization result is shown in TABLE I. "f*N* error" (*N*=1,2,3) means error rate between analytical natural frequency f*N* and the experimental natural frequency f*N*. All trials obtained solutions with a maximum error rate of the order of 1E-8 to 1E-9, which is sufficiently close to zero. It is enough accuracy in practical and it seems that analysis result from our technique is reliable. Using the technique, designers will be able to identify proper material constants easily and estimate noise phenomena around products more accurate.

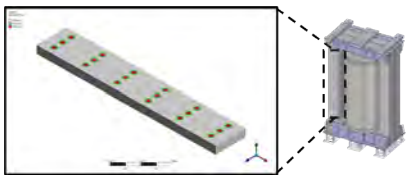

Fig. 1. Iron Core. This is a target product of case study and component of transformers like right one.

TABLE I Optimization Result

	Trial1 [%]	Trial2 [%]	Trial3 [%]
f1 error	4.05E-08	1.86E-09	9.71E-09
f2 error	6.87E-08	7.25E-10	1.67E-08
f3 error	1.03E-09	1.54E-09	6.15E-09
Max	6.87E-08	1.86E-09	1.67E-08

Acknowledgment

The study used the experimental data and the equipment provided by Toshiba Industrial Products and Systems Corporation. I would like to express my gratitude to them.

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Development of supported iridium catalysts for the green synthesis of N-containing chemicals

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Solid-supported catalysts, specifically titania-supported iridium catalysts, have been developed to facilitate the synthesis of various nitrogen-containing chemicals through dehydrogenative or transfer hydrogenation pathways. These catalysts exhibit excellent activity and are recyclable with minimal loss in performance. The crystalline structure of the titania support significantly influences the nature of the surface-bound iridium species, making the selection of the appropriate support crucial for achieving high activity. The advancement of these solid catalysts is anticipated to enable the green synthesis of a range of organic chemicals.

Introduction

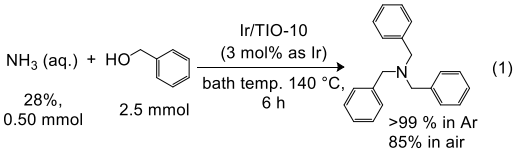
Nitrogen-containing chemicals, such as benzazoles and amines, are crucial intermediates in the pharmaceutical, agrochemical, and chemical industries.[1] Direct synthesis of these compounds through catalytic conversion represents a more environmentally friendly alternative to traditional synthetic methods.[2] Additionally, solid catalysts offer benefits in catalyst separation, recovery, and reuse, while also preventing product contamination by heavy metallic species. In this context, we developed titania-supported iridium catalysts that are effective for the direct synthesis of nitrogen-containing chemicals via direct dehydrogenation or transfer hydrogenation pathways by suitably controlling the physical and electronic properties of surface iridium species by the suitable selection of the titania supports.[3-7]

Results and discussions

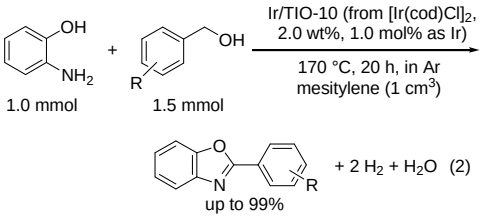
The supported iridium catalysts were prepared from a THF solution of $[Ir(cod)Cl]_2$ (cod; cycloocta-1,5-diene) by the conventional impregnation method followed by the reduction at 500 °C for 30 minutes in a stream of 2%H_2 in Ar. JRC (Japan Reference Catalyst) titanias were delivered from the Catalysis Society of Japan. Catalytic runs were operated under Ar using a Pyrex Schlenk tube (internal volume 20 mL).

The titania-supported iridium catalysts enabled the synthesis of secondary and tertiary amines from aqueous ammonia and alcohols, operating effectively at moderate temperatures without the need for additional solvents or high pressures (eq. 1).[3] Among the catalysts tested, those prepared with JRC-TIO-10 (Atanase) exhibited the highest activity. The system demonstrated good tolerance to atmospheric conditions, and the catalyst could be reused for at least five cycles without significant loss of activity. Additionally, these catalysts proved effective in the alkylation of urea.[4]

The titania-supported iridium catalysts also realized the acceptor-less dehydrogenative synthesis of benzoxazoles



from 2-aminophenol and primary alcohols (eq. 2).[5] These catalysts were applicable for the synthesis of various benzazoles via dehydrogenation or transfer hydrogenation.[6,7] The crystal structure of the titania supports significantly influenced the properties of the surface iridium species and eventually their catalytic activities. Optimal performance was linked to the formation of highly dispersed iridium species with diameters less than 2 nm, achieved through the synergy between iridium and titania, involving so-called SMSI (Strong Metal-Support Interaction) effect.[8] Furthermore, the specific oxidation states of the iridium species played a crucial role: highly-reduced species exhibited excellent activity in dehydrogenative reactions, while Ir^{3+} species were likely responsible for catalytic activity in reactions via transfer hydrogenation.



Acknowledgment

This research was supported by JSPS KAKENHI grants number 17H03458 and 22H01869.

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Enhancing Carboxymethyl Chitosan Film Properties through High Substitution Synthesis: The Role of Particle Size Dependency

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Introduction

Amidst climate change impacts, biomaterials, including carboxymethyl chitosan, play a crucial role in fostering sustainable development. These materials offer renewable alternatives to conventional counterparts, boasting inherent biocompatibility and biodegradability. They can be tailored for various applications, from biomedical to packaging materials. In this study, we aimed to investigate the influence of different chitosan particle sizes on the yield, degree of substitution (DS), water solubility, and modification of reactive functional groups in the synthesized CMCh. Additionally, we measured the water solubility, mechanical properties, and water vapor transmission rate (WVTR) of the CMCh film [1].

Results and Discussions

The DS and water solubility of CMCh depended on chitosan particle size. Smaller particles resulted in higher DS due to their larger surface area, facilitating greater conversion of chitosan to CMCh. This increased DS led to enhanced polarity, as indicated by a higher number of polar groups (-OH, -NH_2, -COOH) confirmed by FT-IR analysis. Consequently, CMCh prepared from smaller chitosan particles showed higher water solubility (88.9% to 95.5%) (Fig. 1).

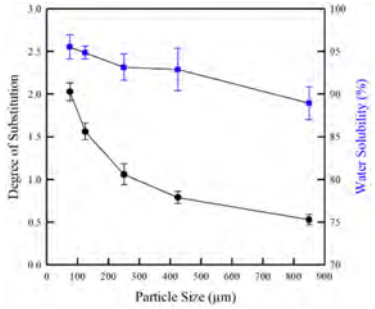

Fig. 1. Effect of chitosan particle sizes on degree of substitution and water solubility of CMCh powders.

The tensile strength and elongation at break of CMCh films were strongly affected by chitosan particle size (Fig. 2). Smaller particles led to the films with higher strength and elongation due to higher chitosan conversion to CMCh, resulting in higher DS and enhanced intermolecular forces. Conversely, NaOH treatment and bulky group formation (-CH_2COOH) reduced crystallinity of film. The CMCh films from smaller particles had lower crystallinity and increased flexibility, enhancing elongation at break.

The chitosan particle size used to synthesize CMCh significantly influenced the water solubility and water vapor transmission rate (WVTR) of the films. Decreasing chitosan particle size led to higher water solubility and WVTR of CMCh films, indicating increased polarity or hydrophilicity. This result is consistent with the FT-IR results, DS, and water solubility of the CMCh powders.

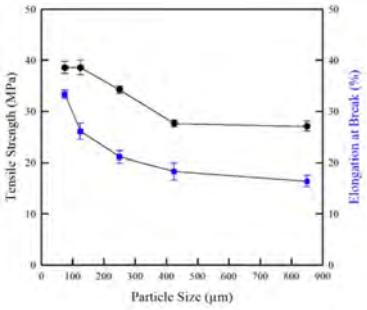

Fig. 2. Effect of chitosan particle sizes on tensile strength and elongation of CMCh films.

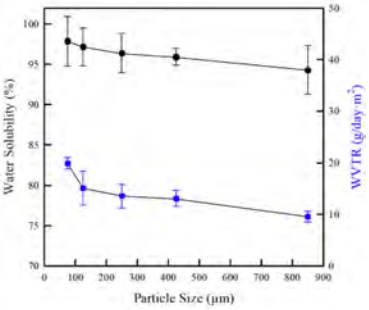

Fig. 3. Effect of chitosan particle sizes on water solubility and water vapor transmission rate of CMCh films.

This study provided a meaningful insight into the potential uses of CMCh in the development of novel functional materials for the biomedical, pharmaceutical, and food packaging industries.

Acknowledgment

This research was supported by the Program Management Unit for Human Resources & Institutional Development, Research and Invitation, NXPO (grant number: B16F640001). The present study was partially supported by TRF Senior Research Scholar (grant no.: RTA6280001). This research work was partially supported by Chiang Mai University. This work has been published previously in *Molecules*, 26(19), 2021. p.6013, the results presented herewith are for communication purposes of previously published work by the authors only.

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Maintenance Technology for Extending the Lifespan of Highways to Promote Sustainable Infrastructure (Reproduction of Damaged Concrete in Computer Simulation)

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For Japanese aging highways, periodical maintenance is necessary. To make maintenance more efficient, a highly accurate damage estimation technique is required.

Introduction

The sounding test is widely used to identify the damage of concrete structures such as highways. The damage is determined by the difference in sound when concrete is struck with a hammer. Considering applying this method to highway entirely, it is time-consuming and costly. Therefore, we focus on the infrared thermography method [1]. This method uses infrared images to identify the damage in a short time and at low cost. The purpose of this study is to develop a simulation technique to improve the accuracy of damage estimation on the infrared thermography method.

Methods and Results

A finite element method is used for highways heat transfer simulation. Several physical properties must be identified to perform the finite element method. In this study, physical properties are identified by experimental result of simple damage model as shown in Fig. 1.

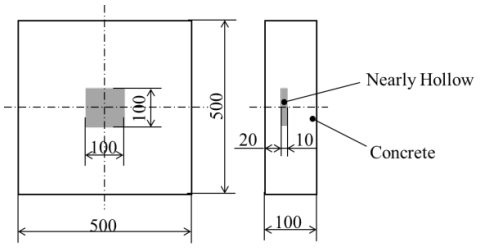

Fig. 1. Simple damage model. (unit: mm)

Temperature difference between damaged and undamaged surfaces is shown in Fig. 2. As shown in this figure, simulation result accurately reproduce experimental result.

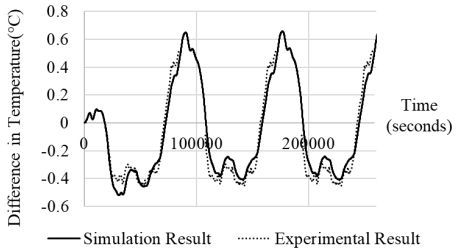

Fig. 2. Comparison of result in simple damage model.

The identified properties were used to simulate the actual damage model as shown in Fig. 3. In this figure, the measured surface displacement (left) and estimated internal crack (right) are shown. The geometry of this model is typical shape of damage called floating or delamination.

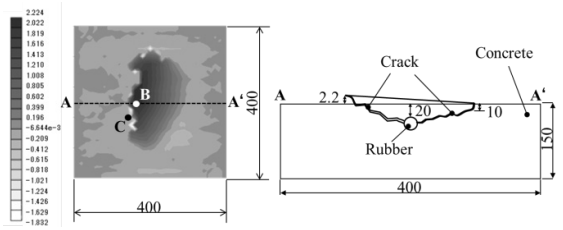

Fig. 3. Actual damage model. (unit: mm)

The temperatures at points B and C in Fig. 3 were obtained from experimental and simulation results. The temperature difference between them is shown in Fig. 4. As shown in this figure, simulation result accurately reproduce experimental result with an accuracy of less than 0.1℃.

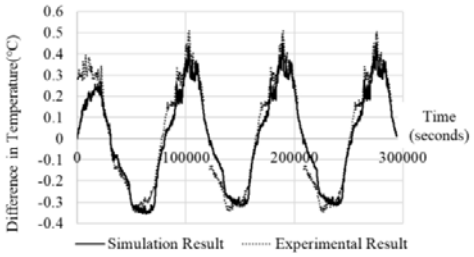

Fig. 4. Comparison of result in actual damage model.

Conclusion

In this study, physical properties were identified with a simple damage model. It was confirmed that the identified properties could be used to reproduce the experimental result of an actual damage model. In the future, it will be possible to simulate concrete temperatures under various conditions. The use of many simulation results will improve the accuracy of the infrared thermography method.

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Novel phosphor materials for next-generation white LEDs or full-color-afterglow indicators

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For good-blue emission phosphor $Sr_3MgSi_2O_8:Eu^{2+}$, we found the presence of Eu3+ states in the case of lower firing temperature by magnetization measurement and obtained the less dispersive spatial distribution of electrons around Eu. We also measure ESR and obtained complicated fine structure in the spectrum of $Ca_2Si_5N_8:Eu^{2+}$ which emit long-persistent red afterglow, which is assisted by defects of various energy levels.

INTRODUCTION

Recently, phosphor materials have been attracting much interests due to a wide variety of uses, such as white LEDs, mobile phone backlights, and plasma displays, and so on. In particular, researchers of this field have high expectations for a three-primary-color light emitting system that achieves natural white light consisting of Red, Green, and Blue It is strongly needed to improve the optical property of each light-emitting material by adjusting the wavelength which suit the cone cells of human eyes. The emission wavelength of Eu^{2+} ion, which is mostly used elements as color center, depends on the coordination situation, Eu concentration, and charge transfer processes via defects. However, it is still difficult to elucidate the relationship between those conditions and the emission properties. In this study, we present the topical results obtained from the various methods of material analysis, such as electron spin resonance (ESR), vibrating sample magnetometer (VSM), and Rietveld analysis with maximum entropy method (MEM).

RESULTS AND DISCUSSIONS

Rare Earth (RE)-activated phosphor $Sr_3MgSi_2O_8$(SMS):RE is one of the candidates for high-efficient blue color materials due to its sharp emission peak at 460 nm[1]. However, SMS:Eu^{2+} synthesized with the firing temperature lower than 1000 ºC sometimes exhibit yellow emission which should be suppressed for application use. We applied the magnetic technique to get the information about valence state of Eu ion. Fig. 1. shows the magnetization at 1.4T for SMS samples fired at the temperature 900–1300 ºC. The small magnetization in the case of firing temperature less than 1000 ºC implies the existence of Eu^{3+} ion and/or Sr_2SiO_4(SS) phase as impurity. For these SMS samples, we performed Rietveld analysis and obtained the electron distribution by MEM, as shown in Fig.2, where the higher firing temperature, the less dispersive state around Eu ion. This might make the energy of Eu 5d states higher and the 5d-4f transition matches to good blue light. We also focus red-emission long-persistent phosphor $Ca_2Si_5N_8:Eu^{2+}$[3], which have been expected for various applications such as night-indicator without electric power, memory device in optical computing and so on. Fig. 3. shows ESR spectrum of $Ca_2Si_5N_8$ with Eu^{2+} 0.05%. In the spectrum, six peaks from Eu nuclear magnetic moment and unpaired spin signal on bond defect between atoms are clearly observed separately. It is found that the bond defects densities at g~2.0 changes over UV irradiation time as well as UV energy, suggesting the various defects level exists in this system.

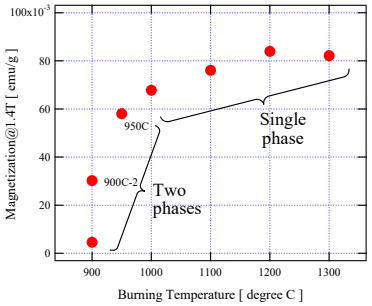

Fig. 1. Magnetization of SMS samples at 1.4 Tesla as a function of firing temperature.

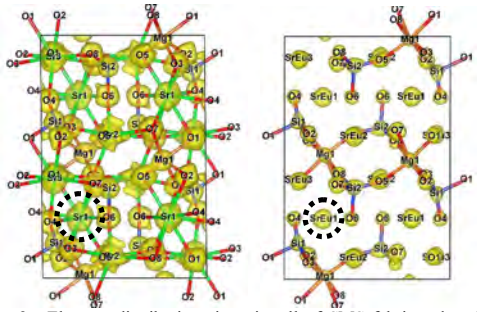

Fig. 2. Electron distributions in unit cell of SMS fabricated at firing temperature of (left) 950 degree C, and (right) 1200 degree C, calculated by MEM based on Rietveld results.

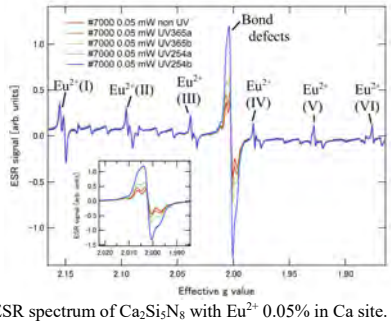

Fig. 3. ESR spectrum of $Ca_2Si_5N_8$ with Eu^{2+} 0.05% in Ca site.

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Wind in digital: anemometer data analysis

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Introduction

The present research is a perspective and continue work of the author's previous paper [1]. The 2,628,000 pieces of wind speed data will be analyzed in frequency domain by Fast Fourier Transform, with selecting the data in a proper time interval. Similar results are expected. However, to identify characteristics of wind signals could become challenge since the wind speed data is enormous, due to characteristics overlaps or cancelled-out. A method to segment appropriate amount of wind speed data is proposed and clear characteristics of wind signals in frequency domain can be anticipated.

Results and discussions

The wind speed data is purchased from Taiwanese Central Weather Bureau, and the recorded period is from May 2020 to May 2024. There are 2,628,000 pieces of wind speed data in total. At the moment the present abstract is written, data is still on final processing and the author is awaiting the purchase order.

During the author was working in one of the offshore wind farms in 2022, the author proposed to continue his previous research on the systematical analysis on measured wind speed data. The research department of the company suggested to test the author's MATLAB program [1], in order to verify the outputs with feeding large number of wind speed data to the program. However, the company did not share their data with the author and plus that the author left the company on January 2024. For those reasons, the author decided to purchase the wind speed data from Taiwanese Central Weather Bureau for academic purposes.

Although the wind speed data have not been coming out from Taiwanese Central Weather Bureau, it is expected the program will reveal similar characteristics of the frequency domain wind signals to [1] when Fast Fourier Transform applied. For example, time domain gust wind mapped to Sinc function in frequency domain, time domain ramp up wind mapped to asymptote-like curve in frequency domain, and time domain periodic wind mapped to spike-like function in frequency domain.

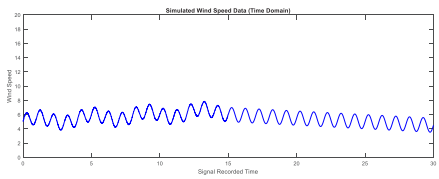

Fig. 1. A low periodic wind as a carrier wave carries a high periodic wind, mixing with a ramp up wind in time domain during 0-15 sec. Later on, a high periodic wind, mixing with a ramp down wind in time domain during 16-30 sec

Based on the wind speed data from Taiwanese Central Weather Bureau is recorded down to every minute, as well as the weather reports usually updates every 6 hours in offshore wind industry (for clients or contractors to make decisions on installation of wind turbines or not at sea), it would be a good and reasonable approach to analyze the wind speed data with a 6 hour basis (for a segment).

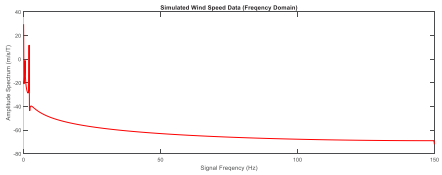

Fig. 2. Two peak-like functions at 0.53 Hz and 1.99 Hz and an asymptote-like curve identified in frequency domain. However, an unrecognized feature at 3.18 Hz also appeared in frequency domain.

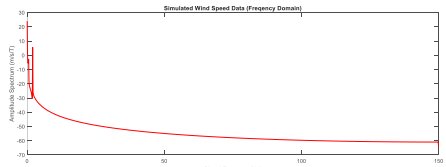

Fig. 3. After segment the wind speed data into two parts: this part is 0-15 sec in time domain. With the method, two peak-like functions at 0.53 Hz and 1.99 Hz and an asymptote-like curve identified in frequency domain. The unrecognized feature at 3.18 Hz disappeared in frequency domain.

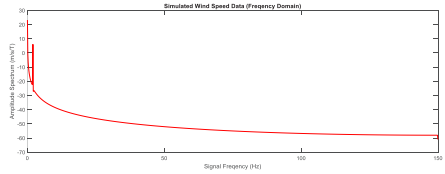

Fig. 4. After segment the wind speed data into two parts: this part is 16-30 sec in time domain. With the method, one peak-like function at 0.53 Hz and an asymptote-like curve identified in frequency domain. The unrecognized feature at 3.18 Hz disappeared in frequency domain.

Acknowledgment

The authors wish to thank the Taiwanese Central Weather Bureau and National Chiayi University, for providing wind speed data and supporting the research. Also, the author likes to thank Dr. Chiung-Wu Su, for his invitation to the 3rd Trilateral Symposium on Sustainability.

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• FOOD SESSION

Advancing the Texture and Functionality of Plant-Based Meat: Investigating the Synergistic Effects of Gluten Quality, Quantity, and Food Additives on Cereal-Based Protein Structures through Innovative Material Engineering Techniques

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Introduction

As one of the largest biopolymers in nature, the gluten protein is a complex system with multi-components and specific aggregation properties. Despite important advances in the study of gluten structure, the specific three-dimensional arrangement of hydrated polymeric glutenins and monomeric gliadins, along with the quality and quantity differences in the gluten system remains elusive [1]. An innovative rheological method (compression-recovery test) is a rapid compression test that can measure elastic behavior of gluten in terms of its degree of recovery [2]. Viscoelastic changes in gluten are observed when oxidized, reduced, or disrupted by hydrogen bonds, compared to using surfactants/emulsifiers i.e., DATEM, AA, urea, and DTT, which increase elasticity and viscoelasticity while decreasing viscosity [3]. The aim of this work was to investigate the effect of gluten substitution and food additives in flour on rheological properties and secondary structure of gluten.

Results and Discussions

Each centroid of the substitution levels represented the average values across all six types of flour. (Fig. 1). The RDA ordination revealed that the effect of gluten products had a high impact on the viscoelastic properties of gluten and the structures formed. Compression-recovery test showed a better detection of changes in retardation time (Ct1) compared to creep-recovery test. An increase in retardation time of 3% and 6% GB substitution suggested a longer time in delayed deformation in the gluten samples with GB after compression force was released. GA and GC may form hydrophobic and hydrophilic interactions of gliadins forming a loosely tied gluten network, which contributed to the increase in viscosity (η0) or resistance to flow.

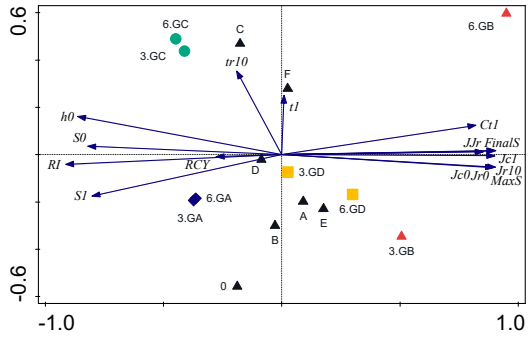

Figure 1. Redundancy analysis (RDA) of gluten with and without treatments with 15 indicators of viscoelastic properties gluten showing the effect of gluten substitution across the six commercial flours.

The impact of different temperature (25, 45 and 65 °C) and additive treatments (AA, DATEM and DTT) on secondary structural motifs and viscoelastic properties was depicted in a biplot graph by principal component analysis (PCA) (Fig. 2). Overall, the gluten with additives and heating had different gluten secondary structural components and %creep strain which led to a different extent of gluten polymerization. Gluten samples with 0.6% DATEM were in quadrant three closely related to antiparallel β-sheets and random coils, while samples with 25 mM DTT was in the middle between samples with 0.6% DATEM and 100 ppm AA heated at 65 °C. Our results suggested that the random coils, α-helices and β-sheets of gluten system with DTT undergone transition as a function of temperature through various conformations. The change in random coils and α-helices peak of DATEM sample maybe due to protein rearrangement which increases α-helical content as observed by others [4].

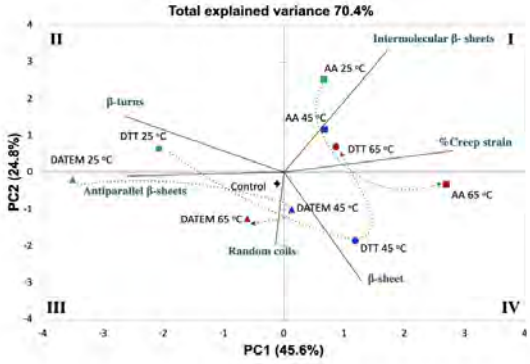

Figure 2. Principal component analysis (PCA) of gluten with six indicators of secondary structural motifs and viscoelastic property (creep strain) showing the effect of temperature (25, 45, and 65 °C) and additive (AA, DATEM and DTT) treatments.

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AI System Image Analysis to Detect Strawberry Fruit Development

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Introduction

An artificial intelligence (AI) system was developed for detecting the maturity level of strawberry fruit (categorized as flower, unripe fruit, semi-ripe fruit, and fully ripe fruit, when fruit is classified on the basis of color) utilizing commercially available equipment with the goal of application to strawberry greenhouse.

Methods

A total of 300 images of strawberry flowers and fruits at different stages of ripeness were taken at various shooting distances and angles (Fig. 1). Among the captured images of flowers and fruits at different stages of ripeness, 273 images were selected, excluding those with many shadows or backlighting. 123 images were used for AI evaluation, and the remaining 150 images, amplified by a factor of 20, were used as the teacher data for 3000 images. For the strawberry fruit and flower detection AI, yolov5 was used as the object detection model, and after training, the AI was asked to judge the 123 images for evaluation.

The detection results were divided into three patterns: "True Positive" (correctly detected), "False Positive" (detected in the wrong place), and "False Negative" (flowers or fruits that should have been detected were not detected) (Fig. 2). Using the detection results, the Accuracy, Precision, and Recall of each item and All items were calculated (Fig.3).

Results and discussions

In the AI before reconstruction, the judgment accuracy at 60% confidence threshold was 57%, 95%, 97% for, 94%, 99%, and 90% for flowers, unripe fruit, semi-ripe fruit, fully ripe fruit, conformance rate, and reproducibility, respectively (Table1). The reason for the low accuracy in judging flowers is that only images in which flowers could be seen from the front were used as teacher data. Therefore, to improve the accuracy of flower judgment, we added 1,580 new images of strawberry flowers to the teacher data, reconstructed the data, and performed re-determination. Compared to the AI before reconstruction, the judgment accuracy improved by 2% for total items and 29% for flowers but decreased by 1% for fully ripe fruits and 3% for semi-ripe and unripe fruits (Table1). The conformance rate remained unchanged. The reproducibility improved by 2%, while the conformance rate remained unchanged.

The decrease in the accuracy of detection for fruits was due to an increase in the number of undetected fruits, which was thought to be caused by the addition of flower images containing sepals to the teacher data, which increased the morphological similarities between fruits and flowers and made it more difficult to discriminate fruits and flowers.

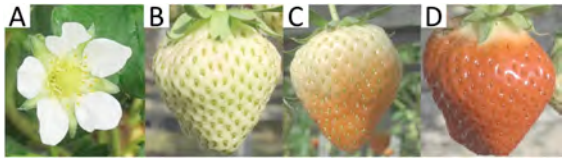

Fig. 1 Examples of each class of strawberry development
A. Flowers (have three or more petals)
B. Unripe fruit (are greenish-white fruits)
C. Semi-ripe fruit (are fruits with less than 80% coloration)
D. Fully ripe fruit (are fruits with more than 80% coloration.)

Fig. 2 Examples of flower judgment
A. TP : True Positive
B. FP : False Positive
C. FN : False Negative
The boxed region was detected by AI,
and is followed by the AI Confidence Score for detection.

$$\text{Accuracy (\%)} = \frac{TP}{TP + FP + FN} \times 100$$

$$\text{Precision (\%)} = \frac{TP}{TP + FP} \times 100$$

$$\text{Recall (\%)} = \frac{TP}{TP + FN} \times 100$$

Fig. 3 Formulas for Accuracy, Precision, and Recall.
Accuracy is used as a performance metric to indicate how well the AI detection. Precision is a measure of the purity of the AI detection. Recall is a measure of the comprehensiveness of the AI detection.

Table1 Accuracy, Precision, and Recall at 60% confidence threshold.

AI	Accuracy(%)					Prec-ision (%)	Recall (%)
	All	Flower	Unripe	Semi-ripe	Fully ripe		
Pre-Rebuilding	90	57	95	97	94	99	90
Rebuilding	92	86	92	94	93	99	92

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Combinatorial effects of longan peel extract and food additives on oxidative stability of edible oils

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INTRODUCTION

A large quantity of longan peel which accounts for 12.4 – 19.6% of the whole fruit weight is annually produced from processing of fruits, and it is currently discarded (Sruamsiri and Silman, 2015). The by-product, in fact, is rich in phenolics, which gallic acid, ellagic acid, and corilagin are the main components (Rakariyatham et al, 2020). Therefore, current research explored the antioxidant activities of longan peel extract together with various food additives in edible oil systems. System 1: Tuna oil under accelerated storage at 50 °C. System 2: Soybean oil heated at 180 °C (frying temperature).

RESULTS AND DISCUSSION

System 1: Tuna oil under accelerated storage at 50 °C. The results demonstrated synergistic effects of longan peel extract (LP)/vitamin E (E)/ascorbyl palmitate (AP) pretreatment against lipid oxidation in the oil by decreasing conjugated dienes, thiobarbituric acid reactive substances (TBARS), particular volatile compounds including octanal, and free radicals in the oil (Rakariyatham et. al, 2021).

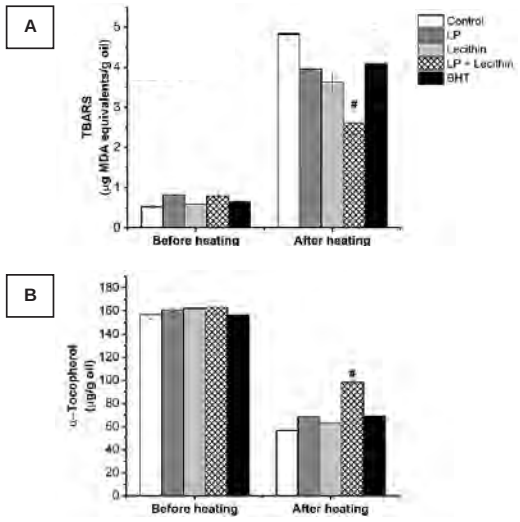

Fig. 1. TBARS (A) and α-tocopherol content (B) in refined soybean oil before and after heating at 180 °C for 24 h. LP, longan peel extract. # symbol expresses synergistic effects. (Rakariyatham et al, 2024)

System 2: Soybean oil heated at 180 °C (frying temperature). The results demonstrated synergistic effects of LP/lecithin by decreasing TBARS and maintaining the level of natural vitamin E (α-tocopherol). In addition, the combination pretreatment also lengthened shelf-life of fried shrimp crackers that were cooked in the oil (Fig. 1). In conclusion, our results exhibited the potential of LP used in combination with food additives to enhance oxidative stability of edible oils (Rakariyatham et al, 2024).

REMARKS / DISCLAIMERS

This work has been published previously in **LWT-Food Science and Technology, Volume 152, December 2021, 112275** and **LWT-Food Science and Technology, Volume 198, 15 April 2024, 116065**, the results presented herewith are for communication purposes of previously published work by the authors only.

ACKNOWLEDGEMENT

Funding: This work was supported by the National Natural Science Foundation of China [grant number 31871759]; Dalian Science and Technology Innovation Fund Project [grant number 2019J11CY005]; Central Funds Guiding the Local Science and Technology Development [2020JH6/10500002]; and Faculty of Agro-Industry, Chiang Mai University, Chiang Mai, Thailand.

I also thank Qingdao Seawit Life Science Co., Ltd. and Thai Vegetable Oil Public Co., Ltd for providing refined oils to use in this study.

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Effect of harvest maturity on passion fruits quality

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Introduction

Passion fruit (*Passiflora edulis*) is one of the important fruits in Taiwan. With high nutrient content and special flavor, passion fruit become the popular fruit in the market. 'Jin-mi No.3' is a new passion fruit cultivar in Taiwan with low acidity and high sweetness. The peel turns to light-yellow after ripening, which is differ from the other cultivars. Passion fruit with high harvesting maturity may enhance edible ratio and flavor. However, the fruit may drop before arriving high harvesting maturity stage. Therefore, we investigate the fruit growth from the day after anthesis till three different harvesting maturities. Fruits with various harvesting maturities stored in different temperature to establish the optimal parameter for harvesting maturity and storage temperature.

Method And Results

Fruits of 'Jin-mi No.3' was planted in Xingang township, Chiayi County. The flowers were marked in the day of anthesis. The growth of passion fruits was measured every two days. Fruits were harvested in three different harvesting maturity stages (early-, middle-, and late-harvesting maturity). Fruits with various harvesting maturities stored in different temperature (20 and 15 ºC). Parameters of fruit quality and physiology were determined during the storage.

Results AND discussions

The ripening of passion fruits was affected by harvesting maturity and storage temperature. Fruits in early harvesting maturity stage took longer time to finish the peel coloring than this harvested at late stage. Besides, temperature also delay the peel color changing during storage. Peel color changing in fruits stored under 20 ºC is earlier than those in 15 ºC (Figure 1&2).

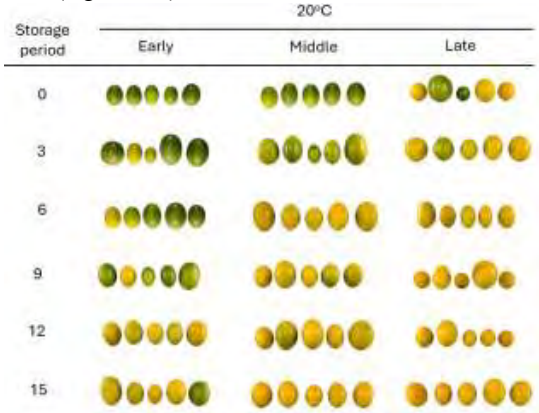

Figure 1. Fruits of 'Jin-mi No.3' with different harvesting maturities stored at 20 ºC.

The quality parameter for passion fruit could include sweetness, acidity, aroma, appearance, and texture. High harvesting maturities may enhance the appearance when fruit ripening. The days with optimal quality of fruits after harvested were 12 day (stored under 20 ºC) and 15 day (stored under 15 ºC). To conclude, lower temperature can prolong the shelf-life passion fruit. Higher harvesting maturities can promote the appearance during storage. 'Jin-mi No.3' with high harvesting maturities stored under 15 ºC is recommended.

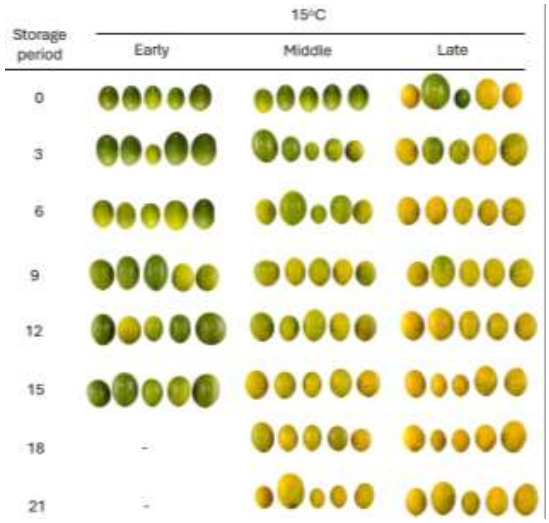

Figure 2. Fruits of 'Jin-mi No.3' with different harvesting maturities stored at 15 ºC.

Figure 3. The optimal quality for passion fruits in three harvesting maturities under 20 and 15 ºC.

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Enhancing Functionality of Whey Protein Concentrate (WPC) with Galacto-Oligosaccharide (GOS) via the Maillard Reaction

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Introduction

Maillard reaction (MR), also referred to as Maillard conjugation and glycation, occurs naturally without the use of any chemicals and is commonly recognized as a non-enzymatic browning reaction[1]. MR is a process involving the interaction between amino groups, present in amino acids, peptides, or proteins, and reducing sugars[2]. The protein-polysaccharide conjugates developed by the MR can be applied as novel emulsifiers in food production[3]. Several studies have indicated that MR can enhance the functional properties of proteins, including solubility, thermal stability, colloidal stability, and emulsification[4].

Based on this background, this study investigated how varying the WPC-GOS ratio and reaction time affected the characteristics and functionality of conjugated WPC. Ratios of 2:1, 1:1, and 1:2 were heated at 90°C for 0, 2, 4, and 6 h. Analyses covered color development, degree of glycation (DG), molecular weight distribution (SDS-PAGE), functional group composition (FTIR), microstructure, protein functionality (emulsifying and foaming), and antioxidant activity.

Results and Discussions

The conjugation process influenced the color parameter by increasing a* and b* values and decreasing L* value, resulting in the emergence of a yellow color, a characteristic outcome of the Maillard Reaction (MR) (Fig. 1). The decrease in L* value indicated darkening of the samples with extended heating time, while the increase in a* and b* values suggested the emergence of red and yellow hues, respectively. The emulsifying activity index (EAI) of WPC-GOS conjugates was significantly higher ($p < 0.05$) compared to both the control group (WPC) and the WPC-GOS mixtures (Table 2). Among the conjugates, those with a ratio of 1:2 and processed for 6 h exhibited the greatest emulsifying activity (24.28%). Conjugates processed for 2-4 h at ratios of 1:1 and 1:2 showed no significant difference ($p \geq 0.05$) in EAI. Similarly, the emulsion stability index (ESI) of the WPC-GOS conjugates was significantly higher ($p < 0.05$) than that of WPC and the WPC-GOS mixes, mirroring the trend observed in EAI. The conjugates processed for a duration exhibited the highest emulsion stability values ranging from 48.02 to 52.09 min. Notably, the WPC-GOS conjugates at a ratio of 1:2 showed significant improvement compared to WPC and WPC-GOS mixes during heating, with foam capacity (FC) and foam stability (FS) reaching their highest values (63.32% and 77.87%, respectively) at 6 hours (Table 1).

Acknowledgment

We gratefully acknowledge the financial support of the Fundamental Fund.

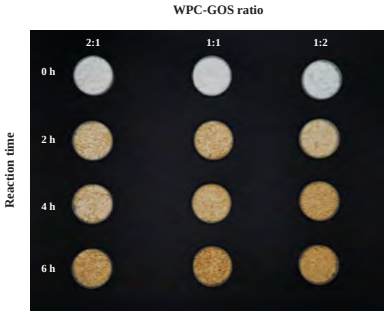

Fig. 1. Changes in color of WPC conjugated with GOS after different ratios (WPC-GOS) and heating times.

Table 1. Functional properties of whey protein concentrate (WPC) and WPC conjugated with GOS after different ratios (WPC-GOS) and heating times.

Ratio	Time (h)	EAI (m^2/g)	ESI (min)	FC (%)	FS (%)
WPC		14.14 ± 0.43^{c}	28.44 ± 0.58^{d}	32.50 ± 1.09^{e}	53.08 ± 1.21^{d}
2:1	0	14.23 ± 0.25^{c}	29.52 ± 0.77^{d}	32.50 ± 1.04^{e}	54.68 ± 1.05^{d}
	2	19.09 ± 0.29^{b}	40.17 ± 0.55^{c}	41.15 ± 1.01^{d}	58.31 ± 1.00^{c}
	4	19.62 ± 0.27^{b}	48.02 ± 0.90^{ab}	46.30 ± 1.10^{c}	61.16 ± 1.11^{bc}
	6	21.10 ± 0.41^{b}	49.09 ± 0.60^{a}	48.67 ± 1.05^{c}	64.75 ± 1.06^{b}
1:1	0	14.52 ± 0.38^{c}	29.94 ± 0.99^{d}	33.55 ± 1.09^{e}	52.85 ± 0.78^{d}
	2	19.09 ± 0.43^{b}	40.47 ± 0.74^{c}	44.71 ± 1.13^{cd}	58.31 ± 1.00^{c}
	4	20.60 ± 0.33^{b}	48.94 ± 0.61^{ab}	47.16 ± 1.06^{c}	65.28 ± 1.07^{b}
	6	22.15 ± 0.61^{b}	50.91 ± 0.86^{a}	53.68 ± 1.05^{b}	67.98 ± 1.19^{b}
1:2	0	15.59 ± 0.39^{c}	30.31 ± 0.58^{d}	35.13 ± 1.06^{e}	53.15 ± 1.04^{d}
	2	19.22 ± 0.32^{b}	42.02 ± 0.98^{c}	49.30 ± 1.07^{c}	69.30 ± 1.18^{b}
	4	20.70 ± 0.38^{b}	48.94 ± 0.82^{ab}	54.87 ± 1.18^{b}	74.22 ± 1.13^{ab}
	6	24.28 ± 0.45^{a}	52.09 ± 0.98^{a}	63.32 ± 1.05^{a}	77.87 ± 1.21^{a}

Each value is an average of three samples ± standard deviation. The means followed by different letters in the same row are significantly different ($p < 0.05$) by Duncan's multiple range test.

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How to improve crop productivity for sustainable agriculture

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Microbial materials of different complexities are used to reveal the laws that govern plant-microbe interactions. These interactions contribute to plant growth promotion and disease resistance, which ultimately leads to sustainable agriculture. Metagenomics is used to analyze microbiomes, and it has revealed the diversity of microorganisms that are associated with plants. It is important to identify molecular functions associated with plant-microbiome interactions to develop microbiota-derived technologies that can be applied to agriculture. Understanding the microbial community can accelerate the discovery of microbiome benefits to plants.
We have analyzed the microbial community that is symbiotic with sugarcane in a specific area of Higash-kagawa city, Kagawa Prefecture and Kenya.

INTRODUCTION

Sugarcane (*Saccharum* spp. hybrid) is an economically important crop that is used worldwide for the production of sugar and biofuel. Sugarcane requires large amounts of nitrogen during the growing season, but up to 70% of the total nitrogen needed for growth may be obtained through incidental nitrogen fixation (1). Multi-year field trials in Brazilian sugarcane production systems have demonstrated that up to 40 kg/ha/y of nitrogen can be obtained through associated nitrogen fixation (1). Therefore, nitrogen fertilizer application in Brazilian sugarcane production is considerably lower than in other countries due to nitrogen fixation associated with Brazilian sugarcane (2). Next-generation sequencing technology is being used to profile the microbial community of sugarcane endophytic fungi by 16S rRNA sequencing. Moreover, nifH gene sequencing is being used to study nitrogen-fixing bacterial communities. It has been found that nitrogen-fixing bacteria in sugarcane vary among different varieties, mainly in Brazil. Sugarcane in Japan is mainly grown in warmer regions such as Okinawa and Kagoshima prefectures. However, Higash-kagawa city in Kagawa Prefecture, which is located on the border between Kagawa and Tokushima Prefectures, which is situated at a more northerly latitude than Okinawa and Kagoshima prefectures, are also known for growing sugarcane (3). *S. sinense* is one of the sugarcane species used to make traditional Japanese wasanbon sugar, a high-grade sugar ingredient that trades at $10-15 per 100 grams. Wasanbon sugar is made exclusively from sugarcane grown in the Kagawa and Tokushima prefectural borders, and the raw material for this sugar is a commercial variety derived from *S. sinsense*. While the climate of the region and commercial varieties have been known to affect the quality of wasanbon sugar, research on soil microorganisms has not been conducted. The purpose of this study is to characterize the symbiotic bacteria of sugarcane grown in Higashi-kagawa city and compared sugarcane grown in Kenya.

RESULTS AND DISCUSSIONS

The study utilized 16S rRNA gene sequencing to extract DNA from sugarcane roots grown in Kenya and Higashi-kagawa city, and to analyze the relative abundance of microbial communities (Fig.1). In bacteria isolated from sugarcane roots in Higashi-kagawa city, the most abundant phylum was *Proteobacteria*, followed by *Verrucomicrobia*, *Acidobacteria*, and *Actinobacteria*, with accounting for over 70% of the bacterial taxa. Conversely, at the phylum level, *Actinobacteria* made up 40% of the major bacteria in Kenyan sugarcane, followed by *Proteobacteria* at 30%. This revealed a distinct pattern from the endophytic bacteria found in sugarcane roots in Higashi-kagawa. It is evident that the endophytic bacteria living in sugarcane vary from area, and the bacteria that are well-suited to the soil environment are the primary symbionts. Sugarcane forms a symbiotic relationship with bacteria that possess high nitrogen-fixing activity, eliminating the need for fertilizer. The identification of bacteria with unique, high nitrogen-fixing activity in a specific region may promote sustainable agriculture. It will be necessary to use the same sugarcane variety in future studies, as the variety used in this research differed.

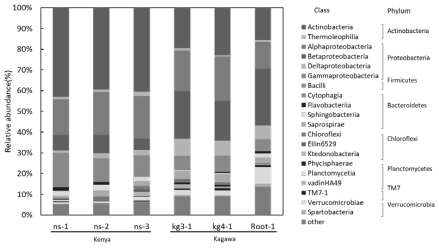

Fig.1 Community flora analysis of bacteria symbiotic with sugarcane roots in Kenya and Higashikagawa, Japan. phylogenetic analysis was performed using the Qiime2 program.

ACKNOWLEDGMENT

This work was supported by a Fund, Faculty of Agriculture Regional Agricultural Development Research

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Primary resin acids are involved in amber color formation of aged pine fatwood woodwork

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Introduction

Pine fatwood woodwork is a traditional woodwork in Kagawa Prefecture, Japan. The region produces good-quality black pine wood. Pine fatwood is a rare pine wood that is more than 300 years old and contains more pine resin than normal pine wood. However, pine fatwood is not a pine species. It is sometimes found at the base of old pine trees and a rare timber that contains plenty of resin. The fatwood is dried for 20 years or more and shaped by a wheel to make dishes, trays, and tea-ware; such products are called 'Koematsu woodwork' in Japan. Although these woodcrafts are not painted with vanish or oil, an amber color develops over time, the mechanism of formation of the amber color in pine woodwork has not yet been studied.

In this study, we analyze the content and chemical composition of pine fatwood resin and conduct model coating tests using pine fatwood resin to elucidate the mechanism of formation of the amber color in aged pine fatwood woodwork.

Results and discussions

Figure 1 shows the color changes in wood treated with pine fatwood extract, rosin, and abietic acid under UV irradiation. The wood treated with fatwood extract became darker in color after 3–5 days. However, the wood treated with rosin showed slight discoloration, and the wood treated with abietic acid showed little discoloration. This kind of discoloration with pine fatwood extract was not observed at room temperature or at 80 °C, which indicates that the reaction was a radical reaction promoted by UV irradiation. The pine fatwood extract polymerized on a silicone sheet using UV, heat, and azobiso(butyronitrile) (AIBN) did not show any discoloration.

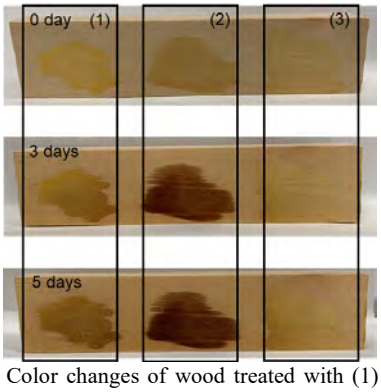

Figure 1. Color changes of wood treated with (1) rosin, (2) pine fatwood extract, and (3) abietic acid under UV irradiation.

Table 1. Compositions of resn acids in pine fatwood extract and normal pine wood extract.

compound	pine fatwood (40-60 mesh)	pine fatwood (60-80 mesh)	pine wood (100 years)	pine wood (200 years)	rosin
(1) pimaric acid	9.4	10.1	13.2	tr	4.9
(2) sandaracopimaric acid	2.1	2.1	1.5	tr	tr
(3) isopimaric acid	13.5	13.2	7.9	tr	tr
(4) levopimaric acid	11.2	8.5	1.1	tr	tr
(5) dehydroabietic acid	14.1	15.8	28.2	4.2	28.7
(6) abietic acid	18.5	21.3	6.8	tr	15.6

(% of extract)

The color analysis showed that the greatest change in the color coordinates occurred for the L* value (lightness) of wood treated with pine fatwood extract, while the L* value decreased by Δ-25 and Δ-30 at three days and five days, respectively. A similar decrease in the L* value was observed in the wood treated with rosin; the L* value decreased by Δ-7.7 and Δ-11.9 at three days and five days, respectively. However, the a* and b* chromaticity coordinates did not correlate with the color change of wood treated with pine fatwood extract.

Table 1 shows the composition of the resin acids in the pine fatwood and normal pine wood extracts. The pine fatwood extract contained a higher ratio of levopimaric acid and isopimaric acid than normal pine wood. Pimaric acid and sandaracopimaric acid content was not different between the pine fatwood and normal pine wood. Several studies have been conducted on the chemical composition of pine resins and rosins using GC-MS because composition is one of the most critical factors in the industrial processing of these materials. The results vary depending on the species, growing area, sample, and extraction method. The main compounds in resin acids are secondary resin acids such as dehydroabietic acid and abietic acid, although secondary resin acids are not present in raw pine wood. Denatured resin acids form primary resin acids such as pimaric acid, isopimaric acid, and levopimaric acid via oxidation and isomerization during extraction or distillation.

In this study, wood treated with pine fatwood extract under UV irradiation showed significantly reduced brightness. The pine fatwood extract contained more primary resin acids, such as levopimaric and isopimaric acids, than the normal pine wood extract. The fatwood extracts polymerized using UV, heat, or AIBN did not show this type of discoloration. These results indicate that the primary resin acids contained in pine fatwood are radicalized by UV light and react with lignin or other heartwood compounds, resulting in the formation of an amber color in the pine fatwood woodwork. The study would prompt reevaluation of the value of 'Koematsu woodwork,' and contribute to the recovery of local wood industry.

Acknowledgment

Pine fatwood was kindly gifted from Craft Arioka (Takamatsu, Kagawa Prefecture).

Proteomic analysis of Mesona chinensis polysaccharides-induced aggregation of milk proteins

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Introduction

Mesona chinensis also named Hsian-Tsao, Herb Jelly, and Mesona chinensis benth, is a yearly herbaceous plant containing a distinct flavor from the *Lamiaceae* family [1]. Hsian-Tsao has been extensively studied in the field of foods and pharmaceuticals for biological functions like antioxidants, protection against heat stroke, hepatoprotective, and anti-hypertensive [2]. Some researchers studied an important medical and edible plant resource, that was usually employed as food ingredients in the production of herbal tea jam-type desserts and edible gel [3]. The main constituents isolated from *Mesona chinensis* are polysaccharides, flavonoids, terpenoids polyphenols, and so on. As the main component of *Mesona chinensis*, *Mesona chinensis* polysaccharide (MCP) has attracted a great deal of attention for various biological activities such as anti-oxidant, immunoregulation, and anti-diabetics [4] [5].

Results and discussions

Recently, there has been some research on the interactions between food proteins and polysaccharides, which are biological systems and applications in the development of products for the food or pharmaceutical industries. The main constituents isolated from *Mesona chinensis* are polysaccharides, flavonoids, terpenoids polyphenols, and so on. The study aimed to use polysaccharides from *Mesona chinensis* (MCP), the effects of milk treatments on gel properties and microstructure.

The MCP-induced aggregation of milk proteins was investigated using proteomic approaches. The addition of MCP (0, 0.5, 1, 1.5, 2.0, 2.5, and 3.0 %) with milk caused the milk proteins to aggregate after a 1 h incubation period as Fig. 1. Then, MCP-milk was divided into supernatant and precipitated as Fig. 2. Gel electrophoresis revealed a drop in the total intensity of αs-casein (from 100 to 8.09%), β-casein (from 100 to 6.47%), κ-casein (from 100 to 1.35%), and β-lactoglobulin (from 100 to 31.59%) in the protein bands with supernatant, conversely, in the precipitate, which revealed a rise in the total intensity of αs-casein (from 0.0 to 100%), β-casein (from 0.0 to 100%), κ-casein (from 0.0 to 100%), and β-lactoglobulin (from 0.0 to 100%) as Fig. 3. Therefore, these results indicated that the proteins underwent aggregation in the casein proteins of MCP-containing milk.

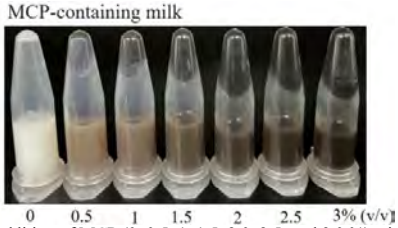

Fig. 1. The addition of MCP (0, 0.5, 1, 1.5, 2.0, 2.5, and 3.0 %) with milk.

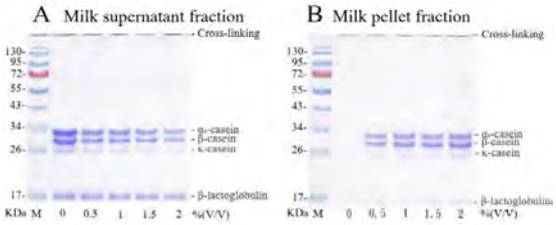

Fig. 2. SDS-PAGE profiles of supernatant and precipitate in milk with MCP (0, 0.5, 1.0, 1.5, and 2.0%) for various lengths of amounts. A. supernatant B. precipitate; M. protein markers.

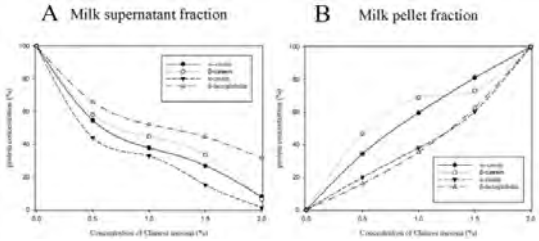

Fig. 3. Densitograms corresponding to the SDS-PAGE analysis of αs-casein, β-casein, κ-casein, and β-lactoglobulin in milk with varying amounts of MCP (0, 0.5, 1.0, 1.5, and 2.0 %) in the supernatant. The results are expressed as arbitrary units (A.U.), which were determined using the Gel-Pro Analyzer software package. Vertical bars represent standard deviations.

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Saccharomyces Isolated from Traditional Fermented Tea (Miang) and Its Feasible Applications

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This study assessed a yeast strain from traditional fermented tea leaves (*Camellia sinensis* var. *assamica*), Miang from northern Thailand, for its ability to grow and produce ethanol in the presence of tannin. Among 43 Miang samples, 25 yeast isolates formed gas in 1% (w/v) tannin, only ML1-1 and ML1-2 produced ethanol and tolerated tannin. These were identified as *Pichia occidentalis* and *Saccharomyces cerevisiae*, respectively. *S. cerevisiae* ML1-2 was selected for further study and exhibited growth at 20–35 °C, pH 4–7, and tolerance to high sugar concentrations of up to 350 g/L. Supplementation of 1% (w/v) tannin had no effect on sugar utilization and ethanol production, while delayed sugar consumption and ethanol production were observed in the reference strain *S. cerevisiae* TISTR 5088. In high-tannin fermentation with Java plum fruit and ground seed, *S. cerevisiae* ML1-2 outperformed *S. cerevisiae* TISTR 5088 in growth and increased ethanol, polyphenols, tannin, and flavonoid content, indicating its potential for high-tannin substrate-based ethanol production or functional alcoholic beverages.

INTRODUCTION

Many microorganisms can convert glucose to ethanol, with *Saccharomyces cerevisiae* being the most well-known for rapid glucose fermentation under anaerobic conditions [1]. Various *S. cerevisiae* strains are crucial for producing quality alcoholic beverages. Effective ethanol fermentation requires yeasts that withstand stress conditions like high osmotic pressure and growth inhibitors [2]. Yeast strains capable of tannin tolerance are also desirable for reducing astringency in wine production. Miang, a fermented tea from *Camellia sinensis* var. *assamica*, is produced in northern Thailand and contains high tannin levels, which increase after fermentation [3,4]. This makes Miang an interesting source for tannin-tolerant microorganisms. Previous studies identified tannin-tolerant yeasts in Miang, such as *Candida ethanolica*, *Debaryomyces hansenii*, and *Cyberlindnera rhodanensis* [5]. However, the potential of these yeasts for ethanol fermentation under high tannin conditions needs further investigation. This study aims to evaluate a yeast strain from Miang for its ability to grow and produce ethanol in high-tannin environments, enhancing strategies for ethanol fermentation and developing alcoholic beverages from high-tannin substrates.

RESULTS AND DISCUSSIONS

Miang samples from 43 markets in five northern Thailand provinces were screened for tannin-tolerant, ethanol-producing yeasts. Among 25 gas-forming samples, only four formed colonies on chloramphenicol-supplemented YPD agar. Seven distinct colonies were tested in YPD broth with 1% (w/v) tannic acid, confirming tannin tolerance and ethanol production abilities. ML1-2 showed the highest sugar consumption and ethanol production (0.35 g/g substrate). Isolates ML1-1 and ML1-2 were investigated for colony morphology after 48 hours at 30°C (Fig. 1). All yeast isolates were identified using the comparison of D1/D2 region sequences with those of the closest species from CBS culture collection. It was found that isolates ML1-1 and ML1-2 were identified to be *Pichia occidentalis* and *Saccharomyces cerevisiae*, respectively, sharing 100% similarity with the type strains. Phylogenetic analysis confirmed these identifications.

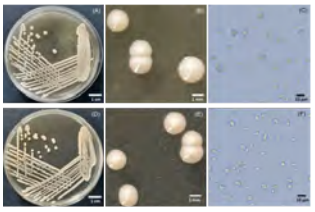

Fig. 1. Cell morphology of *P. occidentalis* ML1-1 (A–C) and *S. cerevisiae* ML1-2 (D–F) on YPD agar after incubation at 30 °C for 48 h.

S. cerevisiae ML1-2 utilized glucose and sucrose for ethanol production, with optimal growth at pH 4-7 and temperatures of 25-30°C. Ethanol production decreased significantly at tannin concentrations above 1%. In YPD medium with 350 g/L glucose and 10% tannin concentrations, ethanol production from ML1-2 (81 g/L) was higher than TISTR 5088 (52.1 g/L) (Fig. 2).

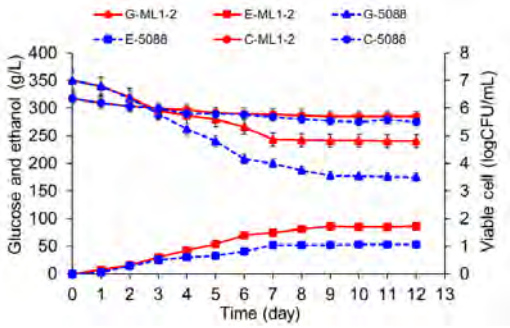

Fig. 2. The profiles of ethanol, glucose, and viable cell count during fermentation of YPD broth containing 10% tannin by *S. cerevisiae* ML1-2 and *S. cerevisiae* TISTR 5088 at 30 °C for 12 days. C: viable cell count; E: ethanol concentration; G: glucose concentration.

Java plum fruit wine fermented with ML1-2 resulted in higher ethanol production and improved bioactive compounds compared to TISTR 5088. Before fermentation, Java plum pulp (JP) showed lower levels of total polyphenols (TP), total tannins (TT), total flavonoids (TF), and DPPH antioxidant activity compared to JP with ground seeds (JPS). During fermentation, total sugar content of JP fermented with ML1-2 decreased to 88.9 g/L, while JP with TISTR 5088 had 90.1 g/L. Ethanol production was higher with ML1-2 (132.8 g/L) than TISTR 5088 (130.7 g/L). In JPS fermentation, ML1-2 reduced total sugar to 108.7 g/L by day 6, with 122.7 g/L ethanol production, compared to TISTR 5088 (193.7 g/L sugar and 80.2 g/L ethanol). TP content increased for both JP and JPS during fermentation. TT and TF remained stable, while DPPH antioxidant activity increased significantly, particularly in JPS with ML1-2. The DPPH antioxidant scavenging activity was found to be higher in the JPS fermented with ML1-2 compared to the uninoculated JPS, with an approximately 5-fold increase at the end of fermentation. Meanwhile, the JPS fermented with 5088 increased by around 2.5 times. The study highlights the potential of *S. cerevisiae* ML1-2 for enhancing ethanol production and bioactive compounds in tannin-rich fermentations.

Table 1. The fermentation parameters of Java plum fruit wine fermented with ground seed by two yeast isolates, *Saccharomyces cerevisiae* ML1-2 and *Saccharomyces cerevisiae* TISTR 5088 at 30 °C for 12 days.

Parameter	Before inoculating	After fermentation for 12 days	
		ML1-2	TISTR 5088
Total sugar con. (g/L)	350±0.31	15.1±0.66	20.2±0.62
Ethanol con. (g/L)	0	168.6±0.38	165.3±0.82
Viable cell (logCFU/mL)	0	7.61±0.03	7.64±0.05
pH	3.67±0.05	3.98±0.03	3.96±0.02
Total polyphenol (mg GAE/mL)	1.72±0.07	3.54±0.13	2.65±0.19
Total tannin (mg TAE/mL)	2.21±0.03	2.34±0.07	2.11±0.08
Total flavonoid (µg QE/mL)	45.11±0.73	43.21±0.27	41.21±0.38
$1/IC_{50}$	1.67±0.22	9.54±0.10	4.42±0.17

ACKNOWLEDGMENTS

The authors are grateful to the Faculty of Agro-Industry for research facilities. This research work was supported by CMU Junior Research Fellowship Program and the National Research Council of Thailand (NRCT).

This works have been accepted or published previously in (Microbiology Research, 14(4), 1969-1983), the results presented herewith are for communication purposes of previously published work by the authors only"

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Selenium Biotransformation and Bioactivity of Polysaccharide Extraction from *Pleurotus ostreatus.*

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Introduction

Selenium (Se) is an essential trace element with important biological functions. *Pleurotus ostreatus*, an edible mushroom, can bioaccumulate Se and produce Se-enriched polysaccharides. This study aimed to investigate the effects of different Se treatments of the substrate on the characteristics of Se-polysaccharides extracted from *P.ostreatus* and evaluate the antioxidant activity in terms of DPPH and ABTS radical scavengers. *P.ostreatus* was cultivated in a substrate supplemented with sodium selenite at concentrations of 200, 400, 600, and 800 mg/kg with a control. The crude polysaccharides were extracted, and the purity of the polysaccharides and Se content were analysed.

Results and Discussion

The yield and purity of crude polysaccharides are shown in Table 1. The significantly ($p < 0.05$) higher yield of 8.62% and purity of 72.17% at the absorbance, of 490 nm was observed in the 800 mg/kg Se enriched substrate.

Table 1 Yield and the Purity of Se Polysaccharide

Content of Se in substrate(mg/kg)	Yield (%)	Purity (%)
0	5.73±0.52^{cd}	54.39±0.39^{cd}
200	5.38±0.41^{d}	44.91±0.21^{d}
400	6.46±0.05^{bc}	69.60±0.78^{ab}
600	6.92±0.06^{b}	61.08±0.33^{bc}
800	8.62±0.01^{a}	72.17±0.98^{a}

Means with different letters $^{a-d}$ within a row are significantly different ($p < 0.05$). Each value is expressed as mean SD (n = 3).

The Se concentration of polysaccharide was also significantly highest ($p < 0.05$) in the concentration 800 mg/kg Se enriched substrate with a concentration of 196.03 µg/g illustrated in Fig. 1. The enhanced purity and Se content of the polysaccharides in the concentration 800 mg/kg of Se enriched substrate suggests that *P.ostreatus* can effectively bioaccumulate Se and incorporate it into the polysaccharide structure. The bioactivity of the Se-polysaccharides at the substrate concentration, 800 mg/kg was further evaluated using DPPH and ABTS radical scavenging assays, which showed promising antioxidants of 25.13±0.01% and 30.17±0.01% as a Trolox equivalent.

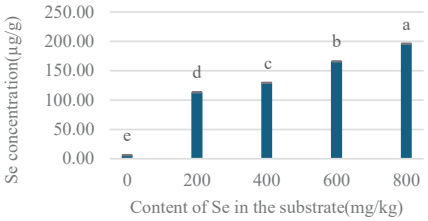

Fig. 1. Selenium concentration in *P. ostreatus* at different Se (as sodium selenite) substrate levels. Error bars indicate the SD of the mean (n = 3). Different letters $^{a-e}$ indicate significant differences ($p < 0.05$)

This study demonstrates the ability of *P. ostreatus* to bio transform Se into bioactive Se-polysaccharides. The findings have implications for the significant impact on the development of Se-polysaccharides as a higher bioactive component in accordance with the growing demand from consumers for natural products that promote general health benefits.

Acknowledgment

The authors are grateful to the Thailand International Corporation Agency for the financial support and the scholarship for the master's degree in food science & technology and the research grant, the supply of necessary chemicals and equipment from the Faculty of Agro-Industry, Chiang Mai University, to conduct the laboratory analysis.

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Unlocking Academic Opportunities: Navigating Study Paths at the Faculty of Agriculture for International Scholars & Students

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Introduction

Globalization has created both challenges and opportunities in education and research. It has also facilitated advancements in research and education with a focus on sustainability, which has emerged as a comprehensive global objective. Japan, as the fourth largest donor of Official Development Assistance (ODA) in education, contributes 836 million USD, predominantly targeting low-income countries[1]. Conversely, middle- and upper-middle-income countries (such as Thailand), do not receive targeted funding. Despite the lack of financial support for these countries, Japan remains an attractive destination for study because of its high standards in research and educational and its relative affordability.

Results and discussions

"Japan's position is stronger than has been appreciated in the past"[2] and is globally recognized for its academic excellence, with Kagawa University ranked 88th nationally[3]. From both educational and research perspectives, Japan is a highly desirable destination. Japan is also known for safety and a welcoming attitude toward international students. Although, Japan has been perceived as an expensive country, this perception is now outdated. Various factors have rendered Japan a more affordable option for international students. Tuition fees are approximately ¥280,000 per semester, with an entrance fee of ¥300,000. Kagawa University offers fee waivers for graduate students, covering 50% of the tuition, which reduces the tuition fee for a master's program to approximately ¥860,000.

The Japanese yen has experienced a significant depreciation in value. Between June 22, 2019, and June 21, 2024, the yen reached its lowest value of 0.006263 US Dollars per Japanese yen on June 21, 2024, marking an overall decline of 32.79% compared to the US Dollar.

Fig. 1. Depreciation of the Japanese Yen Against the US Dollar: June 22, 2019 - June 21, 2024

Compared to the Thai Baht, over the same five-year period, the Japanese yen decreased in value by 19.77%, reaching its lowest value of 0.2296 Thai Baht per Japanese yen on June 21, 2024.

Fig. 2. Depreciation of the Japanese Yen Against the Thai Baht: June 22, 2019 - June 21, 2024

Compounding the effect of the weak yen is the long standing deflation which have kept prices very low in Japan since the late 1990's. Even with the 2% inflation rate targeted by the Japanese government, consumer costs remain low.[6]

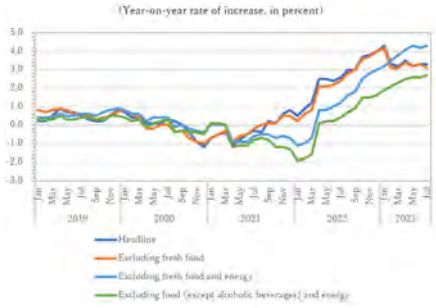

Fig. 2. Consumer Price Index: 2019 - 2023[6]

The Graduate School of Agriculture has developed special programs for international students at the master's and doctoral level, including a special program on sustainable food production. Taken together, these factors have made the Graduate School of Agriculture Kagawa University a very attractive destination for education and research.==

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• SOCIAL SESSION

Bringing down Urban-Rural Walls: a Preliminary Investigation of Visiting Teachers Program in Taiwan

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Introduction

Taiwan is a mountainous island country in the Pacific Ocean with only an area of 36,000 square kilometers but a large population of 23,400,000. Small and densely populated as it is, it has over 1,200 schools in remote areas (hereinafter referred to as rural schools), including elementary, secondary and upper-secondary schools. It is well documented that rural schools, despite their diversities, face many similar disadvantages, for examples, high teacher turnover, low student achievement, limited family support and so on. To solve the problem, Ministry of Education in Taiwan has implemented a series of policies, and one of them had focused on the recruitment and retention of quality teachers in rural schools, that is, "Act for Education Development of Schools in Remote Areas." promulgated on December 6, 2017, on the basis of which came "The Visiting Teachers Program (hereinafter referred to as VTP),". The aim of this study is to provide a preliminary investigation of effects of the program.

Overview of the Program

VTP was formulated by K-12 Education Administration, MOE and so far has entered its eight years. Through the selection of the program, many excellent in-service and retired teachers were sent to rural schools for 1 year and three at most. Those teachers received government subsidies and had to form teaching communities in the visited schools. Each community must include 5 teachers at least, the visiting teacher included. Specifically, they are expected to take on the following responsibilities *with* (emphasis added) the visited schools: (1)To promote the improvement of curriculum and instruction, (2) to foster team collaboration and learning atmosphere, (3) to enhance teachers' professional knowledge and skills, and (4) to embark on any other innovative activities that increase school effectiveness, for instance, forming cross-school strategic alliances, just to name one. Up to the school year 2022-2023, over 181 teachers joined the program and 219 schools were visited.

Picture source: MOE website.

Research Methods and Findings

This study carried out a review of relevant researches on VTP, and interviewed 5 visiting teachers and 3 staff members/teachers from visited schools. Based on results of the aforementioned review and interview, the findings are summarized as the follows.

Firstly, MOE organize professional development activities for the visiting teachers twice each semester. These activities not only empower the visiting teachers professionally but also support them emotionally, in particularly through the experience sharing between each other and lessons learned from former visiting teachers. Besides, university professors conduct inspections and provide feedback, too.

Secondly, according to some visiting teachers, their position is ambiguous, if not awkward. They are looked upon by some local teachers as 'experts' from the outside and are there to 'fix' them. In that sense, they are not welcome and sometimes even experience hostility. On the other hand, some schools treat visiting teachers as supplemental staffing, if so, there is little chance that they can fully exercise their professional expertise to the benefit of the visited schools.

Thirdly, the most successful cases are those where all the teachers and staff members of the visited schools reached consensus in advance, that is, before the visiting teachers came, knowing what needs to be done for the betterment of their schools and what the visiting teachers had to afford for the fulfillment of these visions/goals. These conditions satisfied, the visiting teachers would get along quite well with local teachers, integrate into the visited school culture within very short period of time, and therefore help improve the visited schools to the greatest extent possible.

Conclusion

To reduce the urban-rural disparity in educational (e)quality, our MOE has implemented many policies. VTP is only one among many. It reached certain success indeed but leave some problems unsolved. With eight years of implementation experience and implications thereof, it is believed that VTP will be more effective in the future.

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Cultural Canopies: Bridging Heritage and Urban Green Engagement in Chiang Mai City

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Introduction

As urban populations expand, the demand for accessible green spaces has become critical. Chiang Mai exemplifies this trend, where rapid population growth has highlighted a shortfall in green spaces as per WHO guidelines. Despite governmental efforts to enhance urban greenery, a significant gap persists between these initiatives and resident engagement. Contemporary urban planning often emphasizes the utilitarian benefits of vegetation, such as improving air quality and providing recreational areas, while overlooking the cultural and social significance that plants hold for local communities. This study proposes integrating cultural concepts and community participation to bridge this gap, focusing on Chiang Mai to demonstrate how cultural values can enhance urban green space management, fostering deeper appreciation and active involvement among urban residents.

This study employs a multifaceted approach, incorporating ground surveys, data recording, community interviews, and literature reviews. Ground surveys document existing green spaces and large trees within urban areas, while community interviews gather insights on the cultural significance and utility of various tree species. Photographic and sketch mapping provide visual documentation of tree locations and community green spaces. An academic review cross-references findings with existing literature, validating and enriching the data. Resident involvement is facilitated through workshops and discussions, fostering a collaborative environment for exchanging information and developing strategies for green space enhancement.

Result and Discussion

The study implemented key activities designed to integrate cultural values into urban green space management. These activities included edible tree mapping, community route design, old city tree surveys, ancient waterway route design, and the study of ancient temple paintings. These efforts highlighted the multifaceted roles that urban trees play in Chiang Mai's ecological and cultural landscape, categorized into cultural and historical significance, practical uses, and contributions to biodiversity and ecology. Trees preserved due to their historical or sacred status thrive because of community reverence and care, serving as living monuments to historical events and local legends. Practical uses include providing essential resources such as food, medicinal compounds, and materials for traditional crafts. Ecologically, trees support urban biodiversity by offering habitats and food sources for urban wildlife, contributing to ecological resilience. Post-activity assessments revealed increased awareness among younger generations regarding the practical uses and historical importance of native trees. This heightened awareness is crucial for fostering a culture of environmental stewardship, ensuring future generations value and protect urban green spaces. City tree surveys identified abnormal conditions or invasive species, leading to targeted interventions to maintain the health and vibrancy of urban forests. These interventions help prevent diseases and pests that threaten tree health, ensuring long-term sustainability.

Integrating cultural and ecological considerations into urba n tree management can significantly enhance the value and functionality of urban green spaces. By fostering a deeper connection between residents and their natural environment, these initiatives promote sustainable urban development that respects both cultural heritage and ecological integrity. This holistic approach to urban green space management in Chiang Mai underscores the importance of cultural values in environmental planning, bridging the gap between urban green initiatives and resident engagement.

Development of an ICT system using AI to encourage spontaneous activity in people with severe and multiple disabilities

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Introduction

Individuals with severe multiple disabilities often encounter significant difficulties in communicating through speech, facial expressions, or gestures, which makes it challenging for them to express their opinions. As a result, from an early age, they are often compelled to conform to the opinions of those around them. This situation leads many to abandon their potential for communication, resulting in a passive demeanor that persists into adulthood. However, if they are able to discover a method for conveying their intentions to others, they may become aware of their innate proactive intentions.

In this research, we have developed a smart home model designed to support individuals with severe multiple disabilities by employing machine learning for image and speech recognition to control household appliances. If these individuals can control household appliances using this support system, it may help them to recognize and harness their own active capabilities. This, in turn, could serve as a starting point for initiating communication with others.

Results and Discussions

Individuals with severe multiple disabilities often encounter significant difficulties with even simple speech, which is easily manageable for non-disabled individuals. This makes standard speech recognition systems challenging to use. Consequently, in this study, we have developed a user interface that can be controlled using single words through natural language processing.

Specifically, the system we have prototyped utilizes word utterances as triggers equivalent to conventional switch operations. It was designed as a smart home model system to control the color and on/off state of smart lights. We chose to focus on smart lights because, akin to using a remote control, the operation and the control result are consistently one-to-one. Unlike conversational communication, device control results, such as changing the light color, provide a clear, one-to-one visual representation of the input. This approach makes it easier for individuals with disabilities to comprehend the results of their actions and potentially experience spontaneous communication.

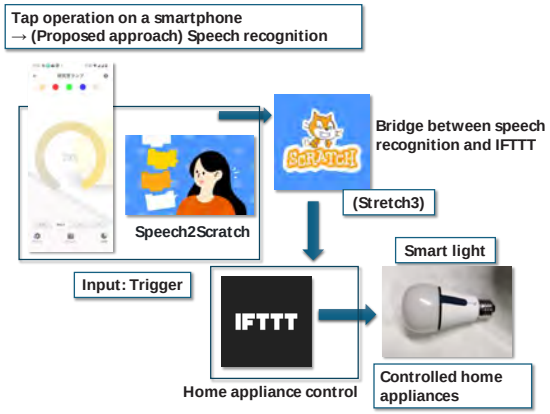

Fig1. A prototype of a voice recognition-based smart home system developed for controlling lighting.

The overview of the interface prototyped in this study is illustrated in Figure 1. The system developed here is based on a smart home system that controls smart lights using a smartphone. Under normal operation, the input part of this system is controlled by touch operations on a smartphone. However, in this study, we control the smart lights through speech utterances by individuals with disabilities.

As depicted in the figure, this user interface employs the speech recognition (Speech2Scratch) as a trigger instead of using a smartphone and controls the smart lights via IFTTT. IFTTT is a web service that integrates different SNS platforms, enabling cross-platform usage, such as sending alerts to other SNS when an email arrives. The Scratch shown in the figure is an extended version of the regular Scratch (Stretch3), serving as a bridge connecting Speech2Scratch and IFTTT.

In this study, we have proposed a smart home model employing a speech recognition system, an image recognition system, and Scratch. This model not only enables users to become aware of their ability to communicate their intentions but also contributes to enhancing their quality of life by controlling household appliances. However, it has not been verified whether individuals with severe multiple disabilities can recognize their initiative-taking abilities through the use of this support system. Consequently, it is imperative to implement practical applications of this system and verify its effectiveness in the future.

Acknowledgment

We would like to express our sincere gratitude to the 2024 Grant-in-Aid for Scientific Research (C) for their support of our project titled "Development of a Communication Support Interface to Promote Spontaneous Activity in Children with Severe Multiple Disabilities" (Project No. 23K11979), which provided partial funding for this research.

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Forging Culture of Lawfulness through the Lens of Conflict Management Theories in Addressing Environmental Issues

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Introduction

In today's world, it is undeniable that environmental issues have been considered as one of the main priorities which call for attention from the world's population. While it is indisputable that awareness raising campaigns for people to opt for the more responsible choices in their consumption, alongside laws and regulations to handle environmental problems in various aspects are significant, it needs to be emphasized that those campaigns, laws, and regulations have to be designed carefully in order to achieve the most sustainable results in addressing environmental problems.

Fostering "Culture of Lawfulness" could be considered as a plausible means among the plethora of proposed mechanisms to deal with environmental issues. The so-called "Culture of Lawfulness", however, is not an easy task for community to establish, and the assessment whether each community possesses culture of lawfulness, or how to establish the community as such highly depends on the context of each community. Since the concept of culture of lawfulness is interrelated to the attainment of a just community, fostering social cohesion, and reinforcement of the rule of law, it is believed that the community whose culture of lawfulness is strong would be likely to cooperate and unlikely to behave irresponsibly towards the community, which in turn results in the decrease of many problems, including environmental issues.

Results and Discussion

The key question in fostering the culture of lawfulness, however, is complex in many levels. The initial research suggests that the conflict management analysis theories, specifically the ACCP conflict mapping analysis, could be a tool in assessing various factors in the community which are considered hindrance to the establishment of culture of lawfulness. The ACCP concept acts as a tool to address and assess the involved actors, contents and contexts of each problem, in order to propose the most plausible and practical process in handling each issue.Furthermore, the Iceberg Theory in conflict resolution may also act as a tool to understand the underlying issues of hindrance in establishing culture of lawfulness, as it offers a concept which emphasizes the importance of human's emotions, which plays a significant role when it comes to the conformity to the rules and regulations.

This research believes that the study to assess the essential elements in order to establish the culture of lawfulness into the community through the concepts of conflict management would play a significant role in ingraining and building the community to the extent that "Culture of Lawfulness" is no longer just a concept, but practical enough to address the current global issues, and thereby makes us come closer to sustainable problem solving, including environmental issues.

Source: ETH Zurich OSCE, The Organization for Security and Cooperation in Europe Team Tumult Auswaertiges Amt ulkoministerio

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Interagency Working Group for Consistent Labor Protection Act Enforcement for Unprotected Migrant Workers

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1. INTRODUCTION

Due to legal exceptions and a lack of labor welfare protection, domestic workers in the household sector in Thailand face significant challenges in accessing healthcare and social protection, unlike other occupations in the country. Currently, there are more than 5.13 million Thai and migrant workers in this occupation (data from the National Statistical Office as of 2023). In particular, migrant workers who travel to work in Thailand do so for a variety of reasons, including the climate, economic conditions, or wars in their home countries. These factors make it difficult and unsafe for them to work and earn enough income to sustain their lives, especially given the ongoing demand for domestic workers in Thailand.

Consequently, the Labor Protection Act of 1998 established a working group to advocate for the amendment of Ministerial Regulation No. 14, with the aim of enhancing the legal protection for domestic workers in the household sector who currently lack protection.

We have chosen a working group of individuals or organizations. The group must meet several requirements, such as possessing knowledge and prior experience in the domestic worker sector, establishing a positive reputation for the organization, and fostering policy-related collaboration with the government. This includes adopting a creative approach to work. It is important to prioritize coordination and cooperation as the primary focus. Working together with a group of domestic workers is crucial.

This involves conducting a thorough assessment of the existing literature. Investigation in the specified field Considering input from stakeholders in diverse labor sectors is a criterion for the working group's selection process. This will result in the creation of a task force that will facilitate the formulation of policy recommendations and advocate for amendments to relevant legislation concerning domestic workers.

2. RESULTS AND DISCUSSIONS

The outcome of this operation was clear: a working group consisting of labor academics, employer networks, and domestic worker networks. The Civil Society Organization (CSO) and the International Organization for Migration (IOM) were composed of: 1) Assistant Ministers of Labor; 2) Informal Labor Protection Division, Department of Labor Protection and Welfare, Ministry of Labor ; 3) Thai Health Promotion Foundation (ThaiHealth); 4) Employers' Confederation of Thailand (ECOT); 5) Confederation of Thailand Labor; 6) Confederation of Informal Labor Coordination Centers of Thailand; 7) Labor Social Security Network; 8) Friends of Women Foundation; 9) Thai-Burmese Ruammitra foundation; 10) The Church of Christ in Thailand; 11) Foundation for the Health and Knowledge of Ethnic Labor (MAP Foundation); 12) Human Rights and Development Foundation (HRDF); 13) Thai Labor Museum; 14) Women Workers for Justice Group (WJG); 15) Migrant Workers Federation (MWF); 16) International Organization for Migration (IOM); 17)) Faculty of Humanities, Chiang Mai University; 18) Faculty of Public Health, Chiang Mai University; 19) UNISERV, Chiang Mai University; 20) Department of Public Health, Suratthani Rajabhat University; 21) Office of Professional Qualifications Innovation Development, Thailand Professional Qualification Institute (Public Organization); 22) The Labor Tigers Group is composed of retired civil servants from the Ministry of Labor who are still enthusiastic about their work and independent developers.

The Ministry of Labor's Department of Labor Protection and Welfare and the Office of the Assistant Minister to the Ministry of Labor have also named them as the main working group that will change Ministerial Regulation No. 14, which is about protecting domestic workers under the Labor Protection Act of 1998. Furthermore, the process of amending this law is highly complex. Therefore, it is crucial to collaborate effectively within the project working group to promote the rights and well-being of domestic workers, including both Thai and migrant workers, as well as those facing personal status issues in Thailand. In particular, domestic and international migration caused by climate change.

The policy proposals of this working group seek to modernize labor protection legislation in order to guarantee equitable access to social security for a specific group of workers. These proposals aim to address the problem of obsolete laws that do not correspond to contemporary employment practices. The Ministry of Labor expects that the working group will offer vital information to inform the academic process of modifying the law, thereby improving the rights and welfare of the vulnerable population as outlined in the recently revised ministerial regulation. The goal is to surpass previous measures in terms of protection.

3. CONCLUSION

In summary, the selection process of the working group to advocate for the amendment of the new ministerial regulation under the Labor Protection Act of 1998 with the Department of Labor Protection and Welfare, Ministry of Labor, is of utmost significance. This working group has previously fulfilled its responsibility to propose additional information regarding the protection of domestic workers under the original ministerial regulation in various areas, such as setting the minimum wage, determining working hours, specifying the number of holidays and sick leave days, regulating the employment of children, women, and pregnant women, and establishing guidelines for overtime hours. The aim of these proposals is to bring about changes in the law that will promote social coexistence, ensure fair employment, improve quality of life, and provide equal access to essential social security and welfare for vulnerable groups. By doing so, these measures aim to support the continued success of these groups and mitigate the impacts of climate change-induced migration for work purposes.

ACKNOWLEDGMENT

This project is financially supported by ThaiHealth Promotion Foundation.

Fig. 1. "Policy Forum on Protecting Migrant Domestic Workers: Achieving Equitable Well-being," organized by the Faculty of Humanities, Chiang Mai University, the Ministry of Labor, and partners on occasion on International Migrants Day.

Management of local industrial clusters in the globally competitive environment: A case study of the glove-related industry in Shikoku

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Purpose of the Study

Unlike a limited number of success stories of industrial clusters such as Silicon Valley and the Third Italy, many local industrial clusters in advanced economies are shrinking due to severe international competition. Some firms, however, continue to be resilient even in struggling clusters. This paper argues that managing a balanced web of trust-based pipelines and buzz in the *glocal* relational space—balancing detachment and embeddedness—plays a crucial role for the success of these firms. In recent decades, economic geography has had a significant focus on intra- and inter-firm pipelines and buzz inside and outside the cluster. Theoretical debates on the topic have flourished. However, empirical case studies are limited. This study attempts to fill the gap through a case study of leading firms in the glove-related industry of Shikoku, Japan. The paper suggests that bringing together the flying geese theory with the pipeline and buzz concept furthers our understanding of the processes at work.

Results and Discussion

This study has demonstrated that managing a balanced web of trust-based pipelines and buzz in the *glocal* relational space is a key for the success of leading firms in the struggling local industrial cluster. The study attempts to bring about a new way of looking at the *glocal* relational space through incorporating the flying geese theory with the pipeline and buzz concepts. This study demonstrates that in the context of an industrial cluster, the "flying geese" don't just appear. Rather, they are forged through the *glocal* relational space established and continually renewed by leading firms.

The study concludes that it is forward-looking, international-oriented leading firms which have the potential to make the cluster competitive rather than the cluster taking the dominant role itself. The empirical results in this study bear out the hypothesized model of resilient firms in a struggling local industrial cluster. Leading firms can buck the trend, and instead, grow even in a cluster with declining domestic sales. Through this case study of leading firms in the glove-related industry in Shikoku, Japan, it appears that manufacturing enterprises which build out a strong relational space of pipelines are the ones that effectively maintain resilience. Through these pipelines, medium-sized firms initially adapt to international competition and changing demographics at home by relocating their main manufacturing functions abroad. Subsequently, R&D and retail functions develop outside Japan, further generating demand for product. Paradoxically, FDI leads to a net growth of their domestic jobs in Japan. Small firms build out pipelines with relational buzz outside the cluster, with an artisan-scaled manufacturing focus within the cluster. These firms are typically owned by highly-skilled workers who focus on highly profitable niche products. In both cases, pipelines—close personal connections based on trust—are put to good use in expanding markets at home and abroad. Success stories of leading firms—"the lead geese"—diffuse through buzz in the cluster, inspiring other firms to follow suit. The trade association in the cluster plays a critical role as the information nexus: disseminating valuable information through official seminars and publications, but also through less formal means. Being near other, similar firms informally generate local buzz that is perceived to be as important as the more formal cooperative mechanisms. The trade association studied here recognizes this and has fostered informal networking among firms and workers.

This study points to the value of longitudinal empirical analysis—especially one focusing on leading firms in a "mundane" industry—in furthering our knowledge of relationships between the operational performance of corporations and their respective industrial cluster. Globalization is progressing at every imaginable scale down to the local: thus the centrality of the concept *glocal*. Both intra- and inter-firm pipelines and relational buzz help connect regions globally as well as locally. A question to be examined next would be how to harness the resilient qualities of leading firms—"the lead geese"—to the benefit of the whole industrial cluster. Balancing the corporate brand with regional branding strategies in the web of pipelines and buzz might be a point of future inquiry. The key is in synthesizing research at the firm-level and the local cluster-level as they operate in tightly embedded relational spaces of the *glocal* as a unified point of analysis.

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Policies and Their Implementations for Rural Education in Taiwan

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Introduction

Three Policies are applied and Four Actions are taken to enrich students' learning and enhance teachers' instruction in rural education.

Three Policies

1. Act for Education Development of Schools in Remote Areas
2. Act for Innovative Development of Rural Education
3. Educational Priority Area Act

Four Corresponding Actions

1. Instructional Innovation and Experimentation
2. Digitalized and Authentic Learning
3. Additional Resources and Community Connection
4. Additional Benefits and Welfare

1. Instructional Innovation and Experimentation

A. Happy Learning in Summer time(**Fig.1**)
Continuous learning in summer time: English learning, interdisciplinary instructional activities
B. Local Education to Increase Self-recognition(**Fig.2**)
Local resources and specificity and create activities for local education, increasing self-recognition
C. Short-term Immersive Learning in Local Communities
Create learning opportunities using local human recourses, promoting interests for learning, deepen the understanding of local culture

Fig.1 summer activities

Fig.2 local education

2. Digitalized and Authentic Learning (**Fig.3 & Fig.4**)

Digital Learning Mates
College students and students work together online weekly on English, Math, and Language as well as game-playing

Fig.3 digital learning mate-college students

Fig.4 digital learning mate-students at remote areas

3. Additional Resources and Community Connection

A. College Students Voluntary Service (**Fig.5**)
College students volunteer to help with students' learning (formal courses, extracurricular activities)
B. Parental Education (**Fig.6**)
Parenting education activities on weekends
C. Additional Instruction After School
Low-income family students receive supplementary remedial instruction on homework and free dinners after school
D. Hometown Coming Back Plan
Invite outstanding people to return to the community and promote hometown attractions

Fig.5 voluntary instruction

Fig.6 parenting education

4. Additional Benefits and Welfare

A. Free and Safer Accommodation for Teachers (**Fig. 7**)
Renovate teachers' dormitory to provide better living quality and boost teachers' motivation to work there and stay longer
B. Free Commute/Shuttle Bus Services for Students (**Fig.8**)
Eliminate travelling difficulties (e.g., distance issues and lack of vehicles), increate students' motivation to come to school to learn
C. Sufficient Facilities and Equipment
More budget (compared to regular areas) spent on facilities and equipment
D. Reduction of Administrative Works
In-service teachers training held mostly online to minimize the administrative works

Fig. 7 free accommodation

Fig.8 free shuttle bus

WELCOME TO TAIWAN,

LAND OF WONDERS & HOSPITALITY

Research on the possibility of sustainable art materials for the Takamatsu City Artists Dispatch

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Introduction

The purpose of this study is to identify the possibility of the sustainable art materials in the Artists® Dispatch Program in Takamatsu. The "Artists Dispatch Program" in Takamatsu city, Kagawa prefecture, is a unique project based on the Reggio Emilia Approach.

The Reggio Emilia Approach system is staffed by educators called "Pedagogista" (educators) and "Atelierista" (art teachers). [1]

Information is shared by the caregivers through documentation in which children's words, activity processes, and artwork are recorded and organized through various means, such as photographs.

The space and environment are prepared for the children to experience a variety of "art".

This approach emphasizes the importance of listening to children's voices and dialogue, as it is the right of every person and every child, and the responsibility of the community to do so. One of Reggio Emilia's facilities is a recycling center called "Remida". The materials in the "Remida" are provided to children free of charge and are used as materials for modeling.

The Artists® Dispatch Program in Takamatsu City, Kagawa Prefecture, is an original program based on the Reggio Emilia Approach, in which Artists® work with children, childcare workers, and staff. This project started in 2009. Thirty-five Artists® were dispatched to 208 childcare centers and kindergartens in FY2024.

The activities of the Artists® are not mere technical instructions in painting, sculpture, dance, music, etc.

Activities are chosen flexibly according to the children's learning and interests. These activities do not have a pre-determined curriculum. Materials, themes, and topics are determined based on the children's interests. This involvement of the Artists® supports the children's expression and exploration.

Results and discussions

This study involved an investigation and the consideration of results. The investigation consisted of a questionnaire for the Artists® and an actual case study. In early childhood education, initiatives such as the finite nature of resources are incorporated into childcare as part of environmental education. Many crafts using waste materials are featured in childcare magazines. The use of these materials is not intended from the outset to address environmental issues. They are used to expand the possibilities of play. The sustainable art materials in this context are not just waste materials. The Artists® were interviewed about the sustainable art materials they use in their activities *(n=19).*

The sustainable art materials that the artists most often used in their activities were natural materials (branches and leaves), newspaper, and wood. The first reason for using sustainable art materials in their activities was "material interest", the second was budget, and the third was environmental concern. Most of the materials were collected by the artists themselves, followed by donations from childcare centers, kindergartens, and parents.

In the activity case study, children used sustainable materials and expanded their expressions. This case study took place on 17 January 2024, at the Wako Childcare Center.

In summary, it is necessary to consider not only playing with waste materials, but also the process of using them in activities. It was also suggested that it is necessary to consider with children and caregivers how materials are perceived.

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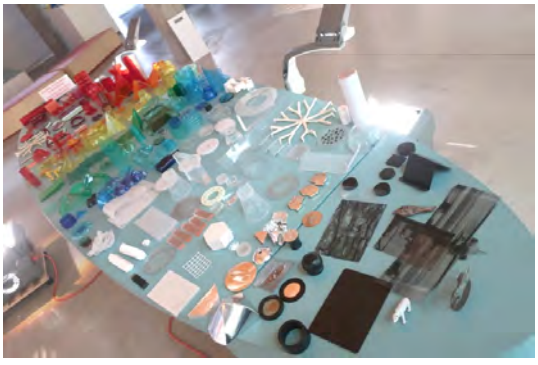

Fig. 1. Materials for the Reggio Emilia approach

Fig. 2. Examples of activities

Taiwan-Japan Comparison of Pedagogical Photo Documentation in Early Childhood Education and Care

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Introduction

Since 2022, this joint research project has focused on the common topics of quality indicators and professional development in Early Childhood Education and Care (ECEC) across the differences in social and cultural beliefs, values, and traditions between Taiwan and Japan. It has been organised into two study clusters, i.e., child studies and ECEC practices. Concerning child studies, we shared the issues regarding 'play' or 'playful approaches' to ensure the qualities of early childhood pedagogies at the last trilateral symposium, 2023, at Kagawa University.

This presentation mainly discusses the issues concerning ECEC practices, especially for pedagogical documentation and meaning-making. The purpose of this study is to explore how pedagogical documentation is recognised in the assessment process of playful approaches in ECEC practices and accepted by practitioners and how it is linked to professional development issues. These studies would expand our understanding of improving the quality of ECEC practices and contribute to an ongoing debate about the best ways to support young children's personal, social and emotional development (Layard et al., 2014). They can enhance the SDG's action in Goal 4, ensuring inclusive and equitable quality education and promoting lifelong learning opportunities for all. The SDG's Goal 4 targets include topics surrounding the quality of ECEC for sustainability.

Pedagogical documentation in ECEC settings

Narrative assessment using pedagogical documentation is one of the most widely accepted ways to describe children's development and outcomes (OECD, 2015). A characteristic of pedagogical documentation is that it is not focused on measuring children's acquisition of knowledge or competencies (Picchio et al., 2014). Pedagogical documentation, which sketches children's stories through their daily practices, is an essential tool for meaning-making and deciding what is going on in the following pedagogies (Dahlberg et al., 2013). Explorations of children's perspectives and learning experiences during play in practices would help ECEC practitioners identify the progression of children's learning to reflect and improve the quality of their pedagogical process and environment to develop children's learning dispositions (Carr & Lee, 2019).

Discussion and Implications

Previous research and practices have explored various forms of pedagogical documentation in ECEC, including written notes, photos, multimedia documentation using videos, artefacts produced by children, and other materials (Buldu, 2010; Merewether, 2018). Text-based pedagogical documentation reflecting on practices is widely distributed throughout the ECCE provisions, and some settings use photos to share their pedagogies with parents and guardians. A visual form like photo documentation would make activities in ECEC settings more visible for young children and adults than written reports. For example, Walters (2006) found that using digital photos in ECEC settings helped verify children's learning and created resources that motivated and encouraged communication.

We plan to conduct a questionnaire survey for pedagogical photo documentation in Taiwan and Japan, which can describe children's anecdotes through their daily play and playful activities. It is essential to explore how it is recognised in the assessment process of ECCE practices and used by teachers in Taiwan and Japan. These studies enable practitioners to support young children's play and playful activities in their settings. The quality would affect children's non-cognitive skills, academic achievement, and participation of their parents and guardians.

Acknowledgement

We wish to thank the children and teachers at preschools in Taiwan who gave us opportunities in this field study. Portions of the contents in this presentation were published at Matsumoto, Nishiu, Taniguchi, Kataoka, & Matsui (2023).

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University Entrance Examinations in New Zealand and Japan: A Contrast in Two Sustainable Testing Systems

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Introduction

Fair and effective testing is an essential issue of concern for all educators. How to evaluate learners' or candidates' abilities in the areas required to be tested is a key part of our work. There is a myriad of approaches for each situation. This paper focuses on two national university entrance examinations and compares and contrasts two quite distinct systems, in Japan, the *Daigaku Nyūgakusha Senbatsu Daigaku Nyūshi Sentā Shiken*, (the Common Test for University Admissions) [1], and in NZ, *University Entrance (UE)*, the New Zealand University Entrance system. [6]

Results and Discussions

A quick glance at Table 1 reveals two different approaches to university entrance examinations. The university entrance system in NZ and the Common Test for University Admissions (from 2021) in Japan are both national standardised tests used to gain access to university-level education. A total of 30 subjects in 6 areas are available in Japan. In NZ in 2024, there are 46 tests available in areas such as a variety of languages, Accounting, Dance, Drama, and Media Studies. These subjects, and many others, differ from those in Japan, as does the test period. Tests are held over 2 days in Japan, whereas in NZ it is 24 days. The test venues, universities in Japan, and high schools in NZ, also reveal quite different approaches.

The number of compulsory subjects is also different. In Japan, most students will take 4 or 5 compulsory subjects with a total of 9 subjects. In NZ the number varies depending on the academic course aimed at, but it can be as low as one, English, that is the sole compulsory subject.

NZ and Japan also have a range of alternative routes to universities. The national *Kyōtsū Shiken* is held over two days in late January. For candidates in Japan, the results from this national test are also used when applying for admission to national and some private universities. The results are combined with these tests, known as *kōki nyūshi*. There are also *suisen nyūgaku*, entrance based on paper tests and interviews as alternate routes.

The NZ system also offers alternate routes to university admission. Anyone over twenty years of age, who has graduated from high school may apply for a university. There is also an option for high school students with excellent grades to skip the final year of high school and start university. Admission based on a portfolio of work, evidence of study in certain subjects at certain levels, may also be submitted as a means of university entrance.

NZ may at first seem to offer test-takers a wider range of subjects than the Japanese system and hence give the candidate a broader opportunity to show their abilities, but it has also been noted that one in three students in NZ suffer from undue mental duress due to testing over a long period [5].

A number of schools are opting out of NCEA Level 1 due to high levels of stress amongst students due to this on-going internal assessment. A limited survey of university fourth year students in Japan also revealed high levels of examination stress. Students indicated that they would not have chosen 60% of the compulsory topics they had to take for university entrance, perhaps suggesting that more freedom could be assigned in the choice of tests, as well as the range of subjects in Japan.

TABLE I COMPARISON OF ENTRANCE EXAMS IN 2023

	Japan	New Zealand
no. of applicants in 2023	491,913 [1]	10.126 [2]
test venues	universities	high schools
no. of days to administer	2	24 [3]
no of test subjects	30 in 6 areas	46
av. no. of tests taken	9	5
av. no. of compulsory subjects	4+	1+
period held	mid-January (winter)	late Nov – early Dec (summer) [4]
test format – pen and paper	yes	yes
test format - online	no	yes
other entrance options	individual university tests, *suisen*, interviews	portfolio, advance entrance, internal assessment
marking by	machine	individual markers

One of the biggest areas of divergence is the test format itself. In Japan, all tests are multichoice. The test-taker will only write their name. The rest is the choice of selecting either A, B, C, or D. NZ tests require candidates to write their answers in full and show the processes, and express their ideas. These are evaluated.

Both countries' tests have merits and demerits. NZ is a small country compared to Japan and its systems have undergone massive restructuring over the last forty years. The current government in NZ is now indicating another move to a more pen-and-paper testing system[6]. In Japan, in contrast, proposes to testing and education systems move at a much slower, cautious pace.

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Voluntary Service Abroad To Promote Education Quality

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Introduction

The sustainable development goals (SDGs) aim to transform our world by requiring people to collaborate to solve problems, including ending poverty and inequality, protecting the planet, and ensuring that everyone enjoys health, justice, and prosperity [1]. To integrate these goals with an informal curriculum on SDG, a professor has been conducting a transformative voluntary service project abroad for university students since 2019. During the summer vacation, two to three university students of teacher college stayed in Chiang Rai for two months to deliver supplemented educational activities for primary and high school students, significantly enhancing their understanding of the SDGs and their role in achieving them.

In Taiwan, many university students attend projects providing educational services for schools with insufficient resources. In recent years, several projects have targeted overseas schools in desperate need of educational services. This unique opportunity not only allows the students to appreciate foreign cultures and education systems but also provides a platform for them to engage in activities with the locals, fostering meaningful and insightful reflections on their contributions to the SDG initiative and their personal and professional growth.

School Background and Settings

In the Chiang Rai mountain area, a unique educational initiative has been established. A Taiwanese lady, recognizing the need to supplement the Thai formal education, set up a private school. This school, catering to students from K to 12, takes a unique approach to education. It primarily teaches Chinese and English languages, along with other courses, including computer technology. This innovative approach to education has attracted the attention of many, including the voluntary teachers and university students who come to teach at the school.

Aiming to promote education quality without much support, the school recruits several voluntary teachers locally and globally. For years, university students from Taiwan will stay at the school for two months to teach. The school lessons are arranged during evenings and weekends. Since the school is located in the mountains, where public transportation is not available, university students stay at the teacher dormitory and enjoy the meals offered by the school. Therefore, university students really immerse themselves in the local community.

Results and Discussions

In addition to teaching, attending local activities is also a good way to experience the differences between the two countries. The local school arranged to attend a calligraphy workshop, visit a night market, and a field trip to Chiang Mai during the weekend. Students have time to engage in activities with the local teachers, residents, and students during their free time. The locals are grown up within the Thai and Chinese cultural environment, which is a good place to experience diverse cultures in a natural way.

Authentic encountering enhances mutual understanding. Interactivity during the long stay and teaching helps university students to experience and reflect on cultures and education. They felt that the students had a passion for learning and expected future development, although the local students had limited learning resources and opportunities associated with foreigners. Additionally, students were impressed by the friendly and mild characteristics of the residents. Furthermore, the friendship is continued through periodical gatherings in Taiwan or Thailand.

Students appreciate this volunteer work abroad as a start to broaden global perspectives. To survive in a foreign country, students need to seek help and communicate with locals. The positive experience encourages them to participate in future projects abroad. Likewise, teachers and students at the host school and community considered this engagement inspiring and rewarding. The visiting students were open and passionate about interacting with the local students. This experience will positively influence local students' attitudes toward global exchange or study.

This short-term service learning in northern Thailand has successfully promoted global learning. As indicated by other studies, these cultural immersion experiences in the form of short-term abroad programs had a lasting impact on developing culturally relevant later [2]. Although no sightseeing spots are attractive to participating students, their reflection during engagement with local students and residents maximizes the benefits of meaningful learning [3].

Students from Taiwan can personally feel the economic inequality in a global context. The gap between countries or the gap between the urban and the remote areas in the economy seems to be increasing. Students can experience the importance of SDGs and contribute to promoting education quality to reduce inequality. This project, in fact, facilitates university students' transformation toward action for sustainability.

Acknowledgment

This project is financially supported by the Ministry of Education, Taiwan.

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• TOURISM SESSION

An engaging guide to mastering tourism sustainability amidst COVID-19 in Thailand

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Introduction

COVID-19 profoundly affected the global tourism industry, with travel restrictions and lockdowns [1]. Numerous countries experienced a substantial decline in tourist arrivals, resulting in economic difficulties for businesses dependent on tourism, such as hotels, airlines, restaurants, and local tour operators [2], [3]. The pandemic has transformed service standards, establishing guidelines to mitigate future pandemic incidents.

Thailand has been acknowledged as one of the countries managing the pandemic most effectively, be successful in controlling COVID-19 with swift response and effective public health sustym [4]. The research aimed to introduce comprehensive emergency standards for the tourism industry, in order to effectively respond to and manage pandemic situations. The outcome standards instructions concluded protocols for health and safety, crisis management, and operational continuity to protect tourists and industry workers while minimizing disruptions and economic impacts during future pandemics.

Results and discussions

Based on interviews with 118 wellness tourism operators and related personnel in Chiangmai, Thailand, the research found that operators needed to enhance their understanding and implementation of measures to manage and prevent the spread of COVID-19. These measures focus group were conceptualized into two key components: Management module (place management, customer service management, and service process management) and business capacity enhancement module (service innovation, new product development, and ensuring in pandemic prevention capability) which had been set as the online training curriculum.

The online training course aimed to promote an understanding of COVID-19 prevention measures among health service businesses, including spas, massage parlors, fitness centers, and restaurants. The goal was to equip them with the necessary knowledge and skills to appropriately implement these measures in their operations and adapt to consumer changes during the pandemic.

The one-day training course session is covers two main parts: compliance with government regulations and meeting the needs of wellness tourism operators according figure 1 which illustrate the course framework for two modules**; must do guide and uplift experience.** The online training course based on self-paced learning [5], [6] through selected videos, enabling participants to independently watch and complete online quizzes. Each participant was supposed to be tested by a ten-questions evaluation, and received an online certificate upon course.

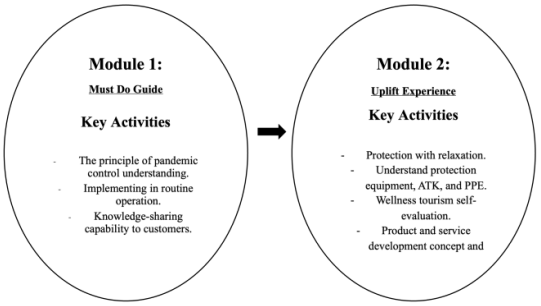

Fig. 1. The workshop on entrepreneurial demand during the COVID-19

The country renowned for its exceptional handling of the COVID-19 crisis has strategically employed online learning as the dominant strategy in revitalizing the tourism industry [7], [8]. The two modules introduced may contribute to the standards of tourism and hospitality industry not only facing crisis situation but also the normal situation leading to the service standard.

Acknowledgment

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Comparison between Tourism Authority of Thailand and Japanese DMOs: Working Paper from the Perspective of Stakeholder Collaboration

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Tourism destinations are complex systems of interacting entities. To improve sustainability, all the entities in the destination need to work collaboratively. The relationship mechanism between inter-organizations has been studied in previous research, but more research is necessary. The perspectives and research gaps of stakeholder relationships in sustainable tourism were presented based on prior research for further discussion.

Introduction

Sustainable tourism research encompasses various themes (Bramwell et al., 2016; Ruhanen et al., 2015). This article addresses the inter-organizational relationships for tourism destination management to promote sustainable tourism and presents perspectives in prior literature for discussion. The Japanese DMOs and the Tourism Authority of Thailand (TAT) are compared from these perspectives.

Research on Inter-Organizational Relationships

A tourist destination is a complex system of interrelated diverse entities (van der Zee et al., 2017). Inter-organizational cooperation is required to promote sustainable tourism. Ruhanen et al. (2015), who extracted 12 themes through a bibliometric analysis of papers on sustainable tourism, found that "governance and policy," and "stakeholders including collaboration & network" were important themes. Bramwell (2016) also mentioned the impact of governance systems and interconnections around social systems, suggesting their importance.

Governance, Stakeholders and Network Research

The relationship between tourism and governance has been addressed in many studies (Keyim, 2017) because various actors are also subject to local regulations, and studies on governance and sustainable tourism consider the relationship with concepts such as trust and power (Nunkoo, 2017). Trust also strengthens a network because it benefits the relationship (Gausdal et al., 2016).

One of the topics recognized as particularly important in tourism management is the coordination between these actors in a network and the mechanisms of relationships (Beritelli et al., 2015). Concerning the coordination of relationships, there is a network perspective that the entire tourism destination should be viewed as one system with a shared vision and coordinated overall (Beritelli et al., 2015). Research on the factors that connect the network and manage it overall is further needed in sustainable tourism.

Japanese DMO and Tourism Authority of Thailand

The coordination of the networks is the mission of the destination management organization (DMO). However, because DMOs have limited forcing power over the various entities involved in tourism, there are difficulties in coordinating between stakeholder organizations (Beritelli et al., 2015). DMOs are now shifting to actively managing tourism destinations to improve the quality of the tourist experience and the destination's competitiveness (van der Zee et al., 2017). DMOs are required to coordinate networks to make tourism destinations sustainable and attractive.

The Japanese government established DMOs in 2015 to facilitate coordination among multiple stakeholders (Hatano et al., 2018). Before the establishment, Japan already had semi-public tourism associations in each administrative region to promote tourism. Under the circumstances, some DMOs have been successful, while others have faced difficulties. DMO Kyoto is one of the successful cases.

Tourism is one of the most important industries in Thailand, and the TAT, a government agency, has power. The TAT is active in implementing sophisticated top-down policies and building and managing networks among stakeholder organizations.

Towards Future Research

There is no single answer to which style is best for promoting sustainable tourism policies, top-down or coordinated, as situations vary. However, considering the management of tourism destinations, continuous discussion is required. The mechanisms of relationships, such as how and under what circumstances tourism promotion should be carried out, and how to proceed with network building for this purpose, and their results should be further studied.

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Enhancing Local Prosperity through Career-Integrated Tourism: Insights from Bang Rong's Community-Base Tourism Model

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INTRODUCTION

For over three decades, Thailand has actively promoted and supported community-based tourism [1]. Most initiatives stem from local communities organizing and managing their own tourism activities, with the goal of generating employment and income while preserving and showcasing their cultural heritage and traditional way of life [2]. The Bang Rong community distinguishes itself by integrating their professional lifestyles into the design of unique tourism experiences. This article aims to evaluate the economic benefits derived from leveraging community capital and lifestyles in the creation of tourism activities.

RESULTS AND DISCUSSIONS

The cost-benefit analysis of key tourism activities in the Bang Rong community reveals that in 2022, integrating local occupational lifestyles into visitor experiences significantly boosted community income, reaching approximately 1.16 million baht annually. Notably, the contributions of rubber planters, farmers, and community restaurants comprised about 78 percent of the total benefits derived from merging occupational livelihoods with tourism experiences (see Table 1).

TABLE 1 SUMMARY OF ENHANCED INCOME GENERATED FROM CAREER-INTERGRATED TOURISM ACTIVITIES.

Activities	Increased Income (baht/year)
1) The professional journey of pineapple farmers.	93,000
2) The professional journey of rubber planters and farmers.	480,000
3) The professional journey of coconut farmers.	165,000
4) Community restaurant.	420,000
Total	**1,158,000**

Source: Derived from estimates provided by interviews with community representatives.
Note:Calculations are based on an estimated annual visitors count of approximately 3,000 individuals.

Regarding the allocation of returns, 68 percent is dedicated to managing tourism activities, 25 percent is allocated to supporting various initiatives, and the remaining 7 percent is contributed to the central fund (see Table 2).

TABLE 2 ALLOCATOIN STRUCTURE OF RETURNS FROM TOURISM ACTIVITIES PER VISIT.

Activities	Percentage
1) Management fee for tourism activities within tourism enterprise groups.	68.21
- *Compensation for tour leaders.*	*39.27*
- *Compensation for staff involved in organizing and preparing tourism activities.*	*36.65*
- *Transportation service fee.*	*13.09*
- *Expense for activity equipment, snacks, and welcome beverages.*	*10.99*
2) Revenue from tourism activities.	25.00
3) Central fund.	6.79
Total	**100.00**

Source: Derived from estimates provided by interviews with community representatives.
Note:Calculations are based on an estimated annual visitors count of approximately 3,000 individuals.

Based on the study, it is recommended that relevant sectors should encourage, support, and offer guidance to tourism communities in designing activities based on local assets, such as lifestyles and career paths. Emphasis should be placed on creating experiences where visitors engage directly with community members (co-creation) and are captivated by the stories shared by locals (storytelling).

ACKNOWLEDGMENT

This work was supported by KhonThai 4.0 Platform, National Research Council of Thailand (NRCT).

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Examine the motivations for food waste avoidance and behavioral intentions

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Introduction

Numerous studies have emphasized the significant impact of food waste on nutritional security, the environment, and sustainable development (Bonomi, Ricciardi, & Rossignoli, 2016; Devin & Richards, 2018). However, previous research has seldom explored the impact of consumer motivations to avoid food waste (Ribbers, Geuens, Pandelaere, & van Herpen, 2023; Stöckli, Niklaus, & Dorn, 2018) and the intervention mechanisms.

Past research has also emphasized the necessity of understanding the different types of motivations people have to avoid food waste when attempting to explain household food waste behaviors (Stancu, Haugaard, & Lähteenmäki, 2016; Stöckli et al., 2018; Van Geffen, van Herpen, & van Trijp, 2020). According to Attiq, Habib, Kaur, Hasni, and Dhir (2021), reducing food waste is considered one of the promising approaches to addressing the food waste problem, such as through leftover consumption and management (Messner, Johnson, & Richards, 2022). Furthermore, consumer awareness of food waste is the first step towards purchasing leftovers, indicating that when consumers seek relevant information and acquire this knowledge, the thoughts generated in their minds may trigger behavioral intentions (Zeithaml, Berry, & Parasuraman, 1996). Based on the above, this study hypothesizes that the higher the consumers' understanding of avoiding food waste, the more likely they are to trigger behavioral intentions.

Results and Discussions

The findings of this study indicate a significant positive relationship between food waste avoidance and behavioral intentions. This suggests that consumers' various motivations to avoid food waste (e.g., environmental, moral, financial, social) increase their propensity to engage in behaviors aimed at reducing food waste (e.g., food storage, redistribution). These results support previous research, indicating that behavior is driven by motivation. In the context of food waste, consumers who feel a sense of sustainable responsibility, experience strong guilt (concern for the hungry), value thriftiness (financial concerns), and exhibit social sensitivity are influenced in their consumption decisions (Graham-Rowe, Jessop, & Sparks, 2015; Stancu et al., 2016; Aschemann-Witzel, Giménez, & Ares, 2018).

This study posits that understanding the various consumer motivations to avoid food waste can more effectively promote waste-avoidance behaviors by addressing these motivations, thereby fostering an attitude towards sustainable living.

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Exploring the antecedents and consequences of motivation to avoid food waste

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Introduction

Approximately one-third of the world's food is lost or wasted annually (Gustavsson, Cederberg, Sonesson, Van Otterdijk, & Meybeck, 2011). According to a report by the Food and Agriculture Organization (FAO) of the United Nations, food waste is a prevalent issue in developed countries such as Germany, Italy, the United States, Japan, and Taiwan. On average, each person wastes about 121 kilograms of food per year globally. Paradoxically, approximately 820 million people suffer from hunger or lack access to a healthy diet daily (FAO, 2019). Therefore, it is crucial to understand the antecedents that motivate consumers to avoid food waste.

Weber (2019) posits that values influence individual behavior; for instance, altruistic values can foster empathy, subsequently affecting attitudes and actions (Nordlund & Garvill, 2002). Thus, altruism acts as a crucial catalyst for individual behavior within the social environment (Ahmad, Ahmad, & Siddique, 2023). Relevant research has indicated that altruism is related to motivations for green consumption (Prakash et al., 2019; Panda et al., 2020; Pop, Săplăcan, & Alt, 2020) and prosocial behavior (Pfattheicher, Nielsen, & Thielmann, 2022). Consequently, when understanding the mechanisms behind consumers' behavior to reduce food waste, altruism emerges as an indispensable factor.

Additionally, social influence is considered an integral part of the decision-making process (Rashotte, 2007). Wee, Ariff, Zakuan, Tajudin, Ismail, and Ishak (2014) comment that consumers, during their cognitive processes, take into account external environmental factors and personal beliefs, making decisions after internalizing the information received (Goldsmith & Goldsmith, 2011). Based on the above discussions, this study incorporates both personal altruistic values and social influence (others) to examine their combined impact on the motivations to avoid food waste, further elucidating the role of these two concepts in behavioral intentions.

Results and Discussions

Firstly, the results of this study reveal a significant positive relationship between altruistic values and social influence on food waste avoidance. This indicates that consumers with altruistic values will engage in waste-avoidance behaviors due to their consideration of others' or society's benefits in environmental protection. This result aligns with prior research showing that higher levels of consumer concern or worry about the environment stimulate a stronger attitude towards avoiding food waste (Roodhuyzen, Luning, Fogliano, & Steenbekkers, 2017). that consumers reduce food waste in their lives for environmental reasons (Abdelradi, 2018).

Secondly, this study also finds a significant positive relationship between social influence and food waste Secondly, this study also finds a significant positive relationship between social influence and food waste avoidance. This indicates that social influence triggers stronger attitudes towards avoiding food waste, allowing consumers to convey their self-worth to others. These results are consistent with the views of Ribbers, Geuens, Pandelaere, and van Herpen (2023), specifically that individuals often care about others' evaluations of themselves (anxiety) and actively strive to leave a positive impression, a trait that is also applicable in the realm of consumer behavior (e.g., preference for green products).

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Exploring the Current Situation and Challenges of Community Sustainable Development: A Case Study of the Hezhuang Community in Chiayi, Taiwan

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Introduction

"Sustainable community" is a lofty goal that community work in all countries hopes to achieve. It includes balanced economic and ecological development, as well as social and human development. Based on the core concept of "sustainable development", this article explores the actual implementation of sustainable development of communities for each of its five aspects including ecological and environmental landscape, society and culture, economy and industry, life functions, mechanisms and governance. conditions and dilemmas. This study uses Hezhuang Community in Chiayi City as a case study to conduct an in-depth analysis to understand the current situation and difficulties faced by Hezhuang Community in promoting sustainable development. This research mainly uses semi-structured interviews in the in-depth interview method, supplemented by secondary data methods to assist in writing this research. An interview outline was formulated in advance, and interviews were conducted with relevant people in the community, including officials from government departments, community development associations, and community residents. Finally, based on the actual situation of promoting sustainable development in individual cases, this article puts forward the practical implications and suggestions for future communities to promote sustainable community development.

Key Words: Sustainable Community, Community Development, Sustainable Community Development, Flagship Project

Acknowledgment

For the completion of this paper, I sincerely thank the residents of Hezhuang community for their assistance in conducting the research. Let this paper be successfully completed.

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Factors in community-based ecotourism development: Insights from indigenous-led initiatives in Oaxaca and Puebla, Mexico

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In a study on indigenous-led community-based ecotourism (CBET) in Mexico, essential factors confirmed include community pride, cooperative efforts, sustainable practices, and flexible work structures. The research highlighted the tension between the communities' desire for autonomy and the necessity of initial government support due to resource constraints. This support is crucial for the successful initiation of CBET projects, emphasizing the importance of balancing indigenous autonomy with external aid to foster sustainable tourism development.

Introduction

In the tourism industry of indigenous communities, differentiated products and attractions are crucial for success. Active involvement allows these communities to express their cultural values and reap economic benefits from tourism development (Fletcher C, et al., 2018). However, Espeso-Molinero, P., et al. (2018) caution that a top-down focus on infrastructure by governments and international firms in places like Lacandon, Chiapas, can undermine indigenous identity. Building on these perspectives, survey and research on community-based ecotourism (CBET) was conducted in Central and South America (Hirami, N., 2023). This study identified four key factors for successful CBET: community pride and motivation, cooperative associations, sustainable management capabilities, and flexible work mechanisms. To validate these findings, the author undertook extensive face-to-face interviews and surveys across ten indigenous communities, including Pueblos Mancomunados in Oaxaca and three communities in Puebla. These efforts aimed to examine the practical application and impact of these identified factors, thereby enriching the understanding of CBET's dynamics within indigenous settings.

Results and discussions

As a means to explore potential revisions to our hypothesis, in-depth interviews were conducted with 6 representatives from the 10 communities, and questionnaires were used for quantitative verification. The in-depth interviews utilized a semi-structured interview style, questioning the background of CBET implementation, involvement with the government, cooperatives, and decision-making methods within the community. Notably, the relationship with local governments was significant. Indigenous communities have a strong desire for independence and autonomy, preferring to avoid domination by government or external tourism companies and desiring no involvement in their projects.

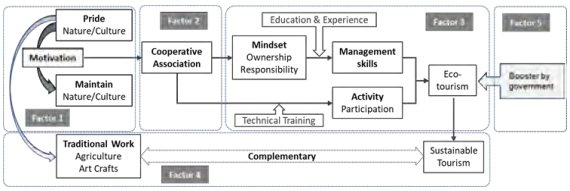

Fig.1 Five essential factors for CBET development

However, the reality is that indigenous communities do not have sufficient resources for construction, with facilities such as tourist lodgings being a minimum requirement for implementing CBET. Successful CBET projects like Pueblos Mancomunados in Oaxaca and the Taselotzin Hotel in Puebla were found to receive support from local governments, especially in the early stages. This support is covered by the "Law of rights of indigenous people and communities" enacted at the state level in Mexico. Such government support is considered a process booster and should be defined as the fifth factor, as illustrated in Fig.1.

Subsequently, the questionnaire aimed to capture the psychological attitudes of community members towards CBET. It included 29 questions covering aspects such as management and operation, social benefits, personal rewards, and the overall impact of CBET on the community, rated on a five-point scale. Out of 68 responses, 55 were considered valid. A factor analysis of these valid responses identified three significant psychological factors:

Psychological Factor 1: Resistance to negative impacts on local culture, lifestyle, and nature, highlighting concerns over sustainability.
Psychological Factor 2: Community members exercising authority with pride, reflecting a sense of empowerment.
Psychological Factor 3: Achieving sustainability through business benefits, emphasizing economic aspects of CBET.

Psychological Factor 1 underscores the importance of sustainability, advocating for careful consideration of impacts on local culture, lifestyle, and nature from planning to implementation. This factor supports the underlying principles of CBET, influencing Factors 2 to 4 as illustrated in Fig.1. Psychological Factor 2 addresses the community's pride and empowerment, playing a crucial role in CBET Factor 1. Psychological Factor 3 focuses on sustainability from an economic perspective, impacting CBET Factors 2 to 4, especially Factor 4. This analysis suggests that these key psychological factors are intricately linked with the fundamental factors for establishing CBET.

Acknowledgments

I wish to express my heartfelt gratitude to Ms. Martha Hidalgo, who kindly participated in preparing and conducting the interviews and questionnaires during the fieldwork. This work has been supported by the JSPS KAKENHI Grant Number JP22K12615.

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On the integration of university courses and local community-based tourism industry development

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INTRODUCTION

The development of the community tourism industry has become a trend in recent years. It is an executable key community task for rural areas with an aging population and an urgent need for transformation. This study takes FuXing Village in Chiayi County as the research object, combines the Narrative Power Project and related courses of National Chiayi University, and uses the existing manpower, agriculture, and resources of the community to design a series of community-based tourism plans and strategies [1]. The results of this study should provide a reference for future tourism industry development in this community.

THEORETICAL BACKGROUND

According to [2], there are three development strategies for the community tourism industry: (1) Integrating cross-community resources to enhance tourism attractiveness; (2) Exploring local characteristic resources and creating differentiated products; and (3) Planning diversified experience products to enhance the value of tourist experience. Based on these three strategies, it is desired to see what can be provided by the university and the FuXing Village.

THE UNIVERSITY SIDE

The related university course is "Language and Culture" provided by the Department of Foreign Languages. In the second part of this course, students are asked to take language field trips and make documents about their interviews with the local people. Before the interviews, the community leader takes the students through the FuXing Village to learn more about it (Picture 1). Later, the course is engaged with the Narrative Power Project sponsored by the Ministry of Education. One part of this project is that the students are asked to interview the young farmers who have returned to their hometown to grow cherry tomatoes (Picture 2). They also have to take relevant pictures during the interviews. After the interviews, the students must organize their thoughts with the images taken and make them into hipster-style postcards about FuXing Village (Picture 3).

THE COMMUNITY SIDE

FuXing Village is a typical agricultural village in Chiayi County. There are few young people living there. Most residents are old people who have retired from work and are taking care of their grandchildren. In the morning, the elderly will gather to participate in the daycare service provided by the government. The participants are usually women. Before lunch in the community kitchen, they use light clay to make various works (Picture 4).

PICTURE 1 VILLAGE TOUR

PICTURE 2 CHERRY TOMATOES

PICTURE 3 HIPSTER-STYLE POSTCARD

PICTURE 4 LIGHT CLAY WORKS

PROSPECTS AND DISCUSSION

Based on [3], local residents and local communities are key factors to sustain community tourism. Through the field trips in the past years, it is believed what students have experienced in the field trips can be developed into a community-based trip. A day trip example is shown in the following Table 1.

TABLE 1 DAY TRIP SAMPLE

Time	Schedule	Host
09:00 ~ 10:00	Village walk tour	Community leader
10:00 ~ 12:00	Cherry tomatoes picking	Young farmers
12:00 ~ 13:30	Lunch	Community kitchen
13:30 ~ 15:00	Light clay making	Community elderly
15:00 ~ 15:30	Choose postcards and send them by mail	Postcards provided by NCYU students

This kind of community trip can be run by the people in the FuXing Village. After the community leader shows the tourists the nice small village, the tourists can enjoy cherry tomato picking afterward. In the afternoon, the elderly who are good at light clay making can be teachers to the tourists. Finally, the postcards made by the students are offered as souvenirs for the guests to send their regards to their loved ones. It is believed that this kind of itinerary should have a certain appeal to young people and the family group.

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The Impact of Gastronomic Tourism on the Regional Economy of Thailand: Examined by the Dynamic I-O model after the Decline of Covid-19[1]*

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Introduction

It is reasonable to state that gastronomic tourism is an efficient tool that has the potential to refresh Thailand's macroeconomic viability. With the aim of becoming the hub of tourism in Southeast Asia, Thailand's tourism industry must urgently address and sustainably integrate gastronomic activities to navigate the troubled situation caused by the decline after the Covid-19 pandemic. This consequence has led the authors to conduct a deep study on a regional input-output (I-O) table analysis for Thailand's tourism system, specifically focusing on gastronomic activities and tourism industries. The tourism I-O data used in this study comes from the official source provided by the Thailand Ministry of Tourism and Sport. Empirically, the results of the dynamic regional I-O model predict that Bangkok and its surrounding areas are the heart of gastronomic tourism development, driving income into Thailand's economy. The eastern region stands as the second area of gastronomy tourism, generating a positive impact on Thailand's economy. On the other hand, the Northeast of Thailand receives less income from gastronomy tourism, despite being the largest area in the country. Ultimately, there should be a greater emphasis on the gastronomy tourism policies in order to fully maximize the potential of tourism development, stimulating every part of Thailand during the economic depression following the decline of Covid-19. Moreover, gastronomy tourism has the potential to play an important role in driving economic growth through the combination of cuisine and tourism development.

Results and discussions

The tourism industry in Thailand has grown very quickly, but there has been a lack of balance in its progress for a long time, especially in the development of gastronomy tourism. Based on data from 2019, gastronomy tourism in Thailand con-tributed income to the Thai economy. It was found that only two regions, Bangkok & Vicinities and Southern Thailand, contributed income to Thailand economy. However, this research is consistent with this report as well, because the overall multipliers of the food industry in these regions were the highest compared to other regions of Thailand (see table 1).

Table 1. The situation of gastronomy tourism in Thailand during 2020 and initial predictive Beta for the dynamic I-O model.

Regions of Thailand	Spending in gastronomic activities (million Baht)	Portion (%)	Initial Beta for the dynamic I-O model (predictive +5% for 2021GDPI[1]	Food Beverage Multipliers
Bangkok & Vicinities	240,984	32.74	0.0164	1.0113
South	213,820	29.05	0.0145	1.0100
East	88,961	12.09	0.006	1.0040
North	81,355	11.05	0.0055	1.0038
West	48,644	6.61	0.0033	1.0023
Northeast	42,276	5.74	0.0029	1.0020
Central	20,012	2.72	0.001	1.0020
Total	736,052	100	0.05	

The main policy recommendation of this research study is to stimulate gastronomic tourism in several regions of Thailand through digital tourism platforms (Sigala, 2020, Bekele and Raj (2024). These platforms aim to connect tourists with local gastronomic experiences, particularly in the Northeastern, Central and West regions of Thailand (see table 1). This is necessary because both regions have a lower I-O multiplier compared to other regions in Thailand. Furthermore, it is crucial for both the public and private sectors to collaborate with food bloggers, chefs, and social media influencers to create an ecosystem that promotes Thai gastronomy and covers every regional part of Thailand extensively (Gursoy and Chi, 2020, Kiráľová, and Malec (2021)). Because of the Covid-19 experience, the significant policy of the gastronomic tourism industry for every region of Thailand must focus on health and safety protocols for all gastronomic tourism activities to boost demand and supply in sustainable gastronomic tourism (Baum and Hai, 2020).

[1] *This works has been accepted or published previously in (Economies 2024; 12(7):180.), the results presented herewith are for communication purposes of previously published work by the authors only

ACKNOWLEDGMENT

This research was partially supported by Chiang Mai University [R66IN00331] and also this research was partially supported by Target Research funding 2023 (R66IN00412), Chiang Mai University, Chiang Mai, Thailand.

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University and Tourism Development: A Problem-Based Project for Tourism Knowledge-Based Destination Development

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Introduction

The paper contributes to the dynamic context of university contributions to achieve sustainable rural community development. Particularly, with a case study of a tourism development project, re-developing Baan Mong Doi Pui Village in Chiang Mai Province. The project engages a lecturer and tourism students from Chiang Mai University with an ethnic community in a place-based project to learn about tourism-related problems and to co-create solutions for alternatively more tourism sustainable development. The main aim of the project was contributing to the rejuvenation of the village as a tourist destination (Butler 1988).

Case study site and Method

This paper is part of the 'House of Humanities Project' from the faculty of Humanities, Chiang Mai University in supporting collaborations to neighbouring communities (Cavicchi, *et al*. 2013). To address the Faculty's missions, Baan Mong Doi Pui was chosen as a place-based project to co-creating sustainable tourism destinations (Rinaldi *et al*. 2022). The village was once a famous tourist destination. Therefore, the focus of the project was not only to rejuvenate the village's tourism activities, but also to encourage tourism students to exercise tourism knowledge to the village as a problem-based learning project for tourism development.

Results and Discussions

The author employed the Problem-Based Learning (PBL) as a instructional method (Duch, *et al*. 2001). By using the village's problems as a tourism context, students develop problem-solving skills and tourism-related knowledge to engaging themselves in self-directed learning process.

The author observed and provided tourism-related knowledge to supporting students learning process as well as creating tourism productions (Cole 2005). Throughout the project, the students created an understanding of conducting a research project, processing tourism development, and analyzing place-specific characteristics (Ramaswamy and Ozacan 2014; Stringer 1996).

The approach offers opportunities for students to develop multi-skills; problem analysis, collaborative learning, and application of knowledge, as well as knowledge transferring. Moreover, the project provided a strategic approach, tourism knowledge-based destination development, to bring the community to realise the important of having tourism knowledge. Being a tourism knowledge-based destination is a means for meaningful tourism rejuvenation, growth, and improvement.

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Unsustainability brought by Animal Tourism: From the case study of Ogijima in Kagawa

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Introduction

Ogijima is a small island located in the central part of the Seto Sea, Japan, it takes approximately 40 minutes by boat from Takamatsu Port. As of March 2018, 160 people resided there (104 households); with a high proportion of elderly residents and a declining population. Ogijima is one of many depopulated islands in Japan.

However, Ogijima has become a popular tourist destination. One reason for this is the Setouchi International Art Festival. During its first exhibition in 2010, approximately 96,000 people visited the island (approximately 900 per day). This art festival helped outsiders discover Ogijima's cats, with a famous animal photographer further boosting its profile as a "Cat Island." Throughout the 2010s, many tourists visited the island primarily to see its cats, even outside the festival period.

However, there are several challenges to making cats a tourist attraction. The first is the trouble caused by cats: for example, there are the voices of islanders suffering from damage and feces, such as the destruction of fields and fishing gear (Ogijima TNR Project Report 2016). The cats attract many tourists but at the same time, cause trouble with the local community. Second, cat populations have declined sharply. In order to avoid problems with residents, 117 cats were spayed in 2016, and the cat population halved by 2022 (The Sankei Shimbun, September 3, 2022). In other words, the tourist destination known as Cat Island may disappear soon.

Therefore, in just over a decade, a small island in the Seto Sea has changed, such as becoming a tourist destination for cats, facing problems with cats in local communities, and then moving away from being a tourist destination. Due to these problems, the actual situation of tourists visiting the island for cats has not yet been clarified.

Previous Research

Previous studies have indicated that animals have been the subject of tourism since ancient times. However, insufficient studies have been conducted on the relationship between animals and tourist destinations (cf. Sato 2019: 22-23).

Tourism research in Japan has focused on tourism by targeting local animals. For example, Tashiro et al. pointed out 101 animal-related tourist destinations in Japan, and 44 of those places are destination for cats (Tashiro et al. 2023: 16-17). Shirayanagi (2010) and Maejima (2021) introduced examples of animal tourism targeting cats in rural areas in Japan. While these studies have positively viewed cats as an object of tourism, the problems and issues have been overlooked.

However, in reality, as in the case of Ogijima mentioned above, cats sometimes cause problems for residents, and their ecology is unpredictable. Tourism aimed at animals does not necessarily positively impact local areas.

Research Question and Method Discussion

Therefore, this study aims to clarify the background and current status of cat tourism in Ogijima and to discuss the issues that animal tourism brings to the region using case studies.

The survey will be conducted from July to August 2024 in Ogijima; residents, tourists, and tourism officials, such as the Kagawa Prefecture Tourism Association, will be interviewed. Through these qualitative anthropological surveys, we will clarify various aspects of animal tourism.

Result and Discussion

The survey revealed that there were a number of problems surrounding cats in Ogijima. The main problem is a division between those in favor of marketing the island as a tourist destination of cats and those who against it. This issue is related to the inhabitants between immigrants and original residents. This case study of cats in Ogijima shows the problems and unsustainability brought by animal tourism that have not been discussed in previous studies.

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• CLIMATE ACTION SESSION

Advancing Sustainability and Climate Resilience at National Chiayi University: Integrating Renewable Energy and Smart Resource Management

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INTRODUCTION

National Chiayi University is dedicated to advancing climate action and sustainability through innovative approaches and technological advancements. By following the Global Reporting Initiative (GRI) framework and supporting the UN's 2030 Agenda for Sustainable Development, the university has set ambitious goals to achieve 50% renewable energy usage by 2035 and carbon neutrality by 2045. Under the leadership of President Han-Chien Lin, the university has implemented various programs and initiatives to address the challenges posed by climate change, demonstrating its commitment to creating a sustainable and resilient campus.

RESULTS AND DISCUSSIONS

In 2023, National Chiayi University successfully completed the "Intelligent Water Resources Management and Innovative Water-Saving Technologies Program," funded by the Water Resources Agency. This program led to the establishment of a smart water resource management system, which includes: (1) Smart Water Meters: Replacing old mechanical flow meters with smart water meters, incorporating time parameters for flow observation. (2) Water Level Gauges: Installing three submersible water level gauges in reservoirs, integrating real-time data into the water resource management system. (3) Pipeline Network: Implementing a pipeline network to collect water consumption data from 88 different areas, including buildings, and integrating this data into the water management system to create a comprehensive water balance system. (4) Smart Water Network Monitoring: Establishing a campus-wide smart water network monitoring system that supports various communication tools, including webpages, tablets, and mobile apps, to detect area-specific water leaks, track water usage statistics, and analyze consumption patterns..

With this system, the university can monitor and manage water usage across the entire campus, promptly identify the sources of leaks, and thereby reduce water resource wastage. (Figure 1)**Fig** 1. Implementation of an an Intelligent Water Resources Management Platform and Smart Water Meters.

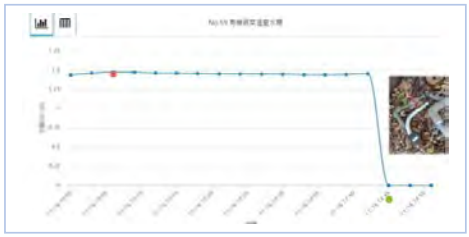

Fig 1. The system indicated a leak in the Agricultural and Biological Sciences Department's vegetable garden (1.5 tons per hour). After closing the water gate, the outflow reduced to zero.

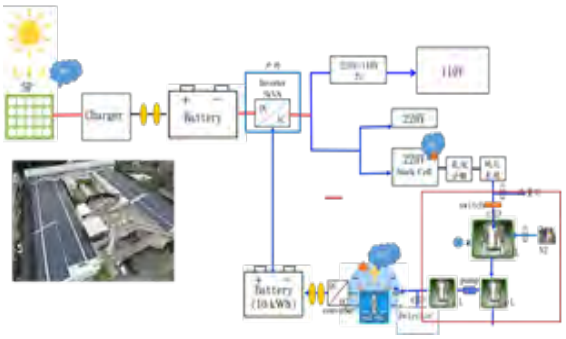

Fig. 2. Solar-powered green hydrogen production

The university's efforts in renewable energy have also shown significant results. By 2023, solar power generation reached 4.30 GWh, leading to a substantial reduction of 2,188.7 metric tons of carbon dioxide emissions. **Figure 3** clearly shows a significant downward trend in the University's Energy Use Intensity (EUI) from 2015 to 2023.

Fig 3. Energy Use Intensity (EUI) at National Chiayi University from 2015 to 2023.

This year, the introduction of green hydrogen energy applications marked a significant milestone. The development of a Green Hydrogen House powered by solar energy for hydrogen production showcased the potential for integrating green hydrogen into the university's sustainability efforts.

Through these comprehensive initiatives, National Chiayi University has not only enhanced its sustainability practices but also provided a valuable reference for global climate action and the mitigation of climate change impacts. The university remains steadfast in its commitment to sustainable development, contributing significantly to the preservation and betterment of our planet.

Carbon Footprint Assessment of NCYU-TN1, A New Drought Tolerant Rice Cultivar from NCYU

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Introduction

Rice is the most widely cultivated and highest-yielding food crop in Taiwan. Research indicates that rice is one of the crops with the highest carbon emissions per unit area and per unit yield. In response to the future carbon credit and carbon trading demands in the agricultural product market, it is essential to conduct carbon footprint assessments for Taiwan's major agricultural practices. The carbon footprint is categorized into product carbon footprint (PCF) and corporate carbon footprint. PCF records and calculates the climate-relevant greenhouse gases that are produced during the entire life cycle of a product, includes all direct and indirect carbon emissions at each stage, starting from raw material acquisition, production and manufacturing, transportation and sales, usage, and waste disposal. The steps in life cycle assessment include defining the goal and scope, life cycle inventory analysis, life cycle impact assessment, and life cycle interpretation. This study references the carbon footprint product category rules (CFP-PCR) for rice (Version 4.0), as announced by Taiwan's Ministry of the Environment (2024). The study analyzes the target product, "NCYU-TN1", an early maturation, drought tolerance and fragrant rice released by NCYU, by calculating the carbon footprint across five major stages of its life cycle mentioned above. The calculation of the product carbon footprint primarily uses the emission factor method. The emission factor method involves multiplying the quantity of raw materials, fuel consumption, or product output by a specific emission factor.

Results and Discussions

We collaborate with the Tainan District Agricultural Research and Extension Station, MOA, has introduced the drought-tolerant and high-quality traits of Taiwan's native upland rice into paddy rice. We have developed a new variety called NCYU-TN1, which is water-saving, low-carbon, high-quality, and has a low glycemic index through molecular marker-assisted breeding techniques,. In this study, it is produced using a low-input conventional cultivation method. Preliminary results from the carbon footprint inventory indicate that the majority of carbon emissions, approximately 70%, occur during the agricultural management stage (raw material acquisition stage). The largest source of emissions at this stage is methane (CH_4) and nitrous oxide (N_2O) emissions from field operations during the planting phase. Each package of the product generates about 0.9426 kg CO_2eq due to field emissions. Many studies have shown that field emissions are the primary source of carbon emissions in rice cultivation (Amnat et al., 2018; Hung et al., 2022). The second highest source of emissions is diesel energy, with each package emitting approximately 0.1752 kg CO_2eq due to the use of diesel fuel, primarily for field machinery operations such as land preparation, transplanting, fertilization, and harvesting. The third highest source is agricultural chemical agents, with each package emitting approximately 0.1125 kg CO_2eq mainly for pest control and herbicides.

Table1 Emission source and coefficient in NCYU-TN1 carbon footprint

Emission source	Emission coefficient	Unit	Fertilizers	Emission coefficient	Unit
Electricity	0.590	kg CO_2 e / kWh	Nitrogen	1.800	kg CO_2 e / kg
Gasoline	3.010	kg CO_2 e / L	Phosphate	0.847	kg CO_2 e / kg
Diesel fuel	3.340	kg CO_2 e / L	Potassium	0.610	kg CO_2 e / kg
Methane	28	kg CO_2 e / kg	Herbicides	13.690	kg CO_2 e / kg
Nitrous oxides	298	kg CO_2 e / kg	Pesticides	14.410	kg CO_2 e / kg
Seeds	1.000	kg CO_2 e / kg	Insecticides	10.280	kg CO_2 e / kg

- The inventory data (such as fuel consumption, electricity usage, and material usage) has been allocated to each product package.
- The carbon emissions for each type of inventory data are calculated using the following emission factors.
- These factors are sourced from the Taiwan Product Carbon Footprint Information Network, the SimaPro database, and the National Greenhouse Gas Inventory.

Table 2 Inventory data of NCYU-TN1 carbon footprint

	Carbon equivalent (kg CO2 e / 2 kg)	Percentage of carbon eq. (%)
Agricultural Management	1.2645	69.87
Post harvest	0.4014	22.18
Transport	0.0122	0.67
Use	0.12	6.63
Waste disposal	0.0118	0.65
Totally	1.8099	100%

In conclusion, to address carbon reduction in field emissions, many studies have focused on water management to achieve carbon reduction effects, such as using alternate wet and dry irrigation (Amnat et al., 2018; Pramono et al., 2021). Additionally, shifting towards low-tillage or no-tillage cultivation methods can reduce diesel energy use, or electric farm machinery could be applied to replace some tasks.

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Climate-Integrated Platforms for Enhancing Public Health Surveillance and Decision Support Systems

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To enhance public health surveillance and address climate- related health impacts, we introduce the Public Health Surveillance for Climate Change (PHS2C) platform. This innovative dashboard monitors health data in Chiang Mai province, offering crucial insights into climate-sensitive health outcomes. The platform aims to integrate climate change and health indicators, focusing on prevalent health issues. The PHS2C platform enables real-time monitoring of hospital visits, including OPD and IPD categories, using data from 2019-2024 for comparative analysis.

Introduction

In the ongoing effort to enhance public health surveillance and address climate-related health impacts, we introduce the innovative Public Health Surveillance for Climate Change (PHS2C) platform. This meticulously crafted dashboard system monitors health data in Chiang Mai province, crucial for comprehending and mitigating climate- sensitive health outcomes.

Results and Discussions

Our primary aim is to establish a comprehensive framework that integrates focused climate change and health indicators, recognizing the intricate interplay between climate drivers, environmental conditions, and public health outcomes. By focusing on prevalent health issues such as Chronic Obstructive Pulmonary Disease, Asthma, Pneumonia, Influenza, Acute Pharyngitis, Bronchitis, Acute Ischemic Heart Diseases, Cerebrovascular Diseases, and Lung Cancer, we seek to provide a holistic understanding of the complex dynamics between environmental factors, human health, and climate change. The PHS2C platform enables real- time monitoring of hospital visits, including OPD and IPD categories. Our methodology employs a research and development, stakeholders can assess current data against the past five years (2019-2024).

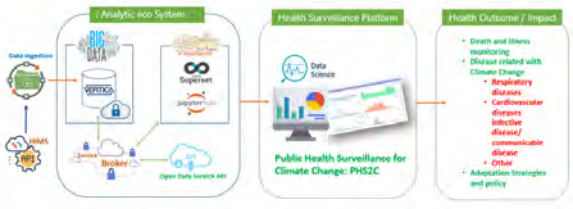

Fig. 1. Framework of the Public Health Surveillance for Climate Change platform: PHS2C

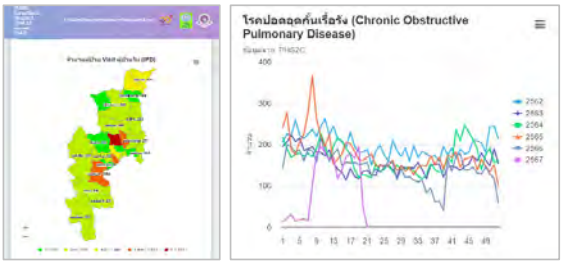

Fig. 2. Real-time data visualization of the PHS2C platform.

Through the implementation of the PHS2C platform, we have gained actionable insights into the nexus between climate change and health outcomes in Chiang Mai province. This empirical evidence underscores the urgency for targeted interventions to bolster public health resilience against the impacts of climate change. The PHS2C platform emerges as a powerful tool for stakeholders to devise informed interventions and policies aimed at safeguarding public health amidst a changing climate. By harnessing real-time data and fostering a deeper understanding of the interconnectedness between environmental factors and health outcomes, we can bolster the resilience of communities in Chiang Mai province. This proactive approach underscores our commitment to promoting the well-being of populations in the face of emerging health challenges exacerbated by climate change.

Acknowledgment

This research was supported by the National Research Council of Thailand (NRCT) under The Smart Emergency Care Services Integration (SECSI) project to Faculty of Public Health Chiang Mai University. This works have been accepted and published previously in 14th International Conference on Public Health among Greater Mekong Sub- Regional Countries.

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Contesting the capitalist state to halt mass extinction? Climate change and the Extinction Rebellion (XR) 'war-machine'

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Introduction

At the forefront of the struggle against climate change and efforts at mitigation have been social movements such as Extinction Rebellion (XR). XR UK can be conceptualized as a 'war-machine' assemblage in order to explore the ways in which it seeks to challenge the capitalist state assemblages implicated in climate change. The paper traces how this XR war-machine seeks to achieve its objectives of transforming states into more benign configurations environmentally speaking.

Results and Discussions

XR UK holds the UK government, and the governments of other powerful states, responsible for the 'negligence' that 'could result in billions of deaths and an 'ecocide' that has brought the population to 'the cliff edge of extinction'.

XR UK seeks to draw 'lines of flight' from the UK state by utilizing the ambiguity of the signifier 'democracy'. In the context of the UK 'democracy' is generally understood as liberal and representative democracy; that is, the population is represented by elected officials. XR UK destabilizes the meaning of the signifier 'democracy', instead constituting it in more 'participatory' and/or 'deliberative' terms.

In so far as the UK state is deemed to be deficient, and the UK government unresponsive democratically to the demands and needs of the population, XR UK seeks to bring about a transformation of the UK state and governance. A 'Citizen's Assembly' for climate and ecological justice is advocated, whereby the aim is to bring about a new political 'culture of participation, fairness and transparency'.

As a war-machine XR UK is decentralized, nonhierarchical, rhizomatic, and geared towards permanent expansion. XR has global ambitions: global problem = global solution.

While XR has enjoyed success, challenges remain in organization, criminalization, public perceptions, dealing with counter-narratives etc.

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Groundwater salinization during the irrigation period and sustainable water use under climate change in the Saijo Plain, Japan

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Introduction

The Saijo Plain in Ehime Prefecture is rich in groundwater, with surface water supplied from a number of sources: irrigation water from the Kamo River, shallow groundwater discharged from the middle reaches of the plain, and deep confined groundwater, which are used for drinking water and irrigation. Climate change has caused drought to become more frequent in recent years, and dependency on groundwater increases during drought periods. As a result, salinization of groundwater is increasing in coastal areas. Drought was particularly severe in July 1994. The groundwater level dropped significantly, leading to increased salinization in coastal areas, causing damage to agriculture. In this study, we propose efficient and sustainable water use to mitigate the fall in groundwater levels during droughts.

Materials and Methods

On August 1 and 2, 2021, when shallow groundwater had ceased discharging because of drought, surface water and groundwater were collected and water flow rates were measured at 43 points in the Saijo Plain (Kamo River flow rate: 2.7 $m^3\ s^{-1}$). We focused on the difference in the content of Stibnite (Sb) and Silicon (Si) in each water source and used them as tracers for hydrological analysis. The ratio of the two tracers in the water source at each point was determined from simultaneous equations using the concentrations of Sb and Si. A lumped parametric model was used to simulate the groundwater level (Takase and Tokumasu, 2019). Each parameter was based on the weather conditions of July 1994, and the rainless period was set to 23 days. The groundwater pumping volume during this period was calculated to be 4.30 $m^3\ s^{-1}$ using the above model. The survey target in 2021 was the right bank area of the Kamo River, with a field area of 5.43 $\times 10^6$ m^2 (A). On the other hand, the tank model covers the entire plain, and the water system area is 8.89 $\times 10^6$ m^2 (B). Therefore, the discharge input to the model was calculated by multiplying the observed discharge by the coefficient 1.63 calculated from (B)/(A).

Results and Discussions

At a groundwater pumping rate of 3.20 $m^3\ s^{-1}$, the groundwater level fell by 0.11 m, while at a 4.30 $m^3\ s^{-1}$ pumping rate, it fell by 1.07 m. In the drought year of 2021 under hydrological conditions similar to 1994, flow rates of various water sources at the end of the plains were as follows: Kamo River irrigation water 0.64 $m^3\ s^{-1}$, shallow groundwater 0.73 $m^3\ s^{-1}$, and deep groundwater 0.86 $m^3\ s^{-1}$, totaling 2.23 $m^3\ s^{-1}$, all of which were found to be flowing into the sea. Effective use of discharged Kamo River irrigation water could reduce the groundwater pumping rate to 3.66 $m^3\ s^{-1}$, resulting in a groundwater level fall of 0.41 m. Further simulations to reduce the amount of groundwater pumping were done by increasing the irrigation water supply from the Kamo River by 0.1 $m^3\ s^{-1}$ step, and correspondingly the groundwater pumping rate was reduced by 0.1 $m^3\ s^{-1}$ step. As a result, with the Kamo River irrigation water supply at 0.91 $m^3\ s^{-1}$ and the groundwater pumping rate at 3.10 $m^3\ s^{-1}$, the groundwater level fell by less than 0.10 m. Even during times of droughts, which occur only once every few decades, the risk of salinization was found to be significantly reduced by efficient allocation of irrigation water from the Kamo River and proper management of groundwater pumping.

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i-Tree Eco in Japan: Quantitative evaluation of the ecosystem service value of street trees

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INTRODUCTION

'Urban forests' encompasses all forms of greenery and green spaces within urban areas, and plays a pivotal role in climate mitigation within urban environments. In recent years, policies have been implemented worldwide with the objective of expanding urban forests and increasing canopy cover, such as '3-30-300 Rule'[1]. Nevertheless, this initiative has been relatively slow to gain traction in Japan. To effectively expand urban forests, it is essential to conduct a comprehensive assessment and visualization of the climate mitigation and other ecosystem services they provide. I present two case studies in Japan utilizing 'i-Tree Eco V6' (The Devay Institute/US Forest Service, here after 'i-Tree'), a free software tool that enables the quantitative evaluation of ecosystem services at the individual tree level.

METHOD

i-Tree requires species name and breast height diameter for ecosystem service assessment. To enhance the precision of the assessment, it is advised that the following data be entered: tree height, crown-base height, crown width, crown light exposure, crown dieback and crown health score. These measurements were collected in the field and an ecosystem services evaluation was conducted using i-Tree.

CASE 1: AN ASSESSMENT OF THE ECOSYSTEM SERVICES PROVIDED BY STREET TREES IN A SYMBOLIC STREET [2]

Chuo-dori Street is a main street in Takamatsu, Kagawa Prefecture, where rows of camphor trees (*Cinnamomum camphora*) are planted along the median strip. The growth status and ecosystem services of the trees on Chuo-dori Street (n=189) were evaluated in comparison to those of camphor trees planted on a neighbouring another street (n=20) and park (n=29).

The trees on Chuo-dori Street were found to be exhibiting high levels of vitality score (Table 1). In contrast, trees on another street and in parks were rated as exhibiting low vigor due to the implementation of a rigorous pruning regimen. It was demonstrated that trees with larger body size and higher vitality exhibited higher ecosystem service rating values.

sTable 1 Growth status and ecosystem services of camphor trees in Case 1

	Diameter of Breast Height (cm)	Vitality Score	Annual carbon sequestration (kg/year per tree)	Annual air pollution removal (kg/year per tree)
Chuo-dori	41.1±9.0	70.3±7.8	9.73±4.43	1.50±0.86
Another street	20.9±7.2	54.9±7.3	2.63±1.98	1.43±0.67
Park	28.2±6.7	67.0±7.5	4.45±3.15	0.89±0.88

Note: Value in Table 1 are means ± standard deviation.

CASE 2: A COMPARATIVE ANALYSIS OF ECOSYSTEM SERVICES PROVIDED BY STREET TREES IN TWO CITIES [3]

Bridgestone Street (Kurume, Fukuoka) and Aoba-dori Street (Sendai, Miyagi) are both boulevards lined with zelkova trees (*Zelkova serrata*) that are representative of their cities. A comparison of tree growth and ecosystem service values between the symbolic streets of the two cities was carried out.

Tree growth on Bridgestone Street (n=156) was good. And then, Aoba-dori Street (n=126) had significantly better growth (Table 2). Air pollution removal was higher in Aoba-dori Street, but annual carbon sequestration was higher in Bridgestone Street. This was thought to be due to the warmer climate in Kurume than in Sendai.

Table 2 Growth status and ecosystem services of camphor trees in Case 2

	Diameter of Breast Height (cm)	Vitality Score	Annual carbon sequestration (kg/year per tree)	Annual air pollution removal (kg/year per tree)
Bridgestone	55.6±12.2	71.6±7.0	20.77±6.22	0.40±0.25
Aoba-dori	54.6±18.6	97.7±2.8	14.72±6.68	0.67±0.33

Note: Value in Table 1 are means ± standard deviation.

CONCLUSION

Only a small proportion of the ecosystem services provided by urban forests can be quantified. In this study, carbon sequestration and air pollution removal were assessed as contributing to climate change mitigation. However, canopy shading and transpiration are also likely to contribute to climate change. It is important to note that current quantitative assessment methods underestimate this. There is a need to develop accurate valuation methods for urban forest ecosystem services including their contribution to climate change.

ACKNOWLEDGMENT

Case 1 research study was funded by the 114Bank Foundation in 2021. Case 2 research study was conducted in collaboration with Urban Tree Diagnosis General Incorporated Association, Japan since 2022.

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Monitoring of rainwater infiltration and storage in a rain garden on the Kagawa University

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Introduction

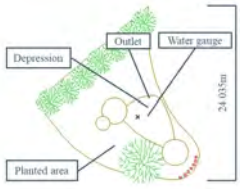

Fig.1. Rain garden plan

In recent years, Japan has focused on and promoted "Rain Gardens(RG)", a type of green infrastructure, as means of alleviating concerns about increasing urban flooding.

However, there are few examples [1] of actual measurement and verification of rainwater treatment functions using rainfall events, and further accumulation of knowledge is essential.

In this study, rainwater infiltration and storage were monitored in a RG constructed on the Kagawa University campus (Fig.1.), and the rainwater treatment function was verified by actual measurement.

Methods

The quantity of rainwater that flows into and infiltrates the RG was calculated from the water level of the depression in the RG.

The coefficient of permeability was calculated from hourly rainfall data (JMA 2024) from the Takamatsu District Meteorological Observatory.

The volume of depressions was measured using a LiDAR device on an iPad Pro (11-inch 3rd gen) to calculate the infiltration of rainwater.

The hydraulic conductivity of the depression in the RG was calculated by drawing an approximate straight line using the least-squares method based on the measured water level fluctuations.

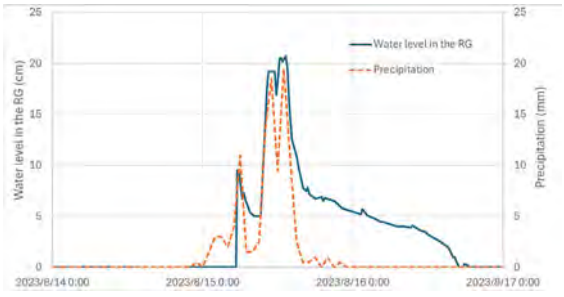

Fig. 2. Water level in the RG fluctuations due to rainfall (8/14/2023~8/17/2023)

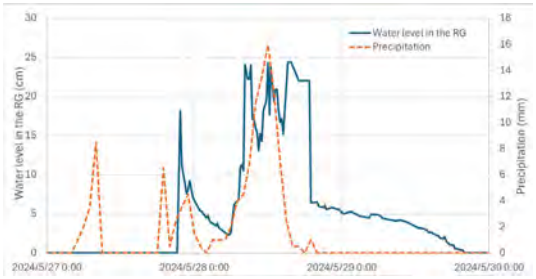

Fig. 3. Water level in the RG fluctuations due to rainfall (5/27/2024~5/30/2024)

Results and Discussions

Water level in RG data and precipitation data showed up to a 3-hour delay from peak rainfall to peak RG water levels for the May 2024 event (Fig.3.).

This suggests that the RG can reduce the risk of internal flooding, which is the purpose of the RG, by controlling the rapid runoff of rainwater into the sewage system and surrounding soil.

3D scan data using LiDAR revealed that the volume of rainwater that can be stored in the depressed area within the RG is 20.968 m³. This is the volume of rainwater that can be stored in the depression in the central part of the RG where waterlogging can be seen due to rainwater between the point where the water level in the water level gauge reaches 0 cm and the bottom of the outlet at a height of 5.6 cm.

However, this value may be the calculated 3D mesh volume of the depression area itself, so the details need to be investigated again.

Conclusion

It was found that the RG was able to temporarily store and infiltrate rainfall into the catchment area, which is several times larger than the depression area where rainwater is mainly treated, and that the RG was able to fulfill its main purpose as a measure against urban flooding.

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Seto Inland Sea Restoration with Blue Carbon – Development of Seaweed Bed Regeneration Structure

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Introduction

The Seto Inland Sea, a semi-enclosed sea area, has experienced unique environmental changes. These changes include smooth material circulation and productive ecosystems, rapid economic growth and environmental degradation, load reduction and reduced catches, and ecosystem changes due to oligotrophic growth and global warming. In this study, we developed a structure that can efficiently regenerate seaweed beds and evaluated the regeneration status and carbon sequestration capacity of the seaweed beds.

Results and Discussions

In the Seto Inland Sea, Seaweed beds and tidal flats, which play an important role in water quality improvement and biological reproduction for vegetative coastal ecosystems, were reclaimed during the high-growth period after the 1950s, and the pollution load from land areas increased rapidly. As a result, eutrophication progressed, red tides occurred frequently, and fishery damage increased, though fishery production increased significantly. At this time, red tide damage became a social issue, and the Law Concerning Environmental Conservation of the Seto Inland Sea was enacted, limiting landfill and reducing the environmental load of nitrogen, phosphorus, and other substances.

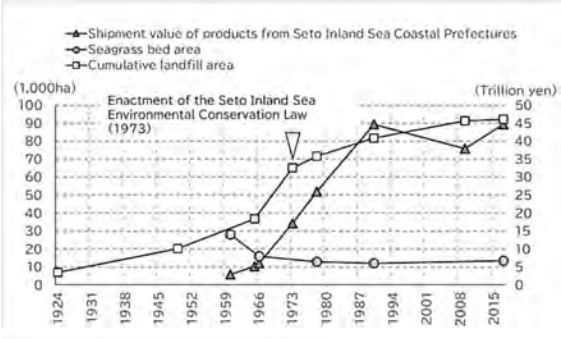

FIGURE I Value of Commodity Shipments, Landfill Area and Seaweed Area in the Seto Inland Sea Basin

As a result, DIN (dissolved inorganic nitrogen) concentrations decreased, and although the sea became visibly cleaner, fishery production in the Seto Inland Sea dropped to one-half of its peak level. Possible reasons for this include oligotrophic growth, global warming, overfishing, and the decline of vegetated coastal ecosystems.

We have developed a new seaweed bed creation reef (Marine Mash) to restore vegetated coastal ecosystems by restoring seaweed beds. 71 units were installed in two shallow areas with poor algae on sandy and muddy bottoms, and a survey on algal growth was continued over 14 years.

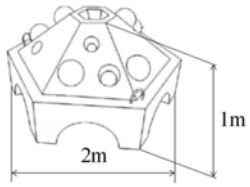

FIGURE II Seagrass Bed Creation Reef (Marine Mash)

Algae (Sargassum and Wakame seaweed) grew abundantly on this structure every year during the study period. They sequestered CO_2 and were washed away as flow algae when the time comes, and settled subsequently to contribute for long-term C sequestration. C sequestration in the algae on Marine Mash was about 150 tons/year/hectare, much higher than that of the Japanese coastal sargassum bed (16.0 ± 2.6 tons CO_2/year/hectare).

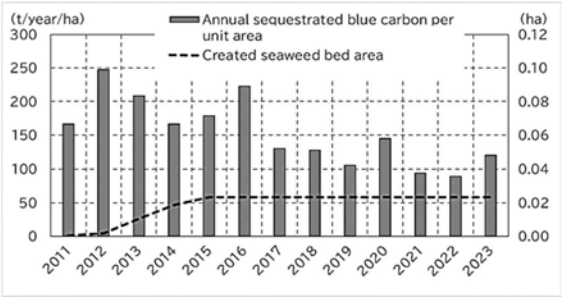

FIGURE III Seagrass Bed Regeneration Area and Blue Carbon Content per Unit Area

Acknowledgment

This work was supported by JST Japan Grant Number JPMJPF2306.

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Perception of elementary school children on “the best mix of electricity generation methods and decarbonization”: report on a lesson in the 4th grade social studies

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Introduction

Learning various methods of electricity generation and explore the best mix of electricity generation are important for creating sustainable future. While Japanese elementary schools rarely focus on the topic of “electricity supply”, we developed a series of lesson plan which are to be carried out at Sakaide Attached elementary school in 12 July 2024 . During this lesson, students will explore “ the best mix of electricity generation and decarbonization ” through dialogue with electricity industry. In the presentation, we will introduce the lesson that we developed, report on the way lessons were carried out, and how students responded during the class. We will also discuss how our findings translate to the issue of climate change and the process of decarbonization in the field of electricity generation.

The meaning of studying "electricity

(1) Because raw materials are sent from overseas, students can learn about the relationship between Japan and other countries. Japan's energy self-sufficiency rate is 11%.

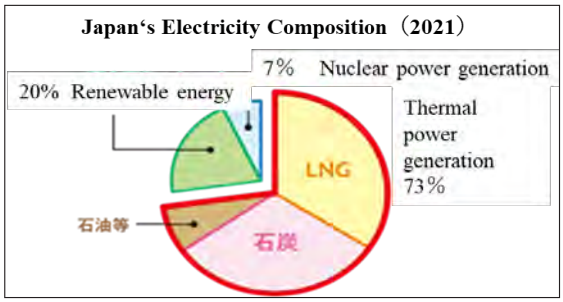
(2)Carbon dioxide reduction is an international commitment, and "decarbonization" and "sustainable power generation" can be taken up.

(3)Power generation takes advantage of the local topography and climate. Example: River flowing = hydro power Oceanfront = offshore wind power Waste from local specialties = biomass power Volcanoes and hot spring areas = geothermal power

(4) With the "deregulation of electricity", households can now choose which type of electricity they use.

(5)There are various methods of generating electricity. Analyze the advantages and disadvantages of each method from the perspectives of "power generation cost," "whether or not carbon dioxide is emitted," "renewable," "stable/naturally influenced," and "power generation that makes use of the local environment."

Perspectives and ideas in perceiving electricity
Safe", "Stable at all times", "Decarbonization", "Low cost (Generation cost and Electricity bill)", "Globalization (Raw materials are imported from overseas)", "Energy saving".



Lesson plans

1.To develop an interest in electricity in our daily lives around us and set the learning question, "How is electricity made and sent?"

2.3..Investigate methods of generating and transmitting electricity.

4.Relate the "approach to electricity generation" to "its meaning and role" and "the wishes of consumers".

5.Understand that electricity is delivered "always" and "stably

6.Learn about the "electricity problem" where sustainability is an issue, and select "the best mix of electricity generation methods" and "the electricity I use" and "how to save electricity" using a "decarbonization," "cost," and "stability" perspective on the advantages and disadvantages of various types of electricity generation.

Students will learn about electricity over six hours during the second week of the first week of July.

The presentation at Chiang Mai University will focus on the sixth period. Specifically, students will report on situations in which they discuss the best mix of electricity and choose the type of electricity they use at home. During this period, employees of the power company will be invited as guest teachers. They will also discuss sustainable electricity with the students.

Through the discussion, students will learn that "all power generation methods have advantages and disadvantages," "there is no perfect method of power generation," and "the best mix is important."

On the day, I will summarize the students' comments and report.

• STUDENT SESSION

A novel physical technique to enhance the stability of starch gels against retrogradation using ultra-fine bubbles

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Introduction

Starch is a versatile ingredient with a multitude of applications in the food industry including noodle and bread. Starch granules are mainly composed of amylose and amylopectin, which originally possess a crystalline structure. These molecules are hydrated when they are heated in a sufficient amount of water to lose crystallinity and form viscoelastic gels; the hydration process is referred to as starch gelatinization. When the gelatinized starch gels are stored under refrigerated conditions, the crystallinity of the starch molecules gradually recovers, which leads to gel hardening and syneresis; this process is referred to as starch retrogradation.

The retrogradation generally results in undesirable changes in starch physicochemical properties such as texture and digestibility. To suppress the retrogradation, food additives like chemically-modified starches and chemically-synthesized emulsifiers are used in various starch-based foods. However, nowadays consumers' demands for clean label are increasing, requiring novel physical methods other than the use of such chemical compounds.

In this study, we focused on ultra-fine bubbles (UFBs), i.e., submicron bubbles with unique colloidal properties, including a negative surface charge and long-term stability against bubble coarsening. UFBs could be utilized in many situations due to its facile production without a large energy input, as well as its clean-label orientation owing to the simple components, i.e., only water and gas. Hence, we used UFBs in starch gel systems to evaluate their effects on the physical properties during the storage.

Results and discussions

Isolated starches derived from various plant resources (i.e., potato, sweet potato, wheat, and corn) were dispersed in deionized water with/without UFBs, followed by heating, to achieve gelatinization. The gelatinized starch dispersions were cooled to obtain starch gels (Control gels and UFB gels, respectively), followed by storage under a refrigerated condition (4℃) for up to 14 days.

To assess the progress of starch retrogradation during storage, breaking tests of Control and UFB gels were conducted to obtain the breaking stress as an indicator of starch retrogradation. Fig. 1 shows time dependent changes in the gel breaking stress during the storage. The results shows that UFBs tended to suppress the increase in breaking stress during the storage particularly for sweet potato starches.

To evaluate the properties of the gel in more detail, texture analyses based on double compression were additionally performed. The results indicated that UFBs tended to suppress the decrease in chewability during storage, which demonstrates that rheological properties of UFB gels are more stable against time dependent the unfavorable changes.

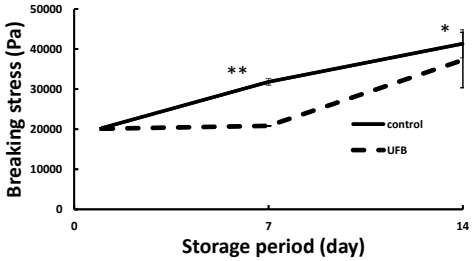

Fig 1. The changes in the breaking stress of starch gels (sweet potato) during the storage (t-test, *: $p < 0.05$, **: $p < 0.01$).

To quantitatively assess the progress of retrogradation, the syneresis of the samples was measured as another indicator. UFB gels tended to be more resistant against syneresis than Control gels as well as the changes in rheological properties.

These results shown in the previous parts suggest that UFBs may inhibit starch retrogradation in an aqueous gel system. To highlight the possible mechanisms and more deeply discuss the interactions between UFBs and starch molecules, the hierarchical structurer and thermodynamic behavior of Control and UFB gels were analyzed. The observation of the network structure of these gels by SEM and analysis of the effect of UFBs on gelatinization and retrogradation of starch molecules based on DSC will be presented.

Acknowledgment

This work was supported by The Public Foundation of Elizabeth Arnold-Fuji Academic Research Grant and JSPS KAKENHI Grant Number 24K17848.

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An Accurate Mango Fruit Maturity Feature Estimation Using 3D Photogrammetry Technique

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Introduction

This study employs 3D photogrammetry techniques to create digital replicas of mangoes and other fruits. Specifically, multiple images are captured and subsequently processed through software to synthesize a three-dimensional model of the mango. This model facilitates the precise measurement of mango parameters, such as height, width, and circumference, which proves invaluable for investigating mango maturity. Furthermore, the 3D model can be utilized to extract numerous parameters for subsequent research endeavors.

Research Methods

In this study, we utilize VisualSFM for 3D reconstruction, generating dense three-dimensional point clouds from captured images. The resulting point clouds undergo processing in MeshLab, including noise removal and size calibration using reference points. Finally, Python is employed to read the ply point cloud files for 3D model measurements. Our approach involves selecting a cross-section and rotating it 360 times in 1-degree increments around the Y-axis (perpendicular to the ground).

Diameter Measurement

Given the irregular cross-section of mangoes, determining the maximum diameter is challenging. At each rotation, the system measures the X-axis diameter of the cross-section. The mango is then segmented into multiple cross-sections, each measured individually to determine the overall maximum diameter.

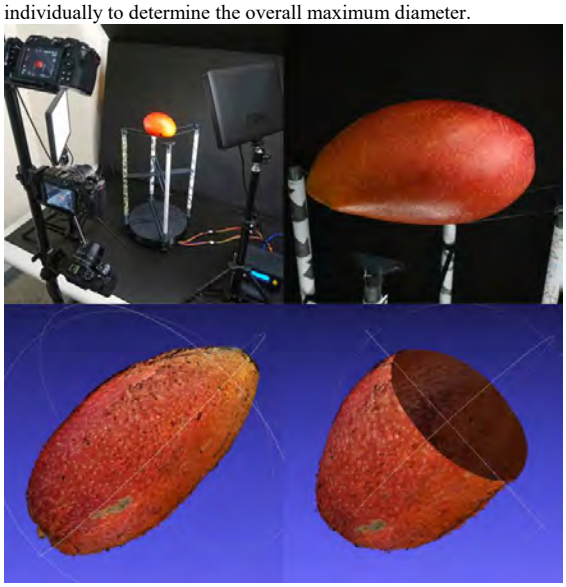

Fig. 1. Top left: Photographic capture platform, comprising camera, support structure, and turntable. Top right: Photograph of the actual mango. Bottom left: mango point cloud model after correction in MeshLab. Bottom right: Cross-section of the mango model.

Circumference Measurement

As the fruit's circumference forms an irregular curve, direct measurement by summing inter-point distances yields substantial errors, with point density affecting measurement accuracy. We therefore employ curve fitting to the point cloud, followed by curve length measurement, minimizing error in circumference calculation. Since point clouds in ply files are unordered, we first determine the relative positions of all points on the selected cross-section. We obtain (x,z) coordinates for each point and calculate their angles relative to the Y-axis. Sorting points by angle establishes their positional relationships. With relative positions determined, we apply CubicSpline to compute the fitting function. Finally, we use the fitting function for resampling to obtain a smooth curve.

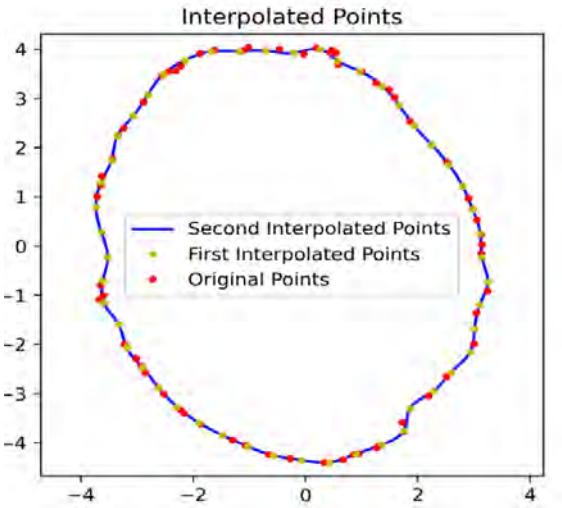

Fig. 2. Original points and interpolated curves. Red points represent the original data points. Green points denote the first interpolation. The blue curve consists of points from the second interpolation, which are highly dense. Consequently, the curve length, equivalent to the circumference, can be calculated with minimal error by computing the Euclidean distances between these points.

Results and Discussions

Our experimental results indicate that the measurement data of the 3D model is consistent with the manual measurement method. Through automated measurements using Python scripting, we can compute a large amount of data that is difficult to obtain manually. This data can be utilized for machine learning to further enhance the feature analysis of fruits.

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Analysis of the Chemical Composition and Molecular Structure of Grains from Different Rice Varieties, and the Quality Changes During the Storage.

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Introduction

Rice (*Oryza sativa* L.) is consumed by over 60% of the global population (Wu *et al.*, 2019). In Taiwan, a significant amount of land is dedicated to rice cultivation. Japonica rice is mainly for cooked rice, however glutinous and indica rice are for various processing purposes. The processed rice should be stored at room temperature, and the required storage time varies among different varieties. During storage, physical properties of rice may change. For instance, the swelling power decreases (Tananuwong and Malila, 2011), the peak temperature increases (Hu *et al*., 2022), and the water binding capacity decreases (Abiodun *et al*., 2014). These changes are likely related to the rice chemical components structure, which can be analyzed using X-ray diffraction, FT-IR and Raman spectroscopy. We aim to identify the relationship between rice structure and its physical properties.

Results and Discussions

The swelling power indicates how much water is held by hydrogen bonds. During gelatinization, these hydrogen bonds break and are replaced by water (Yu *et al*., 2010). A lower swelling power suggests greater difficulty in cooking. The swelling power of waxy rice decreases after storage (Fig. 1), indicating restricted swelling. Additionally, the peak temperature increases after storage, which reflects the endothermic peak during heating. The result showed increase in peak temperature after storage in different rice varieties (Table 1) aligns with the previous results (Tananuwong and Malila, 2011**;** Iuga and Mironeasa, 2019**;** Hu *et al*. 2022)

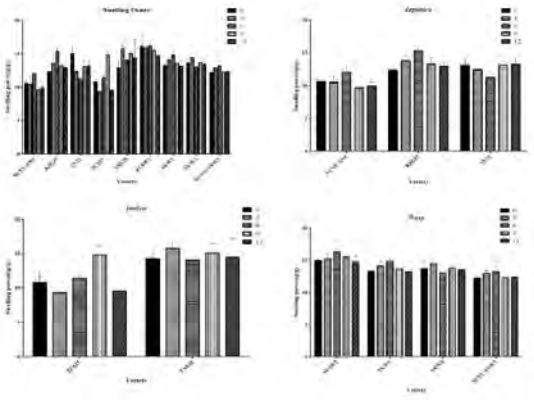

Fig 1. Swelling power of different rice varieties after storage. Flour to water ratio of each sample was 1:10. Error bar represents a standard deviation (n = 3).

Table 1. Peak temperature(℃) of different varieties after storage.

	3 month	6 month	9 month	12 month
NCYU-TN1	71.45	73.27	71.96	68.77
KH147	63.79	68.74	73.22	74.24
TN11	69.51	75.55	72.61	63.28
TCS17	70.66	72.32	72.88	72.16
TNS18	66.77	72.16	70.80	67.95
TCSW2	64.83	66.68	64.49	63.07
TKW1	67.83	68.93	68.87	70.97
TKW3	66.30	66.68	67.20	70.02
NCYU-TNW3	67.38	63.23	60.07	65.84

Acknowledgment

This study would like to thank Tainan District Agricultural Research and Extension Station (DARES), Taichung DARES and Kaohsiung DARES, provided the rice samples. And Agriculture and Food Agency, Ministry of Agriculture, Taiwan for financial support.

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Background and resources for special education students in rural areas in Taiwan

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Abstract

Special education in rural Taiwan faces significant challenges, including teacher shortages, insufficient family support, and inadequate educational resources. However, targeted strategies such as professional learning communities, special education camps, and community support systems have shown promising results. This paper explores the challenges, strategies, outcomes, and future expectations for special education in rural Taiwan, emphasizing the need for comprehensive resource allocation and innovative teaching methods to improve educational equity and support for special education students.

Challenges

Special education in rural Taiwan faces numerous challenges. One of the primary issues is the insufficient family support available to students. Families in rural areas often do not have the necessary educational background and resources to effectively support their children's learning. As a result, many special education students require additional tutoring to keep up with their schoolwork, a service that is often unaffordable for these families (Zheng, 2022).

Teachers in rural areas also face limited opportunities for effective communication and interaction. This lack of interaction hinders the sharing and improvement of teaching practices.

The unique needs of early childhood special education add another layer of complexity. Physical space limitations in rural kindergartens often preclude the establishment of dedicated special education classes or resource rooms.

Overall, these challenges highlight the need for comprehensive resource allocation and innovative strategies to support special education in rural Taiwan.

Strategies

To address challenges in special education in rural Taiwan, several strategies have been implemented. A key initiative is the summer special education camp, which recruits special education teacher trainees from across Taiwan to plan and teach thematic courses (Chen and Wu, 2014). Efforts have also been made to increase resource allocation by recruiting and training more special education teachers, particularly in rural areas, and improving their working conditions to alleviate shortages and boost job satisfaction(Yu & Hu, 2021).

Additionally, the use of technological and innovative teaching methods, such as remote education and online support, helps address teacher shortages and provides individualized teaching tools. These comprehensive strategies aim to improve the quality and accessibility of special education in rural Taiwan, ensuring that all students receive the necessary support and education (Chang, 2021)

The Case of Shicheng "Fun" SE Summer Camp

Shicheng Elementary School in Dongshi District, Taichung, is a rural school that hosts the Shicheng "Fun" Special Education Summer Camp. This camp targets special education students and annually recruits special education majors and teachers from various fields as theme instructors. The goal is to provide diverse learning opportunities for rural special education students and support teacher development.

Teachers design diverse courses, including special needs, arts and crafts, and outdoor activities. The camp emphasizes cross-professional collaboration, promoting resource sharing and mutual growth among teachers and students. Activities and courses are designed to ensure continuous learning during holidays, stimulating student interest and potential. Community and family involvement is encouraged through activities like picnics, helping parents support their children's learning, and utilizing community resources such as volunteer services and local business support.

The Shicheng "Fun" Special Education Summer Camp effectively models special education in rural areas through diverse course design, cross-professional cooperation, continuous learning support, and community and family involvement. This approach creates equal learning opportunities for students and promotes teacher professional development, offering valuable insights for rural special education.

Conclusion

Special education in rural Taiwan faces significant challenges due to resource limitations and teacher shortages. However, through the implementation of targeted strategies and community involvement, there have been notable improvements in both student outcomes and teacher professional development. Continued investment in resources, policy adjustments, and innovative teaching methods are essential to provide equitable educational opportunities for special education students in rural areas, paving the way for their bright futures.

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Connecting Policies to People: How Thai Government Policy Goes Viral on TikTok through Storytelling

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Introduction

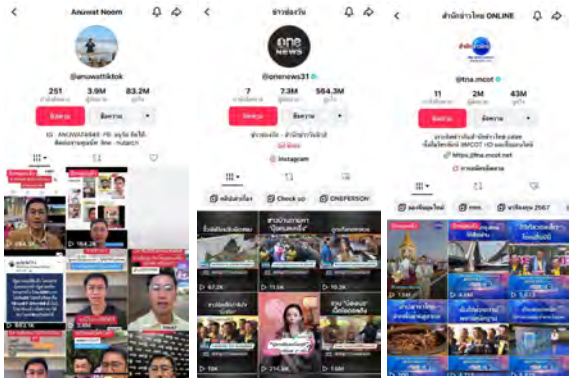
In 2023, global social media users reached 4.76 billion, with an average daily usage of 2.31 hours. This increase has led mass media and the Public Relations Department of Thailand to adopt social media as their additional tools. In Thailand, 61.21 million people (85.3% of the population) use the internet, with 52.25 million active on social media [1] (Datareportal,2023).TikTok has gained significant popularity, particularly during the COVID-19 pandemic, with hashtags like #TikTokNews and #ข่าวTikTok accumulating billions of views. The Public Relations Department uses TikTok to enhance engagement and reduce the gap between the government and citizens. Applying storytelling and viral marketing concepts, this research aims to find strategies for government agency to improve public communication and engagement.

Results and Discussions

This research employs content analysis methods, studying the content and structure of the messages and storytelling forms, aligned with two main theories: storytelling theory and viral marketing [2] (Huang and J. Grant, 2020) The study uses purposive sampling from viral government policy videos on TikTok in three types of accounts: "Thai News Agency ONLINE" (government-affiliated media), "ONE31" (commercial media), and "Anuwat Noom" (individual media). A total of 123 videos that received over 100,000 views from July to December 2023 were selected.

The study found that the common characteristics of viral government policy news videos include a complete storytelling sequence, a clear core question of the story, the "ABT" (And, But, Therefore) format plot twists, a high status of being story-driven (including main and related sub-stories to present detailed information), storytelling through voice or conversation, storytellers with high ability and skill in summarizing information, using simple language, answering questions, and providing examples to clarify content, and highly credible storytellers. For the supporting factors, they also use hashtags consistently to increase video visibility and reach, and use thumbnails and captions, including headlines on thumbnails and captions to explain video details.

The core content themes in viral government policy videos are predominantly related to the Ministry of Finance followed by the Ministry of Energy and the Ministry of Interior. The rest of ministries have no policies as viral videos. This evidence suggests that the Thai economic and social context in 2023 influenced the content of viral videos. During this period, Thailand's economy grew slower than expected, recovering from the COVID-19 pandemic. Consequently, viral videos reflected public interest in government policies, particularly those impacting daily life,



"Anuwat Noom" (individual media) "ONE31" (commercial media) "Thai News Agency ONLINE" (government-affiliated media)

such as economic policies, support for low-income people, and social issue resolutions. The Ministry of Finance's policies, especially digital wallets, low-income support, economic stimulus, and SME support were most prominent. The Ministry of Energy's policies on reducing oil, electricity, and gas prices also gained significant attention.

When comparing across the TikTok account owners, individual media accounts like "Anuwat Noom" excelled in creating viral videos by tailoring entirely new clips to TikTok's platform and audience. In contrast, commercial and government-affiliated media simply recycled their television news content on social media. Individual media account effectively used his limited resources to stand out on TikTok, directly addressing policies affecting people's lives and creating relatable content that led to high levels of sharing and engagement.

Overall, this study provides insights into effective storytelling strategies for disseminating government policy videos on TikTok. It offers a model to improve government policy communication, aiming to meet public needs and foster citizen engagement.

Acknowledgment

I wish to acknowledge my research advisor for her invaluable guidance throughout this study, and the Faculty of Mass Communication for facilitating the presentation of my research.

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Downregulation of XRCC3 expression enhances EGCG induced cytotoxicity and growth inhibition in non-small lung adenocarcinoma A549 cells.

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Introduction

Non-small cell lung cancer (NSCLC) is the most common type, which is account 85% of lung cancers. Most people diagnosed with NSCLC are unsuitable for surgery due to the NSCLC patients with metastasis, so lung cancer is the leading cause of cancer-related death in the global world. And the A549 cells is the type of non-small lung adenocarcinoma cancer cell.

Particularly epigallocatechin gallate (EGCG) is a kind of catechin in green tea. They also a well-known antioxidant, inhibits reactive oxygen species (ROS). It had some effects about lessen side effects and strengthen anticancer effects. Therefore, it has been proved that had synergistic effect with chemopreventive medicines.

XRCC3 is a kind of DNA repair protein, it could remain chromosome stability and repair damaged DNA in homologous recombination (HR).

Erlotinib, an epidermal growth factor receptor tyrosine kinase inhibitor (EGFR-TKI), is a kind of targeted therapy.

After the lung cancer patients take the targeted therapy for a long time, the lung cancer cells will mutations and then contribute to condition about the lung cancer cells have the drug resistance. To improve the therapeutic effect of the erlotinib. In this study I want to find out that EGCG cotreatment with erlotinib could downregulate XRCC3 expression and induce cytotoxicity in NSCLC.

Results and discussions

At present, the use of EGCG in combination with erlotinib to increase cytotoxicity in NSCLC is still debatable and requires further research. My study is trying to prove that treat EGCG combination with erlotinib could significantly reduce protein levels of XRCC3 compared with EGCG alone. And confirm cotreatment could downregulate XRCC3 expression because of which pathway.

I found that compared with treat EGCG alone, combination with erlotinib could reduce significantly XRCC3 expression and increase cytotoxicity. And active p38 MAPK pathway is related to XRCC3 expression.

To confirm induce cytotoxicity and growth inhibition about treat EGCG combination with erlotinib to downregulate XRCC3 expression.

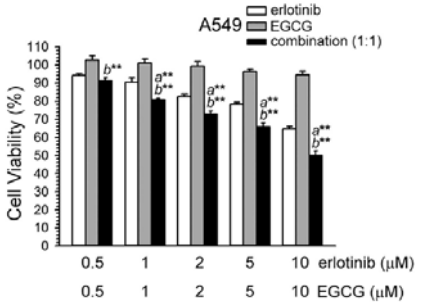

Fig.1 EGCG enhanced erlotinib cytotoxicity in A549 cells. The MTS assay was used to determine the cell viability after EGCG and erlotinib combined therapy at a 1:1 ratio.

In this study, I have two major research direction. First, I will examine the signal transduction mechanism about treat EGCG could downregulate XRCC3 expression and induce cytotoxicity in NSCLC. Second, I want to analysis cytotoxicity and growth inhibition of EGCG cotreatment with erlotinib in the signal transduction pathway that I found before.

I found that EGCG reduces the levels of cellular XRCC3 protein and mRNA in NSCLC cells through the activation of MKK6-p38 MAPK pathway. And then, one of the main elements contributing to the enhancement of erlotinib's cytotoxic effects is the EGCG-induced downregulation of XRCC3 protein.

As a result, EGCG combined therapy with erlotinib to inhibit XRCC3 expression in NSCLC may be a new combined therapy that can synergistically enhance cytotoxic effects. After use the vivo animal and human testing to confirm the feasibility about this study, it can improve the survival of patients with NSCLC and provide more kinds of treatment.

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Effect of ferritin on nitrogen fixation and growth of *Lotus japonicus* inoculated with *Mesorhizobium loti* and grown under nitrogen-free conditions

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Ferritin, an iron storage protein plays a vital role in plants by storing excess iron to prevent oxidative stress and releases when required by the plant for its functions and growth. In this study, we investigated effect of ferritin on growth and nitrogen fixation in *Lotus japonicus* by inoculating *L.japonicus* wild type and ferritin mutant with *Mesorhizobium loti* and grown under nitrogen free conditions. Results from this study indicates that ferritin deficiency inhibits root growth and promotes shoot growth.

Introduction

Iron is an essential micronutrient required in small amount by almost all living organisms. Excess or insufficient iron levels in the plant can negatively impact overall plants growth. Ferritin, a complex protein plays a vital role in balancing iron levels by storing excess iron and releasing it when it is required by the plant.

Ferritin also plays a critical role in various physiological functions including chlorophyll synthesis, respiration and nitrogen fixation. In this study, we investigated effect of ferritin on growth and nitrogen fixation in *Lotus japonicus* inoculated with *Mesorhizobium loti* and grown under nitrogen-free conditions.

Results and Discussions

Growth measurement

Growth was measured at four weeks post inoculation (4wpi) with *M.loti* by measuring the shoot length and the root length.

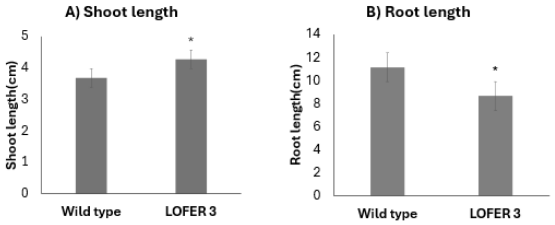

Fig.1. Phenotype measurements at four weeks post inoculation (4wpi). A) Shoot length measured at 4wpi, B) root length measured at 4 wpi. Error bars indicates mean ± SE, and asterisks indicate significant difference ($P<0.05$).

The results showed that ferritin mutant significntly promoted shoot growth (Fig. 1 a) and suppressed root growth (Fig.2 b). From this result, it can be concluded that ferritin suppressed root growth to stop uptake of iron which can be toxic to plants while allowing absorption of other nutrients.

Acetylene reduction activity

Acetylene reduction activity (ARA) was measured at 4wpi to determine nitrogenase activity, an enzyme responsible for nitrogen fixation.

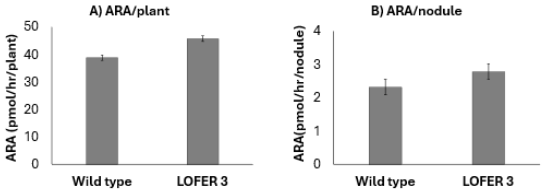

Fig. 2. Acetylene reduction activity at 4wpi. A) Acetylene reduction activity per plant, B) Acetylene reduction activity per nodule. Error bars indicate mean ± SE, n = 19. There was no significant difference in nitrogenase activity in the ferritin mutant when compared to wild type ($P>0.05$).

The results show that there was slight increase in ARA (or no significant difference) of the ferritin mutant compared to the wild (Fig.2). The results indicate that even though the legumes were deficient in ferritin, symbiosis with rhizobia improves plant growth. Under symbiotic conditions, it was also found to produce reactive oxygen species to prevent oxidative stress.

Acknowledgment

I would like to take this opportunity to thank Kagawa University for allowing me to conduct this research and JICA for the financial support provided to attend the 3rd Trilateral Symposium on Sustainability in Thailand.

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Effect of high temperature on flower coloration and pigmentation in *Ranunculus* 'Koharu Temari'

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Introduction

In Kagawa Prefecture, Japan, the production of cut ranunculus flowers by forcing culture was started before 1990 (Murakami, 2012). *Ranunculus* "TEMARI series" cultivars were bred by Kagawa Prefecture Agricultural Experiment Station, and these cultivars are expected to be local specialties. However, in 'Koharu Temari', one of the cultivars, the quality of the flowers varies depending on harvest time. Although the petal color was white with pink edge in February, it was pink single color in March or April. The reason for the difference in flower coloration was estimated to be different environmental factor, since March to April is the season of increasing temperature. Therefore, the effect of high temperature on the coloration and pigmentation in *Ranunculus* 'Koharu Temari' was investigated in this study.

Material and Method

'Koharu Temari' having white petals with pink edge was used for experiments. 'Koharu Temari' plants were grown in the greenhouse, and two phytotron rooms of which temperature was 20 and 25 ℃ in Kagawa University. Fully bloomed flowers were collected, and then divided into three parts: center, middle and external marginals. The coloration of each part was measured using the Royal Horticultural Society (RHS) Color Chart. The width of the pink colored edge was also measured. Then, the petal was divided into pink-colored and white part, and each part was dried at 40 ℃ for 24 hours. The dried petals were immersed with 5 % (v/v) formic acid in methanol to extract flavonoid pigments. The eluates were analyzed by using high performance liquid chromatography (HPLC) system.

Results and discussions

There were the significant differences in flower coloration between the plants flowering in the greenhouse and the phytotron rooms, whereas there were no differences between 20 and 25 ℃ phytotron. The pink-colored area in petals of the plants in the phytotron was expanded (Fig. 1). In some flowers of the plants, the petals had only a pinkish part. The percentage of the colored area flowering in the phytotron was higher than that in the petals in the greenhouse.

Anthocyanins and yellowish flavonoids were contained in all pink-colored and white parts of the petals, respectively. The amount of the main anthocyanin in the petals flowering in the phytotron was larger than the amount in the greenhouse.

In many plants, the anthocyanin content in the petals was decreased at high temperature and increased at low temperature (Nozaki *et.al.*, 2006; Watanabe, 2006). The response to temperature in the petals of 'Koharu Temari' was contrary to that in the previous reports. It was suggested that the expansion of the colored area in the petals of 'Koharu Temari' at high temperature was the specific character.

Fig. 1. Effect of high temperature on the coloration of *Ranunculus* 'Koharu Temari'. (A: In the greenhouse, B: In the phytotron at 20 ℃)

Acknowledgment

The authors thank Ms. Tomoko Morita and Ms. Saki Ueta of Kagawa Prefecture Agricultural Experiment Station in Japan for their help in this study.

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Effect of the rare sugar D-allulose on the texture properties of sourdough bread

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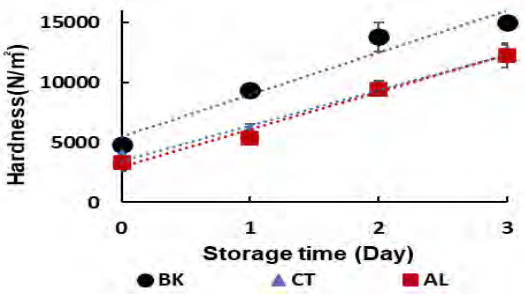
Introduction

D-allulose (Alu) is a rare sugar, defined as a monosaccharide and its derivatives, and is rarely found in nature. Alu, a C-3 epimer of D-fructose (Fru), has almost no calories and has shown disease-preventing effects, such as anti-diabetic properties. Sourdough bread is a bread which has unique flavor, characterized by sourness, and has a longer shelf-life than normal bread. Sourdough bread is made from a fermented dough called sourdough, which contains lactic acid bacteria and natural yeast. The organic acids produced by these microorganisms during fermentation improve the flavor and shelf-life of the bread. In this study, the effects of Alu on the texture properties of sourdough bread were investigated.

Results and discussions

Three types of sourdough bread were prepared: no-sugar bread (BK), 5% sucrose (Suc) added bread (CT), and 5% Alu added bread (AL). The texture of the sourdough bread was evaluated using a texture meter. On day 0, the hardness and cohesiveness of AL showed no significant difference from those of CT and BK (Fig. 1a,1b). The hardness of all sourdough breads increased with storage time, while their cohesiveness decreased (Fig. 1a, 1b). The significant difference between AL and the other samples was found on day 2 and day 3. AL showed the smallest decrease in cohesiveness among the three samples (Fig. 1b). This result indicates that Alu is superior to Suc in the suppressive effect against the texture changes of bread occurred during storage. The sugar content in sourdough bread was determined by HPLC. There was no significant difference in the total sugar content between AL and CT (TABLE I). In AL, the added Alu was reduced 10% by bread production process, while in CT, the added Suc was reduced 67%. The sugar composition in AL was predominantly Alu, while the sugar composition in CT was mainly Fru and D-glucose (TABLE I). These results suggest that residual Alu contributed to the suppression of texture changes during storage.

(a)



(b)

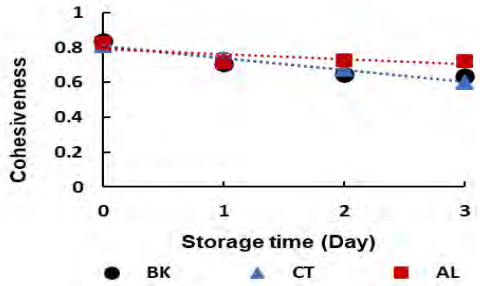


Fig. 1. Changes in texture parameters of sourdough breads during storage
(a) Hardness, (b) Cohesiveness
Error bars represent SD of mean (n=3).

TABLE I The quality of each sugar in baked sourdough breads(g /bread 100 g)

	BK	CT	AL
D-glucose	n.d.	1.17 ± 0.04	n.d.
Sucrose	0.82 ± 0.06 [a]	0.97 ± 0.06 [b]	0.83 ± 0.04 [a]
D-fructose	0.45 ± 0.00 [a]	1.88 ± 0.03 [b]	0.38 ± 0.01 [c]
D-allulose	n.d.	n.d.	2.60 ± 0.10
Total	1.27 ± 0.05 [a]	4.07 ± 0.11 [b]	3.78 ± 0.12 [b]

Data are shown as mean ± SD (n=3). The difference in the alphabet in the table shows a significant difference (Tukey test n=3). n.d. indicates not detected.

Acknowledgment

I thank Professor Yoshihara for significant guidance in the analysis of HPLC.

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Inheritance pattern and high-throughput phenotyping of flower color in periwinkle (*Catharanthus roseus*)

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Periwinkle (*Catharanthus roseus*) is cultivated globally as a potted plant due to its robust resistance to heat and drought. The diverse and attractive flower colors of periwinkle have been key targets for breeding. Despite the development of novel colors and patterns, understanding of flower color inheritance remains limited, posing challenges for efficient breeding strategies. In this study, we employed a high-throughput phenotyping pipeline to analyze flower color phenotypes in a large F_2 population. By extracting RGB values from flower images, we conducted cluster analysis to segregate F_2 individuals and confirm expected inheritance patterns.

Introduction

Periwinkle is renowned for its vibrant and diverse flower colors. Its drought and high-temperature resistance make it a popular potted flower worldwide [1]. Previous research has identified various inheritance patterns for periwinkle flower colors, including pink, orange-red, magenta, and white [2], through phenotyping and statistical analyses. However, phenotyping is time-consuming, with evaluation standards varying among researchers. In this study, an efficient high-throughput system for phenotyping flower colors is provided.

Results and discussions

Photographs of flowers from 311 F_2 progeny of the cross between cultivars 'Cora Cascade Apricot' (CCA) and 'Tattoo Papaya' (TP) were used to build a database. Following the method described previously [3], code for ImageJ was optimized to determine parameters applicable to batch dataset, which were then used to automate the removal of black backgrounds, color value extraction, and dataset creation. This study tested the pipeline with a larger dataset, analyzing over 6000 photos totaling 550 MB, and it accurately completed the image analysis.

After initial testing and 23 iterations of error correction of the R markdown code generated by ChatGPT-4, the final version correctly analyzed flower color data using hierarchical clustering. The errors encountered during these iterations were primarily due to misunderstandings by ChatGPT-4 and functional errors in the code. Each error message was fed back to ChatGPT-4, which adjusted the code until it worked correctly. The optimal combination of clustering distance algorithm and dissimilarity matrix algorithm was determined to be Ward's minimum variance with Euclidean distance, achieving the highest clustering coefficient of 0.993. The elbow method was used to determine the optimal cut tree number for clustering.

TABLE I Segregation of deep and light flower colors

Observed phenotype				
Deep color	Light color	Test ratio	X^2	$P_{0.05, df\,1}$
245	66	3 : 1	2.368	0.124*

*P value > 0.05 indicates the test ratio and observed ratio are not significantly different.

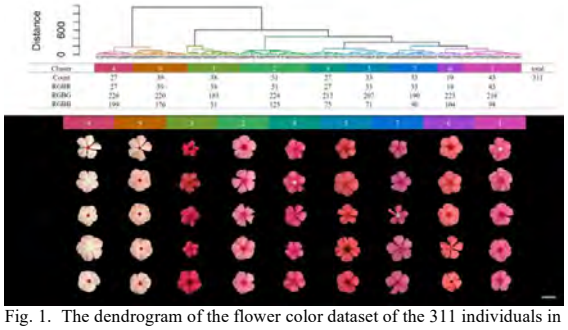

Fig. 1. The dendrogram of the flower color dataset of the 311 individuals in F_2 progeny from the cross between CCA and TP analyzed using hierarchical clustering, and the flower colors were generally clustered into deep and light colors. Bar = 2 cm.

When the flower color data of the F_2 progeny from the cross between CCA and TP were processed, the clustering results were accurate and matched the actual flower photos. The pipeline was also tested with flower color data from 52 other periwinkle F_2 populations, efficiently completing clustering analysis and dendrogram plotting (Fig. 1). Following this, the chi-square test was applied to verify the inheritance patterns based on the clustered traits. The analysis confirmed a 3:1 segregation ratio of deep to light colors in the F_2 progeny from the CCA and TP cross, indicating the involvement of a single gene locus and suggesting a simple Mendelian inheritance pattern. The genotype *D_*, produces deep-colored flowers, while the genotype *dd*, produces light-colored flowers. The *D* allele is completely dominant over the *d* allele. A recent study also supports this observation, identifying genotypes colored (*Hf_*) and apricot (*hfhf*) [4] that align with these findings.

This study integrates image color analysis, RGB composition clustering, and inheritance pattern analysis, significantly improving the efficiency and consistency of phenotyping analysis. It establishes a high-throughput phenotyping pipeline for periwinkle flower colors, which can be applied to further analyze genetic patterns of flower colors and serve as a basis for predicting and selecting hybrid combinations in flower color breeding.

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LARY: A Prototype for Developing an Application to Detect Voice Quality, Train Pronunciation, and Provide Pronunciation Recommendations

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LARY voice detector is a prototype application designed to measure voice quality, assist with pronunciation training, and provide pronunciation recommendations based on academic principles. It helps patients test their voices before seeing a speech therapist and the application allows therapists to track training progress. The app uses Cloud AI Technology to classify hoarse and normal voices, with a model trained on patient voice data. Initial testing showed 80% accuracy, and the results can be shared with therapists or otolaryngologists for further treatment planning.

Introduction

Voice disorders can result from various causes, including medical conditions such as Parkinson's disease, stroke, and accidents, as well as lifestyle factors like excessive yelling or overuse of the voice in teaching. Speech therapy can significantly improve vocalization by providing patients with exercise based on medical principles. However, there is a shortage the amount of speech therapist, particularly Thailand where only 27 out of 77 provinces have a speech therapist available. Furthermore, many patients are unaware how to perform a self-check before seeing a doctor. According to a survey among professionals who reply on their voices such as teacher and singer, 34 out of 55 that hoarseness negatively affected their daily life. Therefore, it is crucial to provide treatment and guidance to maintain vocal health.

Results and discussions

In response to this pressing need, the LARY application has been developed. This app aims to increase access to speech therapy services, improve treatment efficiency, and offer convenience. by serving as a virtual speech therapist. By leveraging Huawei Cloud AI, LARY can detect hoarseness early on, providing essential data that speech therapists can use to diagnose and treat their patients more effectively. The primary objective of LARY is to enable users to assess voice health before seeking treatment from a speech therapist. Patients can record their voice through the application, which then classifies the voice as either normal or hoarse and sends this information to a speech therapist. This early detection and classification streamline the diagnosis and treatment process.

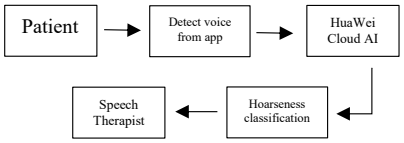

FIGURE 1: CONCEPTION FRAMEWORK

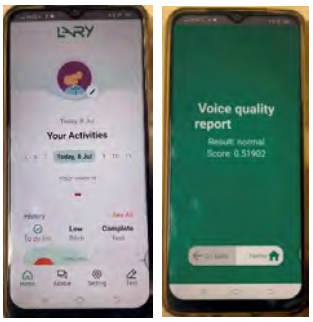

FIGURE 2: A PROTOTYPE APPLICATION

For the testing phase, we used a database consisting of 90 sets for 15 sets for testing. The application achieved an accuracy rate of 80%, with the classification model correctly identifying hoarsenee8 out of 10 times. With normal voices scoring 0.989 and hoarse voices scoring 0.916. These results have been integrated into the application for use by patients, speech therapists and otolaryngologists. The application also provides advice on vocal hygiene, relaxation techniques, and includes video tutorials for practicing pronunciation and breathing exercises.

Acknowledgment

We express our sincere gratitude to our project advisors for their invaluable support, suggestions, and constant encouragement throughout the course of this research. This project would not have been possible without their guidance and the ongoing support from our colleagues and friends

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Mating pattern and ecology of diving beetle *(Eretes griseus)*

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Introduction

The number of endangered wildlife species worldwide has doubled in the last decades, especially among aquatic insects [1]. In Japan, 50 of the 140 species of diving beetles (Dytiscoidea) are listed as endangered [2]. The diving beetle plays an important role in the ecosystem as a predator of small animals, including mosquito larvae, in rice fields in early summer [3]. Although diving beetles are ecologically important, in this talk I will shed light on their basic biology.

Males produce many small sperm, while females produce a few large eggs, indicating that the mating capacity of males is far greater than that of females. This difference creates a sexual conflict when males and females encounter each other: the males are eager to copulate, but the females do not want to. As a result, males have often evolved the traits that force females to copulate. Male diving beetles usually possess large, well-developed suckers on their forelegs but females do not, and the shape and number of these suckers vary among species. These suckers allow males to attach to fleeing females while copulating underwater [4]. While many studies have examined the morphology of male suckers and their interspecific differences, few have demonstrated a direct link between suckers morphology and mating behavior. In this study, we investigated sexual conflict in a common Japanese species *Eretes griseus*, easily collectable in west Japan. Like related species, male *E. griseus* possesses fore tarsi suckers, consisting of two large suckers (1.71 mm² on average area) and 200-300 small suckers (0.002 mm² on average).

Results and discussions

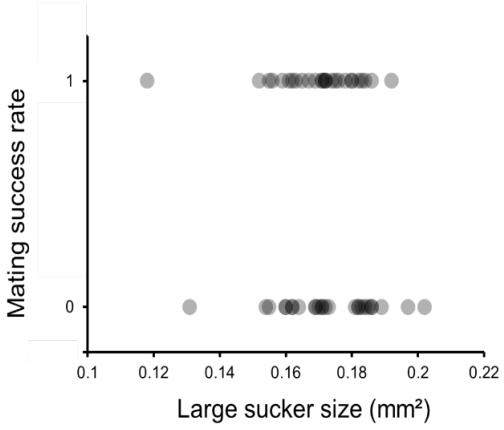

Fig. 1. The relationship between large sucker size (mm²) and mating success rate. A mating success rate of 1 indicates successful mating, while 0 indicates failure.

In this study, 60 pairs of E. griseus were collected and their mating behavior observed. Of these, 30 pairs mated successfully at least once, while the remaining 30 pairs did not mate during the 13-hour observation period. There was no significant correlation between the area of the male's large sucker (mm²) and mating success (Fig. 1). This suggests that large sucker size does not necessarily contribute to successful mating.

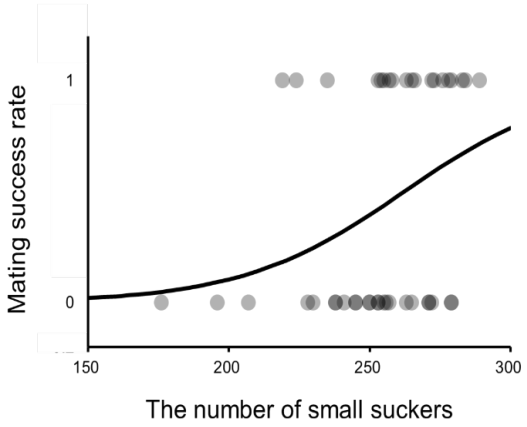

Fig. 2. The relationship between the number of small suckers and mating success rate.

However, there was a significant correlation between the number of small suckers and mating success (Fig. 2). In other words, males with more small suckers are more successful in mating. These results suggest that small suckers are more important than large suckers for mating success in *E. griseus*. These tendencies may be observable in other species of diving beetles.

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MonkWell: Leveraging Digital Technology to Enhance Health Literacy and Prevent Non-Communicable Disease (NCD) Among Buddhist Monks

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Abstract—The rising prevalence of non-communicable diseases (NCDs) among Buddhist monks in Thailand, driven by factors such as improper diet, lack of physical activity, and aging, has become a significant public health concern. These chronic conditions, including hypertension, diabetes, and cardiovascular diseases, are widespread among monks, necessitating targeted health interventions. In response, the MonkWell initiative was developed to leverage healthcare data and technology through a Line Official Account, functioning as a personal health management tool for monks. This platform is designed to enhance health literacy among monks, encouraging better health behaviors and proactive management of NCDs. The implementation of MonkWell is expected to reduce the incidence of NCDs, offering a sustainable approach to long-term health management and improving the overall well-being of this often-overlooked population.

Index Terms—NCDs, monks, non-communicable diseases, health literacy, digital health

Introduction

Non-communicable diseases (NCDs) are chronic conditions, including hypertension, diabetes, and cardiovascular diseases, that gradually develop due to genetic, physiological, and behavioral factors. In Thailand, the rising prevalence of NCDs among Buddhist monks presents a significant public health challenge. Monks often lead spiritually enriching yet physically demanding lives, which, coupled with imbalanced diets and limited healthcare access, heightens their vulnerability to NCDs. As the population of aging monks grows, so does the urgency to address their health needs.

Health literacy plays a crucial role in empowering monks to manage these challenges. Defined as the ability to obtain, process, and understand health information to make informed decisions, health literacy is essential for monks to proactively manage their health. Enhancing health literacy among monks can help them better understand the risks associated with their lifestyle, recognize early symptoms of NCDs, and adopt behaviors that support both their spiritual and physical well-being.

Research Objective

The main objective of this study is to develop MonkWell, a Line Official Account specifically designed to leverage healthcare data and technology to enhance the health literacy of Buddhist monks regarding non-communicable diseases. By improving their understanding of these conditions, MonkWell aims to encourage monks to adopt healthier behaviors that can prevent and manage NCDs more effectively.

Expected Results

MonkWell offers several key features:

1. Data Collection and Personal Health Records: Monks can digitally record and track health metrics such as blood pressure and glucose levels, allowing easy access and updates.

2. Health Data Interpretation: The system provides insights and alerts based on health data, helping monks understand potential risks and make informed decisions.

3. Personalized Health Suggestions: Tailored advice is offered to align with monks' lifestyles, including diet and exercise recommendations.

4. Educational Resources: MonkWell provides accessible materials on NCDs, covering causes, prevention, and regular health monitoring.

The expected outcomes of implementing MonkWell include:

1. Enhanced Health Literacy: Improved understanding of NCDs, leading to greater awareness of lifestyle impacts and the importance of proactive health management.

2. Improved Health Behaviors: Adoption of healthier behaviors, resulting in tangible improvements in health outcomes and reduced NCD prevalence.

3. Better Health Management: Regular tracking of health status enables health promotion, early detection and prevention of severe complications.

4. Data-Driven Public Health Strategies: Aggregated data could inform public health interventions, benefiting broader populations.

The MonkWell initiative addresses the urgent need for innovative health management strategies among Buddhist monks in Thailand. By enhancing health literacy through digital tools, MonkWell aims to empower monks to take control of their health, leading to improved behaviors and better health outcomes. As NCDs continue to challenge public health, initiatives like MonkWell will be vital in promoting health equity and ensuring the well-being of all individuals.

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Promoting Peace and Justice: A Comparative Analysis of Legal systems in Japan and Thailand

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Introduction

This study will first identify the current situation of juvenile delinquency in Thailand and Japan, then examine juvenile law and recidivism, and finally rehabilitation support for juveniles. It also examines the serious upbringing they face. Promoting the healthy development of juveniles is important for maintaining public safety and creating a crime-free society. This research contributes to achieving peace and justice by addressing these issues effectively.

Results and discussions

First, the number of juvenile crimes in Thailand and Japan will be examined. The total number of juvenile crimes in Thailand has been decreasing year by year. Drug offenses are the most common, followed by property offenses. On the other hand, the breakdown of juvenile crime in Japan shows that theft is the most common type of crime, followed by assault.

Table A: Number of Juvenile Crimes in Thailand from 2016 to 2020

Crime Categories	2016	2017	2018	2019	2020
Property Crimes	5,961	4,655	3,782	2,948	1,788
Life and Bodily Harm Crimes	4,158	3,106	2,157	2,175	1,508
Sexual Crimes	1,412	1,314	1,038	922	698
Crimes Against Freedom and Reputation	883	702	566	517	369
Drug Crimes	12,400	11,869	11,352	10,634	8,746
Weapons and Explosives Crimes	2,262	1,527	1,119	951	671
Other Crimes	3,285	2,916	2,595	2,694	4,094
Total	30,361	26,089	22,609	20,841	17,874

Table B: Number of Juvenile Crimes in Japan from 2016 to 2020

Crime Categories	2016	2017	2018	2019	2020
Theft	111,262	102,651	94,441	89,015	78,159
Assault	20,287	18,955	17,952	17,783	16,537
Bodily Injury	14,555	13,489	12,673	12,220	11,294
Total	177,157	163,340	152,023	146,252	131,707

Second, I would like to introduce the juvenile laws of two countries. In Thailand, those under 18 years of age are considered juveniles, and the Act for Establishment of Juvenile Court and the Juvenile Procedure Act were enacted in 1951. In Japan, the Juvenile Law was enacted in 1948, and anyone under the age of 20 was considered a juvenile. However, with the lowering of the age of majority from 20 to 18 in 2020, 18 and 19-year-olds were designated as specified juveniles under the Juvenile Law and are subject to the same criminal procedures as adults for some serious crimes.

Finally, we would like to introduce the current state of recidivism and rehabilitation support systems in both countries. Recidivism is a significant problem in both countries. They experience loneliness in society due to poor family backgrounds, lack of community, etc. Therefore, promoting wellbeing is a key recidivism preventing recidivism. The probation system plays an important role in such situations. It helps them to create a healthy place in society and to have a role in it. In Thailand, the Department of Probation (DOP) was established in 1992 and became the central agency to manage the treatment of offenders in the community. The DOP also oversees drug offender support centers. In Japan, the Crime Prevention and Rehabilitation Law was enacted in 1949. In addition, there is a volunteer organization under the jurisdiction of the Ministry of Justice, the Big brothers and sisters (BBS), which provides learning support to juvenile delinquents as older brothers and sisters.

In such rehabilitation support, it is essential to provide employment opportunities and secure living arrangements for juvenile delinquents. To ensure that young people can lead healthy lives during this crucial and irreplaceable period of their youth, support involving the entire society is necessary. Furthermore, rehabilitation support contributes to the safety of society and lays the foundation for peace. It ensures that juvenile delinquents receive appropriate assistance and are given fair opportunities.

Acknowledgement

I would like to express my gratitude to my supervisor, Prof. HIRANO Miki, for her valuable guidance and support. Lastly, I appreciate BBS members for their encouragement.

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Role of cysteinyl-tRNA synthetase in root nodule symbiosis

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Reactive sulfur species (RSS), one of the Reactive molecular species, are produced during the symbiosis process between *Lotus japonicus* and *Mesorhizobium loti* (1). In our study, we focused on cysteinyl-tRNA synthetase (CARS), an enzyme that produces RSS, and evaluated the phenotypes of *M. loti* mutants of the *cars* gene on root nodule symbiosis. We found that plants infected with the *cars* mutants had suppressed growth and reduced nitrogenase activity. We then measured the amount of RSS in the nodules infected with the *cars* mutants. To determine the amount of sulfane sulfur and hydrogen sulfide (H_2S), a type of RSS, they were labeled with their respective fluorescent probes and observed under fluorescence microscopy. The results showed that the fluorescence intensity the of sulfane sulfur and H_2S were both reduced in the *cars* mutants compared to the wild type (WT). We also analyzed the levels of sulfane sulfur and H2S in *M. loti* using a flow cytometer and found that both levels were decreased in the *cars* mutants. These finding suggest that CARS in *M. loti* may play a role in root nodule symbiosis by producing sulfane sulfur and H_2S in the nodules.

Introduction

Rhizobium and legumes symbiosis in root nodules (2). It is known that reactive molecular sulfur species (RSS) are generated during this symbiotic process. While RNS and ROS are known to function as signal molecules in the symbiotic process, the role of RSS is unclear.

Cysteinyl-tRNA synthetase (CARS), is an enzyme that links cysteine to cysteinyl tRNA, and also produces sulfane sulfur that is one of the RSS. We examined the symbiotic phenotypes of two *cars* mutants with *L. japonicus*. In addition, the growth rate of the *cars* mutants were also measured to evaluate the role of CARS in rhizobia under non-symbiotic conditions (free-living rhizobia).

Results and discussions

To evaluate the amount of RSS in the root nodules, the fluorescence intensity of root nodule sections was measured using specific fluorescent probes for sulfane sulfur and H_2S. The results showed that the RSS-specific fluorescence was weakened in the *cars* mutants, indicating that the *cars* mutation reduced the amount of RSS in the root nodules. In addition, evaluation of the amount of ROS in the root nodule suggest that suggested that ROS accumulated in the *cars* mutants(3), possibly due to the strong antioxidant of RSS *in vivo*.

The function of CSE as an enzyme that produces RSS in the root nodule has been reported (4). This was observed when the amount of RSS decreased in the nodule with the reduction of CSE in *M.loti*. Our study also indicates that the lack of *cars* gene in *M. loti* reduced the amount of RSS, suggesting that CARS functions as an RSS-producing enzyme in the root nodule.

We found that the absence of the *cars* gene in *M. loti* had a negative effect on the symbiotic phenotype. Therefore, we then measured the growth rate of *M. loti* in non-symbiotic conditions (as a free-living cell). The results indicated that the growth rate on the nutrient-rich TY medium was unchanged compared to the WT, however, the mutants exhibited slower on the M9 minimum medium. This might due to the fact that the M9 medium is nutrient-poor and cannot compensate for the absence of CARS.

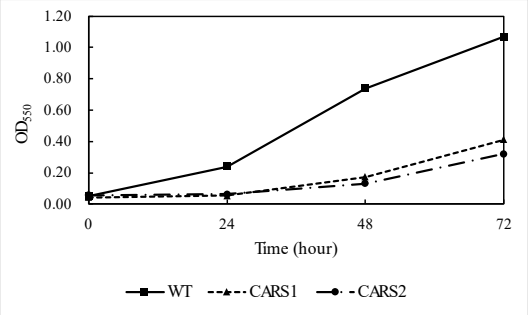

Fig. 1. Growth curve of M. loti in M9 medium. The absorbance was measured every 24 hours with OD550 at the beginning of the culture as about 0.05.

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Storeon: Empowering Student Creativity through a Virtual Showcase and Business Hub

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Introduction

In the digital era, student entrepreneurs face significant challenges in effectively presenting and selling their products online. The process requires platforms that offer a high level of customization, interactivity, and support to showcase their creations in the best light. However, many existing solutions do not fully address the specific needs of students, especially in terms of providing educational resources and fostering a supportive community. Storeon, a virtual showcase and business hub built on the Spatial.io platform, is designed to meet these needs. By offering an immersive and interactive environment tailored to student entrepreneurs, Storeon enhances the visibility and marketability of their products while promoting collaboration and continuous learning within a vibrant community.

Expected Results

Storeon is designed to revolutionize the way student entrepreneurs showcase and sell their products by providing an immersive and interactive platform that meets their unique needs. The following outcomes are anticipated as a result of implementing Storeon:

1. Personalized Experience:

By utilizing Spatial.io's customizable storefronts and avatars, Storeon is anticipated to provide a highly personalized shopping experience. This personalization will allow students to tailor their virtual presence to reflect their unique brand identity, enhancing customer satisfaction and loyalty.

2. Reduced Return Rates:

The immersive 3D environments and interactive product displays are expected to give customers a more accurate understanding of products, reducing the likelihood of returns. This visual and interactive engagement allows customers to make more informed purchasing decisions.

3. Increased Profitability:

With enhanced product visibility, personalized interactions, and effective marketing tools, Storeon is expected to increase the profitability of student businesses. The platform's ability to drive sales through improved customer experiences and targeted promotions will contribute to higher revenue generation.

4. Stronger Engagement:

Real-time interactions between customers and store owners through avatars, along with the dynamic nature of the virtual storefronts, are expected to result in stronger engagement. This increased interaction will help build deeper connections between students and their customers, fostering long-term relationships.

5. Better Understanding of Customers:

Storeon's integrated analytics and insights tools will provide students with valuable data on customer behavior, preferences, and sales performance. This better understanding of customers will enable students to refine their offerings and marketing strategies, leading to improved business outcomes.

6. Enhanced Customer Experience:

The overall customer experience on Storeon is expected to be significantly improved due to the combination of immersive 3D environments, personalized interactions, and seamless e-commerce functionalities. Customers will enjoy a unique and engaging shopping journey, increasing their likelihood of returning and recommending the platform to others.

Acknowledgment

We would like to express our sincere gratitude to all the individuals and organizations that contributed to the development of Storeon. First and foremost, we thank the students who participated in our pilot testing, providing invaluable feedback that helped shape the platform. We are also grateful to the team at Spatial.io for their technical support and for providing the tools necessary to build such an immersive and interactive environment. Special thanks go to our mentors and advisors, whose guidance was instrumental in the project's success.

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Synthesis and Application of Pyrene Derivatives with α-Ketoamide: Roussin's Red Ester as Nitric Oxide Donors

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INTRODUCTION

Nitric oxide (NO) is an important gaseous signaling molecules that plays a crucial role in various biological processes. NO has effective anti-inflammatory and properties that can be used to neutralize free radicals such as ROS in live cells. Therefore, the development of efficient NO releasing agent is of great significance for the study of ROS related diseases. In this study, we synthesized a series of pyrene derivatives with α-ketoamide (**AKA**) structure as the probes. The **AKAS** structure was found to be highly sensitive to ROS, and the fluorescence intensity of the pyrene derivatives was significantly enhanced upon reaction with the radicals. The synthesized pyrene derivatives were characterized by various spectroscopic techniques, including NMR, FT-IR, UV-vis and Fluorescence spectroscopy. The optimized synthetic route was also established to improve the yield and purity of the pyrene derivatives. The synthesized pyrene derivatives were then applied as ROS probes in live cells, and the results showed that they were able to detect ROS with high sensitivity and selectivity. Overall, our study provides a new strategy for the design and synthesis of ROS probes, which has great potential for the study of ROS related diseases.

RESULTS AND DISCUSSIONS

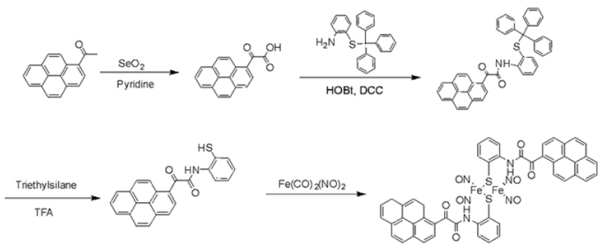

Fig. 1. Synesis of AKA & AKA-RRE

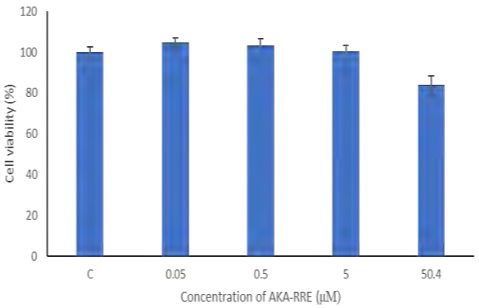

Fig. 2. MTT Assay of AKA-RRE

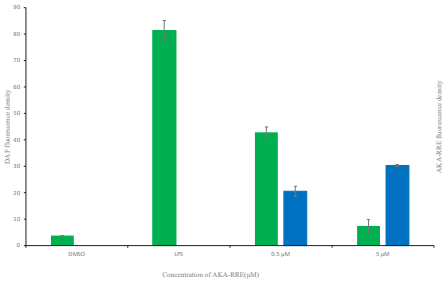

Fig. 3. DAF-FM Assay of AKA-RRE

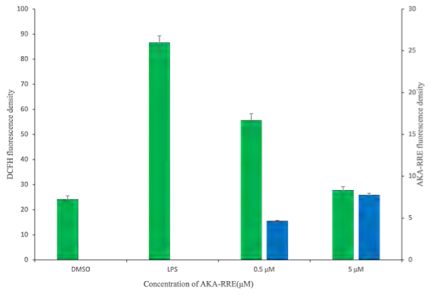

Fig. 4. DCFH-DA Assay of AKA-RRE

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Tha Phae Gate Ice Cream: Promoting Northern Thai Culinary Heritage through 3D Printed Technology, International college of Digital Innovation

Khao Marukapitak, Pasinee Jariyanukit, Witchavee Noinivorn, Kritanop Jaitiang, Arunkorn Juksuton
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These instructions give you basic guidelines for preparing camera-ready one-page abstract for the 3rd Trilateral Symposium on Sustainability presentations.

The Tha Phae Gate 3D Ice Cream project blends Northern Thailand's cultural heritage with modern 3D printing technology. Inspired by the historic Tha Phae Gate, the project used 3D printing to create ice creams that replicate the gate's intricate designs. Incorporating Khao Tan, a traditional Northern Thai sweet, added a unique flavor and texture, marrying tradition with innovation. This fusion highlights the potential of traditional ingredients in modern culinary applications, serving as a form of cultural soft power. The product has also proven effective in promoting tourism, offering a novel way to experience Northern Thai culture while preserving and sharing it with a global audience.

Please note that colored lines and photographs may not reproduce well in the final printed form, as the abstract book will be printed in black and white.

INTRODUCTION

Your goal is to simulate the usual appearance of ***one-page abstracts*** in *the 3rd Trilateral Symposium on Sustainability online proceedings*. The intersection of tradition and innovation often leads to the most captivating creations, and Tha Phae Gate 3D Ice Cream is a testament to this synergy. In the heart of Northern Thailand, Tha Phae Gate stands as a historical landmark, symbolizing the region's rich cultural heritage. Drawing inspiration from this iconic structure, our team has developed a revolutionary product that brings together the ancient and the modern in a truly unique way.

RESULTS AND DISCUSSIONS

The Tha Phae Gate 3D Ice Cream project successfully demonstrated the feasibility and appeal of combining traditional Thai ingredients with modern 3D printing technology. The results highlighted several key outcomes that are both innovative and culturally significant.

1. Design and Production: The 3D printing technology allowed for the precise replication of the intricate architectural details of Tha Phae Gate in the form of ice cream. This not only created a visually striking product but also resonated deeply with the cultural and historical significance of the region. The use of 3D printing provided the flexibility to experiment with various shapes and designs, resulting in a range of ice cream molds that can be customized for different themes or occasions.

2. Integration of Khao Tan: Incorporating Khao Tan, a traditional Northern Thai sweet, into the ice cream provided a unique flavor profile that distinguished Tha Phae Gate 3D Ice Cream from other desserts. The crispy texture of Khao Tan and the subtle sweetness of locally made sugar cane syrup complemented the creamy base of the ice cream, creating a harmonious blend that appealed to both local and international palates. This successful integration also highlighted the potential of using traditional ingredients in modern culinary applications, helping to preserve and promote local food heritage.

3. Soft Power Through Culinary Innovation: Soft power, the ability to influence others through cultural appeal and attraction rather than coercion, plays a crucial role in a nation's global presence. Tha Phae Gate 3D Ice Cream exemplifies this concept by using food as a medium to convey the richness and uniqueness of Thai culture. The intricate design inspired by the historic Tha Phae Gate and the incorporation of Khao Tan, a traditional Northern Thai sweet, transform this dessert into more than just a culinary experience—it becomes a symbol of Thailand's cultural heritage and creativity.

4. Tourism and Cultural Promotion: Tha Phae Gate 3D Ice Cream proved to be an effective tool for promoting Northern Thailand's culture and cuisine. As an edible souvenir, it attracted tourists who were interested in experiencing local flavors in a modern format. This not only enhanced their travel experience but also increased awareness of Northern Thailand's culinary traditions. The project thus contributed to the region's tourism by offering a product that is both innovative and deeply rooted in local culture.

ACKNOWLEDGED

We thank the Northern Thai artisans for contributing Khao Tan and the food science team for developing the recipe. We also appreciate our technology partners, the local community for taste testing, and our marketing team for promoting Tha Phae Gate 3D Ice Cream. Lastly, thanks to the travelers and consumers for your support, which has been essential to our success.

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[2] **Technology partners:** Your expertise in 3D printing was instrumental in bringing our vision to life (companies like Phatharin

The Present Situation and Strategies of Special Education Teachers in Rural Areas in Taiwan

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This study aims to explore the current development situation, difficulties encountered by special education teachers in rural areas in Taiwan, and their coping strategies.

Introduction

The transportation and living conditions in rural areas are highly inconvenient. The further away from urban areas and the smaller the scale of the school, the fewer the number of students, making it difficult to establish self-contained classes or resource rooms. Therefore, it is necessary to rely on a special education teacher to travel between multiple schools, providing resources to students in need. The working range of itinerant teachers is extremely large, with the possibility of working at different locations each day, spending a lot of time commuting. They teach students who are doubly disadvantaged by both their remote location and special education needs.

Results and discussions

The challenges faced by rural education include the following six points:

1.Excessive time spent commuting results in insufficient service time, leading to limited student learning.
2.A wide variety of service targets and large numbers of students result in significant diversity.
3.Difficulty in recruiting qualified teachers and high teacher turnover rates.
4.Issues with professional competency.
5.Interpersonal communication problems, low sense of belonging for itinerant teachers.
6.Insufficient government subsidies and unequal distribution of resources between urban and rural areas.

In response to the challenges faced by rural education, the following strategies are proposed:

1. Reduce the counseling area to minimize transportation fatigue.
2. Lower the student-teacher ratio.
3. Retain excellent temporary teachers without requiring re-selection.
4. Implement a special hiring system to allow willing individuals without teaching certificates to work in rural areas.
5. Develop rural teacher education programs. It is suggested that teacher training universities provide more relevant knowledge, especially in facilitating communication and collaboration between regular and special education teachers. Designate those with a specialty in "rural education" and offer them better salaries and benefits.
6. Conduct training and professional development to enhance professional competency, open to those without teaching certificates.
7. Provide administrative support to give teachers adequate professional backing. "This includes providing resources for novice teachers; offering reasonable benefits for in-service teachers; and ensuring that schools or the government act as strong support when difficulties arise, resolving issues to prevent teachers from facing them alone"
8. Promote collaborative teaching between general and special education teachers and form cross-school resource alliances.

Acknowledgment

We extend our heartfelt gratitude to the dedicated educators and support staff who tirelessly work to overcome the challenges in rural education. We also thank the organizers for the invitation, giving us the opportunity to share with everyone today.

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The Role of Primary and Secondary Education in Understanding Hansen's Disease

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Introduction

1-1 About Leprosy

According to the National Hansen's Disease Museum, Hansen's disease is an infection engendered by a bacterium known to cause leprosy. Hansen's disease-causing leprosy bacteria have a weak ability to cause the disease; in most cases, even if the bacteria enter the body, the immune system does not induce disease onset. The treatment for Hansen's disease is a well-established one- to two-year regimen of two or three medications that, as the WHO states, are distributed free of charge.

1-2 Discrimination against Hansen's Disease

In Japan, there was a lack of proper understanding of leprosy, and the human rights of patients and their families were violated. The following chronology was compiled based on materials from the National Hansen's Disease Museum:

1931: "About leprosy prevention" is revised.
→ Patients and their families were forced into quarantine
1953: The Leprosy Prevention Law was established.
→Shortly after the war, a drug was developed in the U.S. but forced quarantine continued.
1996: The Leprosy Prevention Law was abolished.
1998: People who recovered from leprosy filed a lawsuit seeking state compensation, claiming that the Leprosy Prevention Law violated the Japanese Constitution.
2001: On May 11, the Kumamoto District Court admitted the claim
2009: The Basic Law on the Hansen's Disease Issue, was enacted
→This law protects the human rights of people affected by leprosy.

1-3 Leprosy Education

According to the Ministry of Education, to broaden awareness and understanding of the issue of leprosy, the Basic Plan for Human Rights Education and Cultivation, a result of the 2001 court decision, will actively promote efforts to eliminate prejudice and discrimination against current and former patients. This has led to a strong movement toward making leprosy an educational subject.

In 2016, a peer support program was started, and people affected by leprosy were invited to become lecturers; additionally, in 2020, family members of people affected by leprosy were invited to become lecturers.

Various efforts have been made to intensify the understanding of leprosy in school education.

Previous Study

Studies dealing with learning about leprosy in school education include those by Chizuru Fukumoto (2010) and Kenji Yamamoto (2011). Fukumotos' study focused on individuals who have worked on the issue of leprosy, and sought to develop an empathic understanding of leprosy and an awareness of the need to practice human rights protection. Yamamoto stated that "the class structure is based on "knowledge-based understanding' through the study of the judgment documents themselves, with an emphasis on 'legal thinking and legal judgment,' and is not designed to elicit 'empathic understanding' and 'practical motivation' from the perspective of human rights education" (Yamamoto, 2011, pp. 166-167). Focusing on how to approach students who are indifferent to the issue of leprosy, this study refers to learning methods that elicit "empathic understanding" and "practical motivation," which are the perspectives of human rights education.

These previous studies have intensified the idea of learning methods that goes beyond the mere transmission of knowledge, which was the basis for learning about leprosy until then. However, Fukumoto states, "In this study, it seems that the students who referred to 'how to be' and 'how to live' as human beings in the face of the social problem of leprosy did not go so far as to take action on their own initiative to solve the problem" (Fukumoto, 2010, p.55). None of the studies were able to refer to students who had gained a correct understanding of leprosy, who had a strong interest in the issue of this disease, or were willing to take action to solve the problem.

Based on these previous studies, the present study conducted interviews with people who worked to solve the problem of leprosy to determine what kind of education resonated with them and what kind of knowledge -transfer methods they used when they were students. This allowed us to explore the type of learning that triggers people to take action to solve their own problems.

Method & Question Discussion

Survey method: Qualitative survey.
Survey target: Working to solve leprosy problems.
Survey period: July to mid-August.
Location: National Sanatorium Nagashima Aiseien, Okayama Prefecture.

Discussion

The study findings suggest that those who worked to solve the leprosy problem may have visited Nagashima Aiseien and heard stories from former patients and curators, rather than just learning through classroom lectures or research. By gaining knowledge about the episodes of former patients, we believe that they will be able to obtain stimulation from living memories, not just records, which cannot be obtained through research.

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Thermal behavior of salt-soluble proteins recovered from cricket muscle

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Introduction

Protein is not only one of the three macronutrients but also has excellent physicochemical properties such as gelling and emulsification. Edible insects have been recognized as a sustainable food protein resource, but their current use in the food industry is limited to nutritional roles. Furthermore, excellent physicochemical properties of insect proteins are little known to the author's best knowledge. Salt-soluble proteins (SP) of muscle of fishes and land animals have high gelling property. The aim of this research is to understand gelling property of muscle protein of edible insects. As a preliminary study, biochemical properties and the thermal behavior of SP extracted from cricket muscle were examined and were compared with those of fish and land animal SP.

Results and discussions

SP were extracted from cricket (*G. bimaculatus*), sea bream, and chicken muscle, and were subjected to the following analyses: molecular weight, secondary structure, denaturation temperature, thermal aggregation, and autolysis.

Molecular weight of SP

Molecular weight of SP was determined by SDS-PAGE. Myosin heavy chain (MHC) of cricket muscle had similar molecular weights to those of sea bream and chicken muscle.

Secondary structure of SP

Secondary structure of SP was predicted with a circular dichroism (CD) spectrometer. Cricket SP showed no different CD spectrum from sea bream and chicken SP, suggesting that cricket SP have similar secondary structure to sea bream and chicken SP. Moreover, cricket SP showed a typical CD spectrum to α-helical protein like sea bream and chicken SP (α-helical content was approximately 50%). These results suggest that cricket SP is rich in undenatured myosin.

Thermal behavior - Denaturation temperature of SP

Denaturation temperature of SP was determined with a CD spectrophotometer equipped with a heating controller. The calculated T_m values of sea bream, cricket, and chicken SP were 36.3℃, 49.3℃, 50.4℃, respectively. These results suggest that cricket SP have similar thermal stability to chicken SP, rather than seabream SP.

Thermal behavior – Thermal aggregation of SP

Turbidity of SP was measured by a spectrophotometer equipped with a heating controller. The turbidity curve of cricket SP resembled to that of chicken SP, not sea bream SP (Fig. 1), suggesting that cricket SP shows similar thermal aggregation behavior to chicken SP.

Thermal behavior - Autolysis of SP

Autolysis of SP incubated at 60℃ was examined by SDS-PAGE. Sea bream and chicken SP was not degraded (data not shown), while prominent proteolysis of MHC was detected in cricket SP after 3h incubation (Fig. 2 c). The proteolysis of MHC in cricket SP was inhibited by the addition of protease inhibiters (Fig. 2 d). These results suggest that cricket SP contains endogenous protease which degrades selectively myosin.

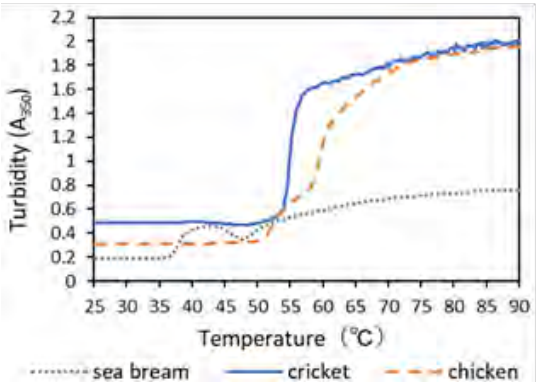

Fig. 1. Effect of temperature on turbidity of SP (1 mg/mL). SP was continuously heated from 25 to 90℃ at a rate of 1.0℃/min.

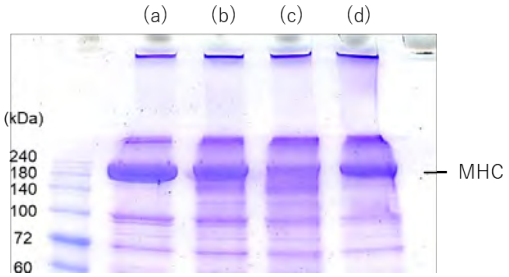

Fig. 2. Molecular weight distribution of unheated / heated cricket SP, determined by SDS-PAGE using 12.5% gel. (a) unheated (b) heated at 60℃ for 1h (c) heated at 60℃ for 3h (d) heated at 60℃ for 3h with protease inhibitor cocktail.

Conclusion

Cricket SP showed similar thermal behavior to chicken SP, possibly suggesting that cricket muscle proteins have high gelling property like land animal muscle proteins. However, cricket muscle had endogenous protease which degrades MHC. Undegraded MHC in heat process is essential to produce high quality muscle gel food. Therefore, it was considered that the inhibition of proteases in cricket muscle is crucial to maintain high gelling property of cricket muscle proteins.

Video Games and Sustainability: Minecraft as a Platform for Education (Using Minecraft as a Low Code Engagement Tool for the Youth in Teaching SDGs)

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Introduction

The education of Sustainable Development Goals (SDG) is a universal goal to address the future of the world's urgent environmental, political, and economic challenges. For the youth and the next generation, video games are a great medium to spread awareness or empower people with digital tools to inspire others.

Results and Discussions

The event พัฒนาทักษะพลังงานในยุคเศรษฐกิจ (BCG Energy Skills Development Project in the BCG Economy) 20 teams for different schools and university competed in the game development contest using Minecraft. The goal was to develop within the Video Game education about "Energy for Sustainable World". The winning team, *ICDI 1*, used storytelling, key gameplay loops, and educational materials to showcase the potential of Minecraft as a learning platform in the map "Heat Reverse"[1].

"Fig. 1," shows the number of players in Minecraft throughout the years; making it have a high potential to reach many young users[2]. *Minecraft: Education Edition*, a version of Minecraft that has added educational materials such as programming and electrical circuitry has already been implemented in classrooms worldwide. In a blog about Minecraft in the Math Classroom, an educator says, "Minecraft provides another kind of motivation and creative way to demonstrate knowledge. Minecraft: Education Edition is best used to create, and I think that external activities play a large role. Minecraft: Education Edition should be used as a creative way to collaborate and communicate knowledge and understanding of ideas[3]."

Of those people playing Minecraft, there is a growing community of modified versions in which other players and developers can add mechanics and content to the game to give it a refreshing take.

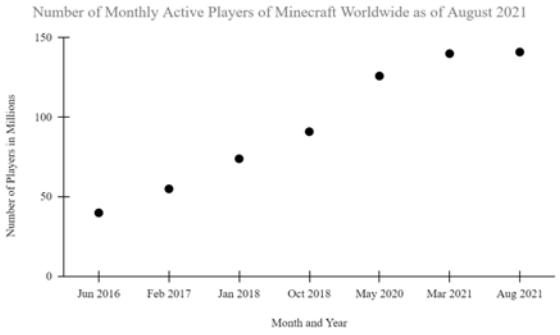

Fig. 1 There is a positive trend in Active Minecraft players throughout the year and remains steady. The number of players in the million is measured each year by Mojang (the developers of Minecraft). The statistics were published by J. Clement on Aug 2, 2022, and are adapted to the above.

For example, RLCraft is a mod pack that features many mods with more than 150 million downloads individually and the pack itself has more than

The map "Heat Reverse" requires no modifications to play but not only offers a storyline and visuals to keep players interested but also provides educational materials about SDGs. With its map mechanics and tools, other creators and map creators can download it publicly online for those interested in learning about SDGs or who want to create more maps through its model.

Acknowledgment

Thank you to Dr. Worawit Tepsan for guidance and design help, Annop Thananchana for growth and development, Kasetsart University staff and BCG group for introducing the project, Chanchai Chan for the development and game design Pantuch Sungkaew for the educational design, Thitirat Chareonsawan for storyboarding and presentation, Atinan Tangchiamsri for documentation and development help.

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THE 3rd TRILATERAL SYMPOSIUM ON SUSTAINABILITY

STRATEGIES FOR CLIMATE ACTION AND MITIGATION OF CLIMATE CHANGE IMPACTS

POSTER PRESENTATION

27th – 29th AUGUST, 2024

CHIANG MAI UNIVERSITY

KAGAWA UNIVERSITY

SESSION POSTER PRESENTATION (30)

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P-01 NCYU

A 3D Photogrammetry Technique and Apparatus for Capturing Fruit Maturity Features of New Taiwan Mango Cultivar

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Mango (Mangifera Indica L.) is one of the key fruit industries in Taiwan. Analyzing the mango's pericarp and shape information, such as length divided by width, volume, and bottom of the fruit, is essentially important for studying mango fruit's maturity. To understand whether the features of the mango's shoulder and bottom are indicative of its growth traits, this research designs a 3D reconstruction imaging framework using mango as the model. The 3D reconstruction of Mango fruit can then be used for automating measurement of its maturity features. The 3D reconstruction imaging framework not only can serves as a research tool to precisely collect mango fruit maturity related feature, but it also can shorten the feature extraction time such that the research accuracy can be improved。

Introduction

Appearance and morphology of mature mango fruits have always been a significant topic in the horticultural postharvest research. Traditionally, measuring the shape characteristics and volume of mangoes has been done using calipers and the water displacement method, which is time-consuming and subject to human error, resulting in less accurate measurements. To address this issue, a 3D imaging reconstruction device has designed for automatic and precise measurement of Mango fruit's maturity features. This design utilizes a turntable mechanism and three digital cameras in capturing the images of the object's outlook. Multiple images of Mango fruit can be automatically captured from a single camera. Through a 3D reconstruction software, this device not only can restore the fruit's 3D outlook but also facilitate researchers in extracting features and conducting maturity recognition studies.

Research Methods

An automated multi-view 3D reconstruction image scanning system is designed in this research. The 3D reconstruction image scanning system is shown in Figure 1. To precisely and automatically capture the surface details and contours of fruits, this system utilizes three Nikon Z30 cameras for imaging from three different angles. These cameras feature automatic focusing and, combined with a turntable system, enable multi-angle fixed-point shooting. The turntable system is controlled via an Arduino processor, which receives starting signals from the user to initiate the turning of the turntable, and the control board subsequently transmits data to a processing PC through data cable to enable the automated shooting, and allowing for remote parameter adjustment. The cameras are controlled through DigicamControl, a third-party digital camera control software using Python scripts. Once the turn table goes one rotation, the images are completely captured and are transmitted to a dataset in the data processing personal computer for data storage, and facilitating subsequent related Mango 3D reconstruction and subsequent maturity feature extraction. The reconstructed 3D Mango is shown in Figure 2.

Fig 1. Complete Structure of the 3D reconstruction system

Fig. 2 .3D reconstruction of Mango fruits

The complete experimental workflow is shown in Figure 3. Using VisualSFM software, the images undergo sparse and dense point cloud reconstruction. Post-processing tasks such as noise removal, scaling, and meshing of the 3D models are conducted using MeshLab and CloudCompare software.

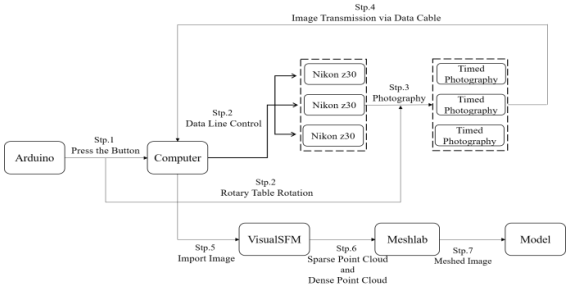

Fig. 3. The complete 3D reconstruction workflow

Results AND discussions

An automated multi-view image capture and 3D reconstruction system for mango fruit is designed in this research. This system not only enables the complete reconstruction of the fruit's full 3D appearance at the time of capture but it can also create a dedicated fruit maturity feature dataset through this automated system, which is beneficial for researchers in data collection and for realizing machine learning-based maturity recognition.

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P-02 CMU

Antioxidant Properties and Inhibition of Angiotensin-Converting Enzyme by Synergistic of Green Tea and Black Rice Extract

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The study explored the synergistic effects of green tea extract (GTE) and black rice extract (BRE) on antioxidant activities and the inhibition of angiotensin-converting enzyme (ACE). Using regression and response surface methodology, the impact of varying GTE concentrations (14.64% w/w to 85.36% w/w) and pH levels (3.5 to 6.4) on these parameters were analyzed. The results showed that both GTE concentration and pH significantly influenced all antioxidant assays and the total phenolic and flavonoid contents ($p<0.05$). Optimized conditions (85.36% w/w GTE and pH 6.0) exhibited the highest antioxidant activities (DPPH IC_{50} = 0.118±0.088 mg/mL, ABTS = 89.14±1.58 mmol TE/100g, FRAP = 373.66±3.42 mmol TE/100g) and the highest total phenolic (120.98±1.60 mmol GAE/100g) and flavonoid contents (15.28±1.07 mmol QE/100g). Therefore, this condition was selected to produce the combined extract for determining the fractional inhibitory concentration index (FICI). The FICI was 0.47 for DPPH and 0.51 for ACE inhibition, indicating a synergistic effect. These findings suggest that the combined extract can be used as a functional ingredient for its antioxidant properties and particularly in the inhibition of ACE.

Introduction

Plant polyphenols are powerful neutralizers of free radicals and reactive oxygen species (ROS) due to their aromatic structural characteristics and hydroxyl groups [1]. Synergy is defined as the biological activity of a combined extract being greater than that of an individual extract [2]. Thailand is abundant with numerous natural resources rich in polyphenols such as green tea and black rice. Green tea extract has a strong synergy with various plant extracts. There are currently few scientific literatures about the synergistic effects of green tea-rich in catechins and black rice-rich in anthocyanins on antioxidant abilities and ACE inhibition, however; there have been reports of interaction effect of them through co-pigmentation process [3]. Therefore, the objective of this study was to evaluate the synergistic effect of combination between GTE and BRE on antioxidant activities and the inhibition of ACE.

Results and Discussions

The regression models ($p<0.05$) for optimal performance conditions are shown in Table 1. Statistical analysis confirmed that both GTE concentration and pH significantly influenced all response variables ($p<0.05$). Fig. 1 displays 3D response surface plots, characterized by high antioxidant activities and total phenolic and flavonoid contents. The optimal condition was a GTE concentration of 85.36 %w/w and a pH of 6.00 (Fig. 2). The combination index showed that the combined extract had superior bioactive properties compared to the individual extract (Table 2).These results suggest that a combination of GTE and BRE could serve as an effective functional ingredient.

TABLE 1 The Regression Equations of GTE Concentration and pH on Antioxidant Activities and Bioactive Compound

Response Variables	Regression Equations	p	R^2
DPPH IC_{50} (mg/mL)	-0.1559 - 0.0077A + 0.2624B + 0.0001A^2 - 0.0191B^2- 0.0009AB	<0.0192	0.9313
ABTS (mmol TE/100g)	14.4871 + 0.3175A + 17.4172B - 0.0030A^2 - 2.0149B^2 + 0.0500AB	<0.0138	0.9423
FRAP (mmol TE/100g)	43.5823-0.7008A + 85.8490B - 0.0028A^2 - 12.6323B^2 + 0.7037AB	<0.0086	0.9547
TPC (mmol GAE/100g)	Y = 205.8468 - 1.7693A - 48.3892B + 0.0127A^2 + 3.9532B^2 + 0.2223AB	<0.0025	0.9454
TFC (mmol QE/100g)	Y = 18.9594 - 0.2682A - 4.7438B + 0.0031A^2 + 0.4447B^2 + 0.0127AB	<0.0024	0.9468

Note: A = GTE concentration in the combined extract (%w/w) and B = pH of the aqueous solution

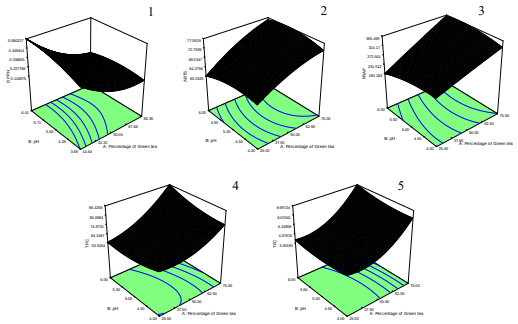

Fig. 1. 3D response surface plots effects between A and B on (1) DPPH (2) ABTS (3) FRAP (4) TPC (5) TFC

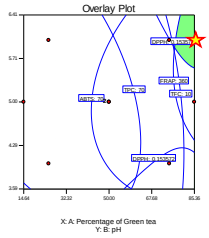

Fig. 2. Response surface of optimized condition

TABLE 2 The Antioxidant Activity (DPPH) and ACE Inhibition of Individual and Combined Extract, and Theirs FICI.

Samples	DPPH (IC_{50}; mg/mL)	ACE inhibition (IC_{50}; µg/mL)
GTE	0.371±0.036^b mg/mL	19.740±1.514^b µg/mL
BRE	2.522±0.204^a mg/mL	31.620±0.721^a µg/mL
Combined extract	0.112±0.015^c mg/mL	6.125±0.106^c µg/mL
FICI	0.35±0.08 (synergistic)	0.51±0.02 (partially synergistic)

Note: different alphabet indicated significantly difference ($p<0.05$) FICI ≤ 0.5 (synergistic) FICI = 0.51 - 0.99 (partially synergistic) FICI =1 (additive) FICI = 1.01 - 4 (indifferent) FICI > 4 (antagonistic), GTE: green tea extract, BRE: Black rice extract, Combined extract: GTE concentration in the combined extract of 85.36 %w/w and a pH of 6.00.

The work described herein is affiliated with the "Cluster of High Value Products from Thai Rice and Plants for Health, Chiang Mai University, Thailand". The results presented in this study are intended for publication soon.

Acknowledgment

The authors express sincere gratitude for the financial support provided by the Cluster of High Value Products from Thai Rice and Plants for Health, Chiang Mai University.

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THE 3rd TRILATERAL SYMPOSIUM ON SUSTAINABILITY
STRATEGIES FOR CLIMATE ACTION AND MITIGATION OF CLIMATE CHANGE IMPACTS
KAGAWA UNIVERSITY
P-03 CMU

Application of high-pressure processing on brown rick milk containing synergistic-encapsulated powder of green tea and black rice extract

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This research examined applying high-pressure processing (HPP) in pilot-industrial scale on brown rice milk (BRM) with synergistic-encapsulated powder of green tea and black rice extract (SEP). Initially, plain BRM without SEP was treated under HPP conditions of 500-600 MPa for 10-20 minutes. The HPP condition of 600 MPa for 20 minutes resulted in a total plate count below 1 x 10^4CFU/mL and yeast-mold count below 1 x 10^2 CFU/mL, in addition to let the highest scores in appearance, aroma, flavor, and overall liking. When applying this condition to BRM with SEP, total plate counts (TPC) and yeast-mold levels exceeded Thai Industrial Standards Institute standards at SEP concentrations of 11%, 13% and 15% w/v. Then, the treatment time was extended to 40 min to meet these standards. Thus, HPP shows promise for future experiments on BRM with SEP, focusing on optimal SEP selection for enhanced sensory and health benefits

Introduction

Plant-based milk incorporated with encapsulated powder of natural extracts can provide various bioactive compounds and improve human health, consideration should be given to the preservation technology to maintain the bio-accessibility of these compounds. High pressure processing (HPP) is a non-thermal technology that has been suggested as an alternative to traditional thermal processing to enhance the health-related properties of food products [1]. HPP is recommended for extending product shelf life while maintaining sensory qualities and preserving nutrients which could be degraded by thermal processing [2]. In Thailand, HPP treatment is approved for use in preserving low-acid beverages (pH>4.6), particularly plant-based milk [3]. Therefore, the objectives of the present study were to explore the possibility of using HPP to preserve brown rice milk, both with and without SEP.

Results and Discussions

HPP (Baotou KeFA High Presure Technology Co.,LTD, China) was performed by pressure chamber had capacity of 65 L. The maximum pressure was 600 MPa.

Fig. 1. HPP Apparatus that located at Science and Technology Park (STeP), Chiang Mai University, Chiang Mai, Thailand.

Table 1. shows the effect of HPP conditions on TPC, yeast-mold, and sensory properties. The samples treated under all conditions showed TPC less than 1 x 10^4 CFU/mL and yeast-mold less than 1 x 10^2 CFU/mL, which comply with the Thai Industrial Standards Institute for brown rice drinks (CPS.282/2015). Additionally, different HPP conditions did not affect rice aroma, overall aroma, sweetness, bitterness, overall flavor, and aftertaste. However, the condition of 600 MPa for 20 minutes resulted in the highest appearance, overall aroma, flavor, and overall liking. Thus, this condition was considered appropriate for preserving brown rice milk containing SEP.

TABLE 1. Microbiological and Sensory Properties of Plain BRM Under Various HPP Conditions

Properties	Conditions of HPP			
	500 MPa 10 min	500 MPa 20 min	600 MPa 10 min	600 MPa 20 min
Microbiological				
TPC (CFU/mL)	3.2 x 10^3	4.2 x 10	5.6 x 10^2	3.9 x 10
Yeast and Mold (CFU/mL)	<1 x 10	<1 x 10	<1 x 10	<1 x 10
Sensory Attributes (n=50)				
Color	6.6 ± 1.5^{ab}	6.3 ± 1.4^{b}	6.9 ± 0.3^{a}	6.4 ± 1.5^{b}
Appearances	5.6 ± 0.5^{b}	5.6 ± 0.9^{b}	5.9 ± 0.3^{b}	6.7 ± 0.4^{a}
Rice Aroma ^{ns}	6.6 ± 1.5	6.6 ± 1.5	6.6 ± 0.5	6.3 ± 1.4
Overall Aroma	5.5 ± 1.7^{b}	7.0 ± 1.3^{a}	6.8 ± 1.0^{a}	7.5 ± 0.8^{a}
Sweet ^{ns}	6.4 ± 1.5	6.6 ± 0.9	6.5 ± 0.7	7.7 ± 1.8
Bitter ^{ns}	6.6 ± 1.4	6.4 ± 0.8	6.5 ± 0.8	6.5 ± 1.5
Rice Flavor	6.7 ± 0.4^{c}	7.1 ± 0.8^{bc}	7.4 ± 1.5^{ab}	7.8 ± 0.6^{a}
Overall Flavor ^{ns}	6.5 ± 0.5	6.6 ± 0.8	6.6 ± 0.9	7.2 ± 0.8
Viscosity	7.3 ± 0.9^{b}	7.4 ± 0.5^{b}	7.4 ± 1.5^{b}	7.9 ± 1.6^{a}
After Taste ^{ns}	6.6 ± 0.5	7.1 ± 0.8	6.6 ± 1.5	6.7 ± 0.7
Overall Liking	6.4 ± 0.7^{c}	7.1 ± 0.9^{b}	7.4 ± 0.6^{b}	8.4 ± 0.9^{a}

Note: Values indicate mean ± standard deviation. The superscript letters (a-c) in the same column indicate significant differences at $p \leq 0.05$, while ns indicates no significant difference at $p > 0.05$.

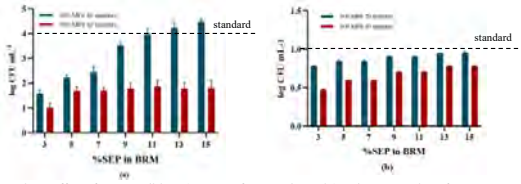

Fig 2. Effect of HPP conditions (600 MPa for 20 and 40 min) and concentration of SEP on microbiological properties (a) TPC and (b) yeast and mold

The results indicated that an increase of adding SEP resulted in a higher TPC and yeast-mold (Fig 2.), which may be attributed to contamination during the mixing of SEP. Samples with SEP 11%, 13%, and 15% w/v treated by 600 MPa for 20 min exceeded the TPC levels set by the Thai Industrial Standards. Additionally, samples with all SEP concentrations treated at 600 MPa for 40 minutes met these standards.

Fig 3. Appearance of BRM with SEP varied 0, 3, 5, 7, 9, 11, 13 and 15% (a) before HPP and (b) after HPP

Acknowledgment

This work was supported by the Royal Golden Jubilee (RGJ) Ph.D. Program. (Grant No. PHD/0120/2561) and the Faculty of Agro Industry, Chiang Mai University.

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P-04 KU

Chemical constituents and α-glucosidase inhibitory activity of Indonesian tea (*Orthosiphon aristatus*)

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Introduction

In recent years, the number of patients with lifestyle-related diseases has increased in Indonesia, Malaysia, Thailand, and other Southeast Asian countries due to unbalanced diets, lack of exercise, and stress. It is estimated that approximately 10% of the total Indonesian population is diabetic or pre-diabetic. Many of them cannot afford proper medical care and preventive treatments. Therefore, it is important to prevent diabetes and hyperglycemia through natural food sources instead of expensive medicines.

Kumis Kuching (*Orthosiphon aristatus*) is a medicinal herb in the Lamiaceae family. The herb is widely found in the Southeast Asian countries such as Indonesia, Malaysia, and Thailand. It is called as Kumis Kuching and Misai Kuching in Indonesia and Malaysia, respectively. Those names mean cat's whiskers, so the flower has many long filaments like cat's whiskers. The herb has traditionally used to treat a wide range of diseases, such as fever, epilepsy, rheumatism, hypertension, arthritis, and kidney disease. Several classes of compounds have been isolated from the plant, including flavonoids, terpenoids, saponins, and phenolic acids. The most characteristic substances of the plant are polymethoxylated flavones (3'-hydroxy-5,6,7,4'-tetramethoxyflavone, eupatorin, sinensetin), and rosmarinic acid (Fig. 1).

The aim of this study is to isolate and identify the polymethoxyflavones and rosmarinic acid from Kumis Kuching and evaluate their α-glucosidase inhibitory activities using a yeast enzyme and a rat small intestine enzyme.

Results and discussions

Many researchers have studied α-glucosidase (AGH) inhibitors in natural or synthetic compounds to prevent diabetes and hyperglycemia. However, most of these inhibition studies have been done using yeast AGH method, which is simple and economical. AGHs are broadly divided into two families, family I (yeast) and family II (mammalian), on the basis of the difference in primary structure, and AGH inhibitory specificity differ for each enzyme.

Table1. α-Glucosidase inhibitory activity of polymethoxyflavones and rosmarinic acid-related substances

samples	yeast α-glucosidase IC_{50}(μg/mL)	rat small intestine α-glucosidase IC_{50}(μg/mL)
luteolin	NA	NA
eupatorin	NA	NA
3'-hydroxy-5,6,7,4'-tetramethoxyflavone	NA	NA
5,6,7,4'-tetramethoxyflavone	NA	NA
sinensetin	1590	NA
rosmarinic acid	657	799
chlorogenic acid	865	1263
caffeic acid	94.8	87.7
quinic acid	449	NA
epicatechin	475	2295
acarbose	611	84.4

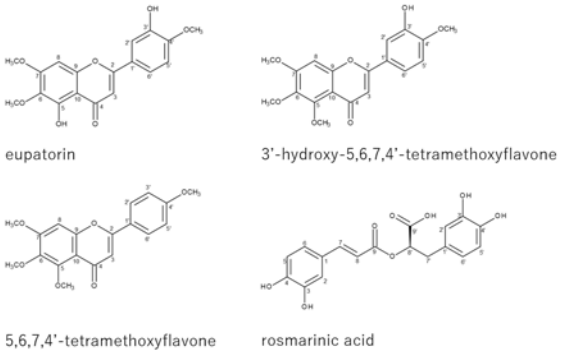

Figure 1. Chemical structures of polymetoxyflavones and rosmarinic acid.

In this study, (-)-epicatechin showed weak inhibitory activity on yeast α-glucosidase, but less inhibitory activity on rat small intestinal α-glucosidase. Conversely, acarbose had high inhibitory activity for the mammalian α-glucosidase, but little effect on yeast α-glucosidase. (Table1)

Three polymethoxyflavonoids, eupatorin (22.8 mg), 3'-hydroxy-5,6,7,4'-tetramethoxyflavone (1.0 mg), and 5,6,7,4'-tetramethoxyflavone (39.7 mg), were isolated and identified from the ethanol extract of Kumis Kuching leaves. The polymethoxyflavones showed no inhibitory activity in the rat small intestine α-glucosidase. Sinensetin showed low inhibitory activity in the yeast α-glucosidase. Although some researchers reported that polymethoxyflavones have α-glucosidase inhibitory activity, the limited solubility of polymethoxyflavones in water may influence the low activities in this study.

Rosmarinic acid exhibited moderate inhibitory activities in both yeast α-glucosidase and rat small intestine α-glucosidase. The inhibitory activities of rosmarinic acid were higher than those of chlorogenic acid. Caffeic acid had high inhibitory activity, while quinic acid showed no inhibitory activity against rat small intestine α-glucosidase. These results indicated that rosmarinic acid, which has water solubility and two catechol units, in Kumis Kuching would expect to prevent the diabetes and hyperglycemia.

Compared Cultivation Practices and Carbon Footprinting in Different Rice Varieties, "NCYU-TN1" and "TN11"

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Introduction

Rice, one of the world's major crops, is a staple food that provides more than half of the global population's caloric intake. However, rice cultivation often involves prolonged flooding, creating anaerobic conditions in paddies that lead to the production of greenhouse gases (GHGs), including carbon dioxide (CO_2) and methane (CH_4). To mitigate the environmental impact, reducing fertilizer and pesticide use and improving water-use efficiency during rice cultivation are essential. In recent years, global environmental changes have raised concerns about food production and security. Extreme climate events such as droughts and floods have become increasingly frequent, exacerbating water scarcity and affecting rice cultivation practices. Water shortages have become the new norm, significantly impacting food production and security. To adapt to these climate challenges, agricultural practices must align with the Taiwanese government's goal of achieving a 50% reduction in agricultural carbon emissions by 2050. Agriculture plays a vital role in carbon sequestration and rice paddies covering the largest agricultural area in Taiwan, offer an opportunity to assess carbon footprints and promote low-carbon emission rice varieties, contributing to net-zero targets. This study calculates the carbon footprint of the short-growth-period, drought tolerant rice variety NCYU-TN1 under conventional cultivation practices and compares it with the existing dominant variety TN11. This comparison provides insights for achieving net-zero carbon emissions in rice cultivation in the future.

Results and Discussions

Our data showed that the carbon footprint of drought tolerant variety, NCYU-TN1, is much lower than that of TN11, with a total effective reduction of 30% in carbon emissions. Besides, NCYU-TN1 has 50% less water usage compared to TN11. The result also showed NCYU-TN1 significantly less fertilizer application than TN11 reducing approximately 50% fertilizer application.

Table 1. The costs of the drought-tolerant rice variety NCYU-TN1 and the dominant variety TN11 at the second crop season in 2023.

Second crop of 112th year	NCYU TN 1	Compared	TN 11
Number of growing days	Second crop 85 days	Early 25 days	Second crop 110 days
Fertilizer dosage	Second crop 424.5 kg/ha	50%	Second crop 860.9 kg/ha
Water consumption	Second crop 6000 t/ha	50%	Second crop 12000 t/ha
Integrated crop management	Second crop twice	-30%	Second crop thrice
Farming costs	Second crop 35000 NTD/ha		Second crop 35000 NTD/ha

Table 2. The production efficiency of the drought-tolerant rice variety NCYU-TN1 and the dominant variety TN11 at the second crop season in 2023.

Second crop of 112th year	NCYU TN 1	Compared	TN 11
crop yield	Second crop 6850 kg/ha	-25%	Second crop 8920 kg/ha
Production costs	Second crop 70000 NTD/ha	-20%	Second crop 90000 NTD/ha
production efficiency	Second crop 1500000 NTD/ha	+150%	Second crop 600000 NTD/ha

Table 3. Compared CO_2 emissions of the drought-tolerant rice variety NCYU-TN1 and the variety TN11 at the second crop season in 2023.

Second cropping NCYU TN 1		Compared	Second cropping TN 11	
Planting stage	Carbon emissions equivalent ($kgCO_2e$)	$kgCO_2e$	Planting stage	Carbon emissions equivalent ($kgCO_2e$)
Cultivation and management	397.67	-48%	Cultivation and management	765.5
Total carbon emissions equivalent	837.67	-30%	Total carbon emissions equivalent	1225.5

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Acknowledgments

This study would like to thank Tainan District Agricultural Research and Extension Station (DARES), MOA provided rice EXPERIMENT FIELD AND FUNDING BY MOA. WE ALSO THANK Chenghe Farm FOR Cultivation management and data provision.

P-06 NCYU

Correlation Analysis between Peel Color and Total Soluble Solids Content of New Taiwan Cultivar Mango for Prediction of Sweetness

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Mango (Mangifera indica) is one of the important fruit industries in Taiwan and is a popular summer fruit with various types, each having its unique taste and flavor. However, assessing the sweetness of mangoes can be challenging for agricultural commodity traders and consumers when purchasing them. This study utilizes machine learning techniques to analyze the correlation between the color of mangoes and their sweetness. A dataset of mango color information and corresponding sweetness ratings have collected in Lab and a relationship between mango color and sweetness can be discovered by using a Backpropagation Feedforward Neural Network algorithm. Experimental results shown that the redder the color, the sweeter the mango. Based on this results, a deep learning based sweetness prediction method for predicting the sweetness of mangoes will be proposed in the near future.

Introduction

Identification of fruit varieties and the sweetness has always been an important topic in agricultural production. Different fruit varieties may have subtle but significant differences in appearance and taste, which are crucial for variety recognition and commodity trade. Traditional identification methods often rely on the experience of farmers and can have limitations in terms of accuracy and efficiency. Therefore, employing computer vision and machine learning techniques to achieve automated fruit variety and sweetness identification has become a challenging yet highly promising research direction.

Method And Results

In this study, a total amount of 32 mangoes have been prepared as data samples for the experiment. To maintain consistency during image capturing, camera angle was fixed in taking mango images as the dataset. To measure the Total Soluble Solids Content (TSS) of the mangoes, a handheld refractometer (ATC-1E, ATAGO, Japan) is employed to measure the sweetness of Irwin mangoes. Based on the measured sweetness, expressed in °Brix, the mangoes were classified into three categories: not sweet, sweet, and very sweet. From these three categories, one mango was selected as a sample, and its red, yellow, and green areas were manually separated. A sample image is shown in Figure 1, which illustrates the different color areas extracted from a mango classified as "sweet." Since the images contain some colors that are difficult to classify perfectly (e.g., orange, brown, etc.), areas that the human eye can only accurately identify as red, yellow, and green are extracted for processing. Subsequently, the images were analyzed using the RGB color space in computer vision to obtain the mean and standard deviation for each channel. For each mango in the dataset, the RGB values of each pixel were calculated in RGB color space.

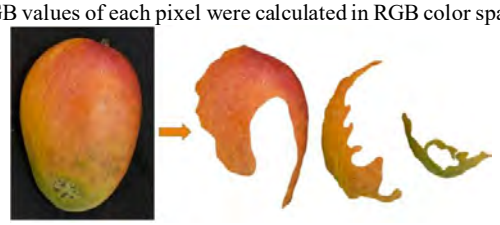

Figure 1. Mango pericarp color extraction

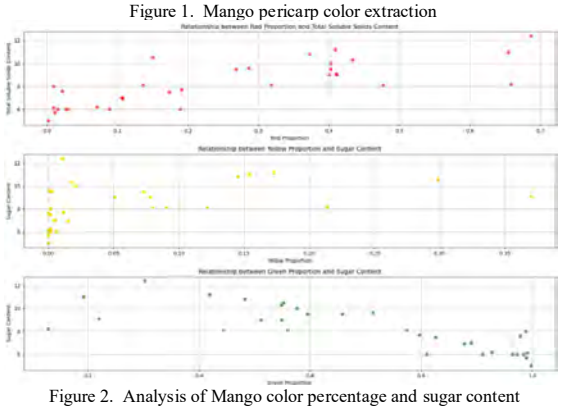

Figure 2. Analysis of Mango color percentage and sugar content

Using the average and standard deviation of the sample's RGB values, we applied the K-Nearest Neighbor (KNN) algorithm to assign each pixel in the image to either red, yellow, or green. Through this method, we were able to calculate the percentage of red, yellow, and green areas for each mango. Next, we analyzed the obtained color percentages and Total Soluble Solids Content (TSS). The results indicated that a higher percentage of the red area generally corresponds to higher sweetness, while a lower percentage of the green area usually corresponds to lower sweetness. No significant pattern was observed for the yellow area, as shown in Figure 2.

Conclusion

In existing research, when mango color characteristics are used for training machine learning models, the value of the R channel in the RGB color space is typically used as a feature. However, the R channel mainly represents the intensity of red in the pixels, which does not fully align with human perception and discrimination of red. Therefore, by using this method, more intuitive understanding of the data is provided.

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THE 3rd TRILATERAL SYMPOSIUM ON SUSTAINABILITY
STRATEGIES FOR CLIMATE ACTION AND MITIGATION OF CLIMATE CHANGE IMPACTS
P-07 KU

Current State and Challenges of Inbound Tourism in Naoshima: Focus on Island Access”

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Overview of Naoshima

Naoshima is an island located in Kagawa Prefecture, which is part of the Shikoku region in Japan. It has an area of approximately 14 sq uare kilometers and a total population of appro ximately 3,000. Since the 1990s, the island has been developed using art as the central theme, and creating art pieces by utilizing vacant tradit ional houses. Today, Naoshima is a widely reco gnized tourist destination both domestically and internationally, owing to its unique artworks and events such as the Setouchi Triennale.

Literature Review

In recent years, overtourism has become a concern in various regions of Japan. Nara et al. (2019) analyzed the current state of overtou rism in Kyoto City using survey data and, hig hlighted congestion in public transportation as a major issue faced by Kyoto residents.

Tashita et al. (2023) studied rural areas, f ocusing on regions like Toyooka City in the H yogo Prefecture, which have rapidly become to urist destinations owing to the registration of v arious cultural heritage sites. They considered t raffic congestion and tourist pollution as the t wo key perspectives on transportation overtouri sm.

While there is substantial discussion on tr ansportation issues due to overtourism in urban and rural areas, the discourse is lacking on to urist challenges in island regions like Naoshim a, where cars are not commonly used.

Matsuo (2020: 106) explored Naoshima to wn from the standpoint of modern history and rise of tourism, elucidating the process by whi ch the town became well-known as an art isla nd.

Another factor contributing to Naoshima's global recognition is the Setouchi Triennale, an art event. Takayama (2017: 28) examined the creation of new local characteristics through co mmunity development in Naoshima, involving not only tourists but also residents.

Most research on Naoshima, including the above, focuses on so-called "art tourism."

However, the challenges related to the in creasing demand for inbound art tourism in Naoshima have not been discussed. New inb ound tourism challenges may be highlighted by studying the transportation issues in Naos hima.

Research Question

This study examines the access challenge s accompanying the increase in inbound touri sm to Naoshima, thereby addressing tourism transportation issues in island regions. The in vestigation method was a survey that, analyz ed issues faced in island tourism by inbound tourists through questions about the means of transportation, connectivity to tourist spots, a nd ease of touring. Additionally, interviews w ere conducted with the Naoshima Tourism As sociation and Naoshima Town Office to inves tigate the challenges faced by the hosts.

Survey Results

The surveys highlighted the transportatio n challenges faced in island tourism. Going f orward, not only addressing the increasing us e of transportation by inbound tourists but al so exploring new forms of tourism are neces sary.

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P-08 CMU

Enhanced catalysis of CO_2 cycloaddition at ambient pressure through rational design of interpenetrating Zn^{II}/Ln^{III} heterometallic coordination polymers

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Through rational use of 2,2′-bipyridine-4,4′-dicarboxylic acid (H_2bipydc), new series of interpenetrating heterometallic coordination polymers, i.e. $[Zn^{II}Ln^{III}(bipydc)_2(HCOO)(H_2O)_3]\cdot 2H_2O$ where Ln^{III} = Pr^{III} (I), Nd^{III} (II), Sm^{III} (III) and Eu^{III} (IV), were synthesized and characterized. Their single crystal structures were illustrated, and potential functioning sites were identified. Their performances in catalyzing the CO_2 cycloaddition reactions with epoxides, particularly allyl glycidyl ether (AGE) were evaluated at 90 ◦C for 4 h at ambient pressure. Viability of IV in catalyzing the reactions of other monosubstituted epoxides was also studied. A comparison of the catalytic performance of IV towards the different selected epoxides was exhibited, revealing the preferential and influential interactions of epoxides at different metal sites according to computational calculations.

Introduction

This work has been published previously in (*Journal of CO2 Utilization* **2024**, *80*, 102686) [1], the results presented herewith are for communication purposes of previously published work by the authors only. Therefore, please read this published article for further details.

In brief, catalyzed CO_2 cycloaddition reactions with epoxides are one of the most attractive strategies to diminish atmospheric CO_2. Among several heterogeneous catalysts, coordination polymers (CPs), especially those containing heterometallic transition metals and lanthanides, have been recognized as effective catalysts, although the deep details on their catalytic mechanism were not yet fully revealed. This work aims to synthesize a new series of heterometallic $[Zn^{II}Ln^{III}(bipydc)_2(HCOO)(H_2O)_3]\cdot 2H_2O$ for use as heterogenous catalyst for CO_2 cycloaddition reactions with epoxides at mild temperature and ambient pressure. The preferential and influential interactions of epoxides at different metal sites were revealed according to computational calculations.

Results and Discussions

Single crystal X-ray diffraction analysis shows that the new series of heterometallic $[Zn^{II}Ln^{III}(bipydc)_2(HCOO)(H_2O)_3]\cdot 2H_2O$ are three-dimensional rare interpenetrating frameworks, and the locations of active sites for catalysis were disclosed (Fig. 1). All synthesized CPs showed effective catalytic performance toward the CO_2 cycloaddition with AGE. Particularly, **IV** (Eu^{III}) (as a representative of the others) also shows viability with several monosubstituted epoxides (Table I). According to computational studies, the epoxides prefer to interact with Zn^{II} side rather than Ln^{III} side. Moreover, the existence of the electron-rich groups on the substituted chain of AGE, which are preferable to the opposite charge on Zn^{II}, was crucial to promote efficient catalysis.

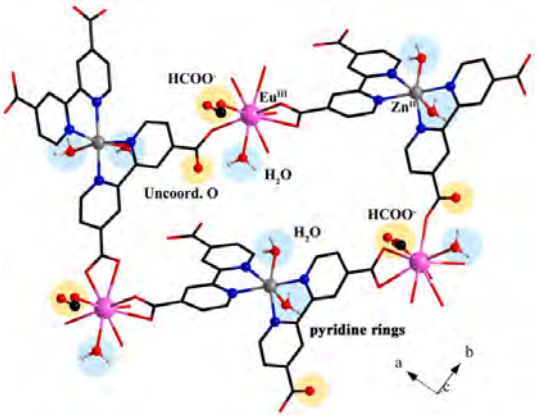
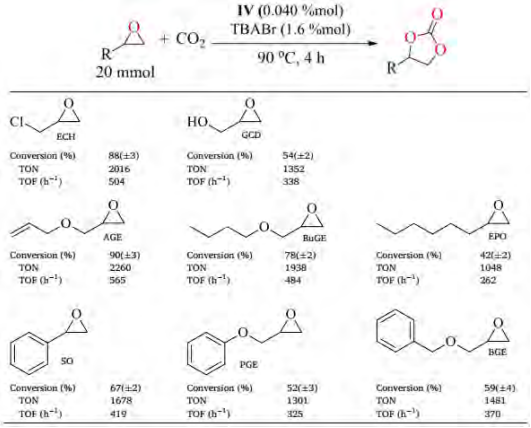


Fig. 1. Potential acidic and basic sites on the framework of **IV** (as a representative of **I** - **IV**)

Table I Catalytic performances of **IV** in CO_2 cycloaddition reactions with different monosubstituted epoxides under ambient pressure



Acknowledgment

This research is supported by Chiang Mai University, the NSRF, The NSTDA, the Erawan HPC Project, and the Chalawan HPC cluster.

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Evaluating the Feasibility of Vapor Heat Treatment for Exporting 'Wan-li-shiang' Mango Fruit

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Introduction

Taiwan has many types of mangoes, but only a few can be exported, affecting the annual mango export volume. This study aims to evaluate the export possibility of "Wan-li shiang" mangoes , hoping to find the appropriate ripeness, storage temperature, and storage duration suitable for export. Vapor Heat Treatment (VHT) is a treatment for export. We determine which treatment is best for export, by performing VHT and simulating the storage temperatures during transportation.

Materials and Methods

We used mangoes of three different ripeness levels, divided into a vapor heat treatment group and a control group, which were further divided into two storage temperatures (8°C and 5°C) and four storage duration combinations (refrigerated for 7 days and then warmed for 3 days, refrigerated for 7 days and then warmed for 6 days, refrigerated for 14 days and then warmed for 3 days, refrigerated for 14 days and then warmed for 6 days), resulting in a total of three batches that each consist of 16 combinations. We compared and analyzed the salability, flavor, and sugar-acid ratio to determine which combination is more suitable for export.

Results and Discussion

According to Table 1, the salability rate of early maturity mangoes after vapor heat treatment was almost 100%, while the salability rate for middle maturity mangoes decreased slightly after the treatment. The salability for late maturity Wan-li-shiang mangoes after vapor heat treatment was below 60%. As shown in Figure 1, we can see more clearly that the appearance of early maturity mangoes after vapor heat treatment is better and more attractive.

Table 1. Salability of Wan-li-shiang Mangoes after undergoing simulated storage and transportation（%）.

	Early maturity		Middle maturity		Late maturity	
	control	VHT	control	VHT	control	VHT
8 °C-7.3d	100	100	100	100	100	40
8 °C-7.6d	75	100	100	80	60	60
8 °C-14.3d	80	100	100	40	100	40
8 °C-14.6d	40	100	80	40	80	20
5 °C-7.3d	80	100	100	60	100	40
5 °C-7.6d	25	100	60	60	60	20
5 °C-14.3d	60	60	40	60	100	0
5 °C-14.6d	100	100	80	60	100	20

According to the flavor radar chart in Figure 2, we can see that the aroma and sweetness of early and middle maturity mangoes with vapor heat treatment are almost the same, but the early maturity mangoes are juicier. The vapor heat treatment had little effect on the flavor of Wan-li-shiang mangoes.

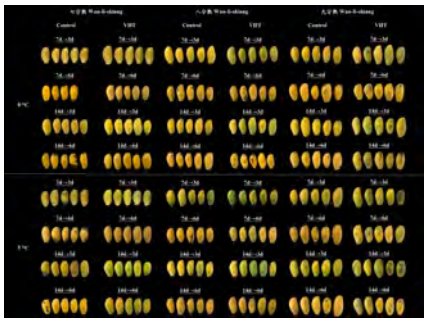

Fig 1. The appearance of Wan-li-shiang mango fruit simulated transport.

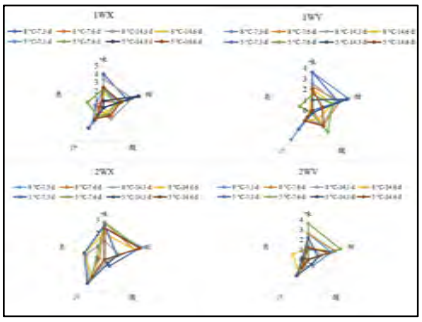

Fig 2. Early maturity and middle maturity flavor radar chart.

According to Table 2, the sugar-acid ratio of early maturity Wan-li-shiang mangoes generally ranged between 30 to 50, but it slightly decreased after vapor heat treatment. The sugar-acid ratio of middle maturity Wan-li-shiang mangoes have a greater fiuctuation, but most were above 50 after vapor heat treatment, indicating a generally sweeter flavor compared to the early maturity mangoes.

Table 2. early and middle maturity Wan-li-shiagn mangoes suger-acid ratio.

	Early maturity		Middle maturity	
	control	VHT	control	VHT
8 °C-7.3d	44.6	46.2	54.1	40.5
8°C-7.6d	47.7	39.3	64.0	69.0
8 °C-14.3d	47.4	36.5	68.3	53.9
8 °C-14.6d	44.6	48.2	48.7	57.9
5 °C-7.3d	43.4	33.5	38.5	52.1
5 °C-7.6d	45.8	53.3	76.3	52.8
5 °C-14.3d	65.0	35.3	39.6	37.6
5 °C-14.6d	50.8	43.3	53.3	58.5

Conclusion

Because the salability rate of late maturity mangoes is low, late maturity mangoes were not included in the comparison. Overall, early maturity mangoes are the most suitable for export. Their overall flavor is better due to a slight acidity. Although middle maturity mangoes are less suitable for export, their overall flavor is sweeter, which might be more appealing to general consumer.

P-10 KU

Examining Male Students' Makeup-Wearing Preference after 2000

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Introduction

Convenience stores, drugstores, and department stores have opened sections specializing in men's cosmetics. As the Japan Department Stores Association's "April 2024 National Sales of Department Stores" presents, sales have been increasing annually. In this context, we examined why male university students became interested in cosmetics from the viewpoint of social and personal factors.

【Year-on-year sales and trends by product】

By product	Year-on-year sales	Trends
Cosmetics	14.6	Positive for 26 consecutive months
Clothing	6.4	Positive for 26 consecutive months
Foodstuff	-1.3	Negative for the first time in 4 months
Sundries	15.0	Positive for 31 consecutive months

Source: April 2024 National Department Store Sales Summary

Background

Several hypotheses can be proposed regarding why male college students wear makeup. For example, these students are more interested in makeup because women expect them to wear it, men want to express their individuality, and men's cosmetics have started appearing in the market.

After 1900, growing a beard was associated with a gentleman's appearance; thus, it became fashionable for male university students to grow a beard as a symbol of elitism. At that time, Japanese men's makeup consisted mainly of grooming their hair and beards, so-called women's make-up was not an option for men.

Murasawa (2000) explained that male makeup products did not grain popularity because men who wanted to retain conventional masculinity rejected the idea of men wearing makeup, and those who had doubts about the conventional male-centered society rejected the mainstream male image created by male makeup.

In 2003, starting with the establishment of the nation's first men's cosmetics sales floor in Isetan Shinjuku called the "Men's Building," men's cosmetics gained public acceptance.

In a study of men's awareness of makeup, Kaneda (2008) reported that approximately 80% of students began caring for their skin by the time they were in high school. Although modern men are highly interested in makeup and prefer to incorporate it into their daily routines, including hair coloring and skin care, there is an additional category of men who seek social and appearance success by visiting salons for nail care, esthetic treatment, and other services.

We believe that men's makeup expectations and interest have changed owing to increased makeup use by famous influencers and idols on social networking sites such as Instagram and TikTok.

Furthermore, Matsumura et al. (2021) confirmed that makeup can improve mood, which in turn leads to a sense of fulfillment in life. As the use of makeup may have induced positive emotions even during the COVID-19 pandemic era, we also consider that this period may have led to an increase in the use of makeup.

Therefore, in this study, we analyzed why male students began wearing makeup after 2000.

Research Method

To clarify the questions of this study, 50 male college students were surveyed about their makeup preferences. Some of the survey questions were as follows: "Are you currently wearing make-up?" "What type of makeup did you wear?"

Results and Discussion

Social factors, such as changing attitudes toward gender, were responsible for the growing acceptance of makeup among male college students after 2000. Approximately half of the male college students surveyed in our study wore makeup, and it appeared that their makeup-use behavior began owing to the influence of celebrities and influencers. Even male college students who did not wear makeup were, interested in it. The trends observed in this study suggest that the number of male college students engaging in makeup usage will continue to increase in the future.

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Fostering Reflective Practice in Teacher Education (2): Strengthening Reflective Practices with Digital Tools

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Introduction

Ensuring high-quality teacher training is crucial for University Social Responsibility (USR) and addressing educational disparities. Lesson studies are essential for developing teachers as reflective practitioners by providing opportunities for reflection. The integration of online lesson studies removes time and location barriers, significantly expanding the potential for broader teacher-learning communities. Documenting the process of lesson studies enables ongoing teacher development, offering a systematic approach to enhance teaching quality and student outcomes.

The primary objective of this study is to develop and execute an online lesson study program for university students, analyze its role in facilitating student reflection, and evaluate its effectiveness. By integrating collaborative lesson planning, video production of teaching demonstrations, and structured reflection, the program aims to foster reflective practices among future educators.

Our program of online lesson study program

1. Pedagogical Methodology Lectures: These lectures provided a foundation of varied teaching strategies to build pedagogical knowledge.
2. Collaborative Lesson Planning: After the lectures, students worked together to draft lesson plans, aiming to create engaging and instructional video content.
3. Video Recording as Teachers: Participants recorded educational videos, emphasizing critical teaching points using blackboards and other teaching aids.
4. Video Review and Editing: The recorded videos were reviewed and edited to improve engagement and clarity, then uploaded for peer review on Microsoft Stream.
5. Group Feedback Sessions: Conducted on Microsoft Teams, these sessions allowed students to provide and receive peer feedback on their teaching videos.
6. Reflection Reports: Students composed reflection reports based on peer feedback to identify teaching strengths and areas for improvement, emphasizing continuous professional development.

Methods

The study was conducted over a semester-long course involving sophomores and juniors enrolled in a teacher training program. Approximately 100 participants engaged in pre-lesson pedagogical methodology lectures, collaborative lesson planning, video recording of teaching demonstrations, peer feedback sessions, and reflective reporting. A mixed-method approach was employed to evaluate the effectiveness of the platform. Quantitative text mining and qualitative content analysis were used to analyze the reflective reports submitted by the students. These reports were segmented, categorized, and analyzed for biases, focusing on five key dimensions adapted from Darling-Hammond (1997; 2006) to assess the depth and quality of reflection.

Results

The findings revealed that nearly all students actively engaged in reflective practices, with a significant focus on improving their teaching methods. The analysis showed that the reflections often concentrated on critical teaching aspects such as the clarity of explanations and the effectiveness of problem-solving tasks. However, there was a noticeable bias towards limited consideration of educational philosophy in the reflections.

Supplementary instruction provided during the course helped to address this bias, leading to enhanced reflective practices among students. The study underscored the importance of expert support in reflective methodologies to help students critically evaluate their teaching practices and incorporate broader educational philosophies into their reflections.

Discussion

The study demonstrates the significant positive outcomes of the online lesson study platform. It highlights the potential of such platforms to enhance educational quality and address disparities by providing structured opportunities for reflection and collaboration. The online nature of the lesson studies facilitates easier access to expert support, making it more feasible to secure the necessary guidance to deepen reflections.

While securing supporters to deepen reflections remains a challenge, the study indicates that the online format makes this task more manageable. This finding underscores the suitability of online lesson studies for future-oriented lesson research. The integration of expert support in reflective methodologies is crucial for maximizing the benefits of these platforms, ensuring that future educators are well-equipped to improve their teaching practices and address educational disparities effectively.

In conclusion, the online lesson study program has proven to be a valuable tool for aspiring teachers, integrating seamlessly into university curricula and enhancing the overall quality of teacher training. Future research should continue to explore the best practices for implementing online lesson studies and further investigate how to effectively support reflective practices in teacher education.

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P-12 KU

Glucocorticoid receptor antagonist mifepristone induces adipocyte differentiation with characteristics similar to normal adipose tissue

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Introduction

The combination of isobutylmethylxanthine, insulin, and dexamethasone (MIX) is a widely-used conventional protocol to induce the differentiation of mouse preadipocyte 3T3-L1 into mature adipocytes *in vitro*. Both glucocorticoid receptor and peroxisome proliferator-activated receptor-γ (PPARγ) play a critical role in adipocyte differentiation. Mifepristone is an antagonist of the glucocorticoid receptor but also acts as an agonist of PPARγ. Therefore, the present study investigated the effect of mifepristone on adipocyte differentiation.

Methods

Cell culture

3T3-L1 cells were cultured in DMEM containing 10% FBS. After reaching confluency, cells were subjected to differentiation protocol with MIX and mifepristone.

Evaluation of differentiation into adipocytes

Lipid droplet staining were performed with Bodipy493/503. Real-time PCR and immunoblot analyses were used to detect the expression of the differentiation markers, adiponectin and Fabp4.

DNA microarray analysis

Clariom_S_Mouse DNA chip (Platform: GPL23038) was used in DNA microarray analysis.

Results

Mifepristone not only enhanced adipocyte differentiation induced by MIX protocol but also induced adipocyte differentiation alone, as evidenced by lipid droplets formation and induction of the expression of adiponectin and Fabp4. These effects were inhibited by transection of siRNA targeted PPARγ, and treatment with an PPARγ antagonist (10 μM T0070907) and the neutralizing antibody against adiponectin (ANOC9104). Mifepristone activated the promoter activity of PPRE (PPAR-responsive element) in a manner sensitive to PPARγ antagonist. A principal component analysis (PCA) of DNA microarray data revealed that the mifepristone-induced adipocytes represent some characteristics of the *in situ* adipocytes in normal adipose tissues to a greater extent than those induced by MIX protocol. The adipocytes induced by mifepristone alone were closer to *in situ* epididymal and inguinal adipose tissues in terms of primary component 2 and 3, respectively, than those induced by MIX protocol or control preadipocytes. Forty-four genes were common between adipocyte induced by mifepristone and epididymal adipose tissues, but distinct from those induced by MIX protocol or control preadipocytes.

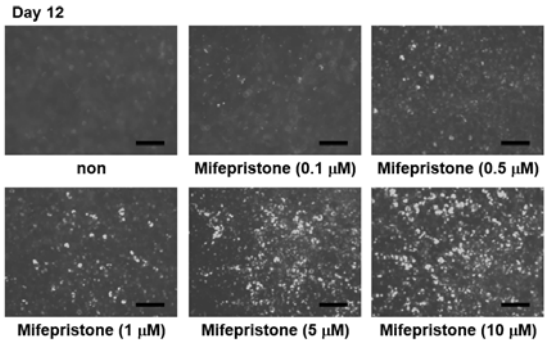

Figure 1. Induction of adipocyte differentiation by mifepristone alone in 3T3-L1 cells. Representative fluorescent microscopic images of Bodipy 493/503 (green) fluorescence on day 12. The cells were treated with mifepristone at the indicated concentrations for the first 5 days, and then cultured in its absence until day 12. Scale bar, 300 μm.

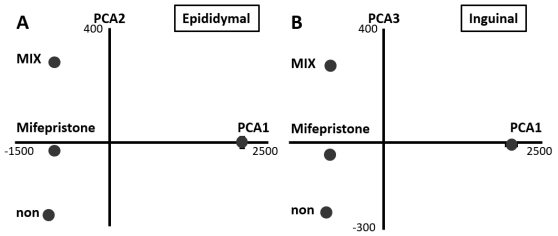

Figure 2. The principal component analysis of three datasets of 3T3-L1 cell and registered datasets of the normal mouse epididymal and inguinal adipose tissues. The principal component analysis of the datasets of 3T3-L1 cells without (non) and with differentiation with MIX protocol and mifepristone and those of epididymal (A) and inguinal (B) adipose tissues.

Conclusions

Mifepristone alone is capable of inducing adipocyte differentiation in 3T3-L1 cells and adipogenesis *in vivo*. PPARγ and adiponectin play a critical role in the mifepristone-induced adipocyte differentiation. Mifepristone-induced adipocytes are closer to the *in situ* adipocytes than those induced by MIX protocol. The present study proposes a single treatment with mifepristone as a novel protocol to induce more physiologically relevant adipocytes in 3T3-L1 cells than the conventional protocol.

Acknowledgment

This study was supported in part by the JSPS KAKENHI (Nos. 23K10890, 22H03536, 20K20663 and 19K11641).

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Helminth Parasite of Stripe Snakehead Fish in Taiwan and Thailand

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Introduction

The Striped Snakehead (*Channa striata*), widely distributed in Southeast Asia, has successfully invaded Taiwan over the past 30 years. Its large body size, tolerance to polluted water, parental care behavior, and predatory feeding habits have contributed to its successful colonization of most freshwater ecosystems in Taiwan. However, the origin and invasive history of Channa striata in Taiwan, as well as its associated parasites and pathogens, remain unclear.

In this study, we compared the prevalence and diversity of parasites in *C. striata* between Taiwan and Thailand, investigated the interactions between this alien fish and its parasites, and elucidated the population genetic structures of *C. striata* and its endoparasites.

Results and Discussions

From 2017 to 2020, we examined 21 Striped Snakehead fish from two sites in Thailand and 359 fish from eight sites in Taiwan. Our results showed that the invasive *C. striata* in Taiwan had a higher parasite prevalence and diversity than their native counterparts in Thailand. The primary parasite species infecting *C. striata* were *Pallisentis* sp. and *Camallanus* sp. Based on current morphological and molecular evidence, we propose that these may be new species. We also observed parasite spillover among coexisting fishes infected with *Pallisentis* sp., although the infected worms were immature and not well developed.

Genetically, the population of *C. striata* was more diverse in Thailand than in Taiwan. The mismatch distribution suggested that the introduction of *C. striata* in Taiwan was likely a single invasion event, followed by rapid expansion facilitated by human transportation. The genetic structure of *Pallisentis* sp. illustrated significant genetic differentiation among geographic populations (Fig. 1) and potential host-parasite co-evolution due to its host specificity. In contrast, the population genetic structure of *Camallanus* sp. did not correlate with its snakehead hosts. This research provides valuable insights into the invasive biology of *Channa striata* and its associated parasites.

Acknowledgment

The authors are grateful to the Prof. Da-Ji Huang and his research team at Chia Nan University of Pharmacy & Science for providing fish specimens used in the study.

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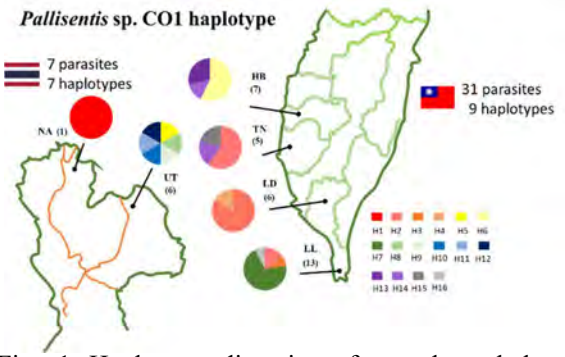

Fig. 1 Haplotype diversity of acanthocephalan parasite *Pallisentis* sp. from the snakehead fish (*Channa striata*) in Taiwan and Thailand.

P-14 NCYU

Helminth Parasites from Invasive and Native Frogs in Taiwan

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Introduction

Enemy Release Hypothesis is a key concept in invasion biology. It posits that invasive species often thrive in new environments due to the absence of their natural enemies, such as predators, pathogens, and parasites. This lack of natural checks and balances can allow invasive species to proliferate and dominate over native species. In addition, two commonly used theories in the composition of parasite communities within invasive and native species are the parasite spillover and the parasite spillback (Stuart et al., 2020).

Over the past two decades, several alien amphibian species have invaded Taiwan, potentially directly or indirectly affecting native Taiwanese frogs and their internal parasite fauna. This study focuses on native species (*Duttaphrynus melanostictus*) and alien species (*Kaloula pulchra, Polypedates megacephalus*) in Taiwan, investigating whether there are differences in the composition of parasites within these species.

Results and Discussions

From 2017 to 2020, we examined 21 Striped Snakehead fish from two sites in Thailand and 359 fish from eight sites in Taiwan. Our results showed that the invasive *C. striata* in Taiwan had a higher parasite prevalence and diversity than their native counterparts in Thailand. The primary parasite species infecting *C. striata* were *Pallisentis* sp. and *Camallanus* sp. Based on current morphological and molecular evidence, we propose that these may be new species. We also observed parasite spillover among coexisting fishes infected with *Pallisentis* sp., although the infected worms were immature and not well developed.

A total of 17 types of parasites were found in *D. melanostictus*, 10 types in *K pulchra*, and 12 types in *P. megacephalus* (as shown in Table 1). The results indicate that the native species, *D. melanostictus*, harbors the highest number of parasites. This could be attributed to the long term association between local parasite with local host; meanwhile, the invasive hosts may experience the Enemy Release or the potential parasite spillback from local amphibian communities.

Table 1. Parasite species list from 1 native (D.m.) and 2 invasive frogs (K. p. & P. m.) in Taiwan.

Helminth taxa	*Duttaphrynus melanostictus*	*Kaloula pulchra*	*Polypedates megacephalus*
Nematodes			
Meteterakis govindi	+	+	+
Cosmocercoides sp1.	+	--	--
Cosmocercoides sp2.	--	+	--
Cosmocercoides sp3.	--	--	+
Oswaldocruzia mitunagai	+	+	+
Oswaldocruzia filiformis	+	--	+
Rhabdias bufonis	+	--	--
Rhabdias incerta	+	--	--
Quimperiidae sp.	+	--	--
Nemat_larva sp.	--	--	+
Acanthocephalans			
Pseudoacanthocephalus bufonis	+	+	+
Plagiorhynchus sp1.	+	--	--
Plagiorhynchus sp2.	--	+	--
Plagiorhynchus sp3.	--	--	+
Trematodes			
Mesocoelium sociale	+	--	--
Mesocoelium monodi	+	+	+
Mesocoelium sp1.	+	--	--
Mesocoelium sp2.	--	+	--
Mesocoelium sp3.	--	--	+
Cetodes			
Cestode_larva sp1.	+	--	--
Cestode_larva sp2.	--	+	--
Cestode_larva sp3.	--	--	+
Pentastomids			
Kiricephalus pattoni	+	+	+
Raillietiella sp.1	+	--	--
Raillietiella sp.2	+	--	--
Penta_larva sp.1	--	+	--
Penta_larva sp.2	--	--	+
Penta_larva sp.3	--	--	+

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P-15 KU

How has Udon Noodles Culture been made in Kagawa

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Introduction

Kagawa is known for udon noodles. In 2011, the Kagawa prefecture officially named itself "Udon Prefecture" and promoted udon as the main attraction for tourism. For example, according to the *2020 Kagawa Prefectural Tourist Survey*, 78.8% of tourists visiting Kagawa prefecture eat udon during their visit, and on average, and each visitor goes to 1.61 Udon restaurants per one trip.

Thus, while "Kagawa Prefecture = Udon" is well known both inside and outside of the prefecture, there are different kinds of understandings about udon. In addition to the residents of Kagawa, udon noodles have been explained in multiple ways in books and research. This presentation focuses on how these factors can be explained.

Previous Research

For example, the origin and history of udon noodles in Kagawa differ, and various explanations have been provided in prior research. Manabe (2006) explained that udon noodles were introduced from the Tang Dynasty (China) during the Nara period to the Heian period (8th to 12th centuries). Yoshihara states that wheat production began in Kagawa in ancient times and became deeply rooted in the Sanuki area (Yoshihara 2018). However, there is also an argument about their ancient origins as legends (Sasaki et al. 2013).

Among the historical materials on eating udon noodles in Kagawa, paintings from 1688 to 1703 and literature materials compiled in 1713 are considered the oldest. This study focuses on the fact that some theories originated in the Nara and Heian eras, although historical facts remain from approximately 1700s.

The same can be said of the explanation that udon is related to the geographical environment of Kagawa and how udon culture spread. In other words, there are various reasons and theories for Kagawa's specialization in udon noodles.

There are many reports and studies on the origin and history of udon noodles in Kagawa, however, no research discusses how the discourse on the specialty of udon in Kagawa has been made.

Research Question

Therefore, this study aims to clarify the discourse related to udon by considering how the origin and history of udon have been taught and understood in Kagawa Prefecture (this study does not explain the origin or history of udon through historical facts).

Method

In this study, we first surveyed university students' understanding of udon from June to July 2024.

Furthermore, we conducted a field survey on how udon is taught in Kagawa Prefecture's elementary and secondary education and analyzed the teaching materials available at the school.

Result and Discussion

The questionnaire survey revealed that students of Kagawa are more likely to believe in legends about the origin of udon without historical facts. In other hand, the students from other prefectures have a better understanding of the historical fact of udon.

In addition, when we looked into the teaching materials used in educational sites in Kagawa, it was revealed that the origin and relevance of udon to Kagawa could be explained in various ways through information and discourse.

As Hobsbawm and Ranger (1992) described *The Invention of Tradition*, the tradition of udon in Kagawa, which was thought to have been cultivated throughout its long history, has been created by various discourse at educational sites in the prefecture.

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In Vitro Investigation Of The Safety and Biological Activity Of Agarwood Leaf Tea

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Introduction

Agarwood leaf tea is made from the leaves of *Aquilaria crassna* and which are mainly distributed in Southeast Asia. Agarwood leaf tea has been consumed for a long time in various Southeast Asian countries for its purported health benefits but there is no record in traditional literature of Chinese medicine. Previous studies have indicated that agarwood leaves contain various bioactive compounds and which may be related to beneficial pharmacological properties, such as antioxidant, antibacterial, and anti-inflammatory effects. However, agarwood leaf tea is not recognized as a legal health beverage in Taiwan. Therefore, this present study aims to investigate whether agarwood leaf tea locally cultivated and made in Taiwan has sufficient safety and potential efficacy as a health beverage.

Materials and Methods

In this study, agarwood leaf tea was cultivated and made in Zhuqi Township, Chiayi County, Taiwan (at an altitude of approximately 300 meter). Then, we measured the content of polyphenols, flavonoids and triterpenoids in agarwood leaf tea by a UV-Vis spectroscopy. Moreover, the antioxidant property of agarwood leaf tea was performed by DPPH and ABTS assays. The cytotoxicity and anti-inflammatory effects of agarwood leaf tea were evaluated in RAW264.7 mouse macrophages. We also determined whether agarwood leaf tea could facilitate wound healing and enhance extracellular matrix (ECM) secretion in Hs68 human fibroblasts.

Results and discussions

In Table 1, agarwood leaf tea extracted with different solvent systems showed various contents in polyphenols, flavonoids and triterpenoids. In comparison with the polyphenols and flavonoids, the triterpenoid content was low in the water extract of agarwood leaf tea but that cannot be measured in the extract used ethanol and 50% ethanol solution due to high background values. The extraction methods may affect the yields of active compounds. According to our results, the extraction yield of polyphenols and flavonoids in agarwood leaf tea extracted with 50% ethanol solution was slightly higher than hot water. In addition, agarwood leaf tea extracted with hot water and 50% ethanol solution showed good antioxidant activity in DPPH and ABTS assays.

In cell culture study, we used hot water extract of agarwood leaf tea to study the cytotoxicity and anti-inflammatory effect. Agarwood leaf tea extract had good cell viability in RAW264.7 macrophages when the concentration was up to 4 mg/ml. Agarwood leaf tea extract can suppress NO release in LPS-induced macrophages in dose-dependent manner. Then, we used Hs68 human dermal fibroblasts to study the anti-skin aging effect of agarwood leaf tea extract. As expected, there is no significant cytotoxicity in Hs68 fibroblasts when the concentration is up to 1000 μg/ml and low concentrations of agarwood leaf tea extract can slightly stimulate cell proliferation and elastin expression.

It is worth to note that agarwood leaf tea extract had better cell migration performance at the concentration of 10 μg/ml in wound scratching experiment. Based on our data, agarwood leaf extract may have good anti-oxidant, anti-inflammatory and anti-skin aging activities.

TABLE 1 Total flavonoid, phenolic and contents of agarwood leaf tea extract prepared using with different solvent systems.

	Flavonoid	Polyphenol	Triterpenoid
Hot water	12.11 ± 0.50	17.60 ± 1.79	2.54 ± 0.39
50% Ethanol	14.25 ± 0.45	20.79 ± 1.52	N/L
Ethanol	N/L	5.60 ± 0.005	N/L

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Involvement of phospholipid-metabolizing PLAAT enzymes in organelle degradation

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Introduction

Various lipid-metabolizing enzymes have been implicated in lifestyle-related diseases such as obesity and fatty liver, which are common chronic diseases worldwide. The phospholipase A and acyltransferase (PLAAT) family proteins are lipid-metabolizing enzymes and show phospholipase A_1/A_2 and acyltransferase activities. The family consists of five isoforms (PLAAT1-5) in humans and three isoforms (PLAAT1, 3, and 5) in mice.

We have shown that overexpression of PLAAT1 in HEK293 cells causes not only the degradation of peroxisomes but also the fragmentation of mitochondria. In contrast, overexpression of PLAAT3 results in the degradation of peroxisomes without affecting mitochondria (Table 1). These effects on organelles were dependent on their enzyme activities, as enzymatically inactive mutants failed to cause organelle degradation[1,2].

To clarify the involvement of other PLAAT proteins in organelle degradation, in this study, we examined whether overexpression of PLAAT5 causes morphological changes in peroxisomes and mitochondria.

Results and discussions

We established a HEK293 cell line that expresses an EGFP-fused wild-type PLAAT5 (PLAAT-WT) or its enzymatically inactive mutant (PLAAT5-CS) in a doxycycline (DOX)-dependent manner. When PLAAT5 expression was induced by DOX, the green signals of PLAAT5-WT were not localized to organelles but were distributed throughout the cytoplasm (Fig. 1A). Moreover, the mutant PLAAT5-CS showed a similar distribution. Next, we observed the structure of peroxisomes, and punctate dot-like signals were similarly detected in both PLAAT5-WT and PLAAT5-CS cells. In contrast, as reported previously[1,2], the expression of PLAAT1-WT or PLAAT3-WT caused the degradation of peroxisomes. We also examined the effects of PLAAT5 on mitochondrial structure (Fig. 1). Similar to PLAAT3-WT cells, apparent differences in mitochondrial structure were not detectable in PLAAT5-WT cells, whereas mitochondrial fragmentation was observed by PLAAT1 expression (Fig. 1). These results suggested that, unlike PLAAT1 and PLAAT3, PLAAT5 expression does not cause significant morphological changes in peroxisomes and mitochondria.

The study revealed that each PLAAT protein has distinctive effects on the dynamics and function of organelles. Further research is needed to elucidate the mechanism by which PLAAT proteins recognize and degrade specific organelles.

Table 1. The effects of PLAAT proteins on organelles.

	Peroxisome	Mitochondria
PLAAT1	Degradation	Fragmentation
PLAAT3	Degradation	Not changed
PLAAT5	Not changed	Not changed

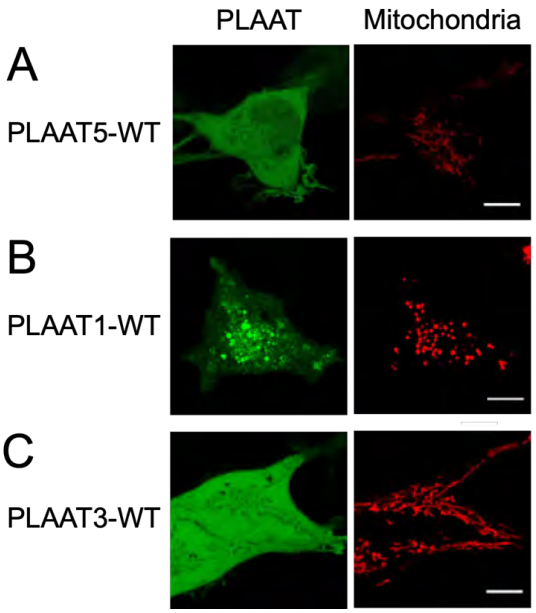

Fig.1. The effects of PLAAT proteins on mitochondrial structure. PLAAT1-WT, PLAAT3-WT, and PLAAT5-WT cells were cultured in the presence of DOX (+) for 6 hours, and PLAAT proteins (green) and mitochondria (red) were observed with fluorescence confocal microscopy. Scale bar, 10 μm.

Acknowledgment

This work was supported by Grants-in-Aid for Scientific Research (to Uyama T. and Ueda N.) from the Japan Society for the Promotion of Science.

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Is Soy Milk the Only Popular Choice? Different Views on Plant-based Milk among Thai and South Korean Consumers

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Consumer food choice is one of the main contributors to global sustainability. Plant-based (PB) milk consumption has gained great interest in the past decade to move toward global warming mitigation and nutritional enhancement. This research aims to understand consumer attitudes toward PB milk products. It also seeks to compare those attitudes between Thai and South Korean consumers. The data collection was carried out via online survey during April-June 2024. In total, there are 180 data collected (138 from Thailand and 42 from South Korea). The participants' ages range from 20 to 70 years old. There are 7.44% females and 25.56 males. It was found that most consumers drink PB milk less than once a month and mostly drink soy milk on its own instead of mixing the milk with other drinks such as coffee. Regarding the model of the Theory of Planned Behaviour, the intention variable is not significant among consumers from both countries. Regarding the model of the Theory of Planned Behaviour, South Koreans tended to consume PB milk because of themselves more than Thai consumers whom their peers could influence. Policymakers who want to promote PB milk consumption can start by focusing on soybean milk promotion.

Introduction

With the increase in health benefits of consuming more PB milk, there are more and more food products in the market using this PB diet idea as a product concept. However, there is a lack of in-depth understanding of factors encouraging consumers to buy and drink them, adopt PB diets or prevent consumers from PB food consumption [1]. Many food companies are interested in launching new products or developing current products using the PB food trend [2].

We aim to compare PB milk between Thai and South Korean consumers to discover factors driving their behaviour which could be similar or different. This comparison would hopefully provide information for decision-makers to learn from each country, inspire relevant sectors to solve health problems, and eventually help each other to tackle the problem. The findings will shed light on how to achieve the goal of PB food consumption and how to adapt policies in each country to suit the people's behaviour the best.

Results and Discussions

TABLE 1 Consumer Behaviour of Plant-Based Milk Consumption

Frequency	Pooled data (n=180)	Thailand (n=138)	South Korea (n=42)
Never	12 (6.67%)	6 (4.35%)	6 (14.29%)
Less than once a month	62 (34.44%)	51 (36.96%)	11 (26.19%)
1-3 times per month	44 (24.44%)	28 (20.29%)	16 (38.10%)
Once a week	16 (8.89%)	13 (9.42%)	3 (7.14%)
2-3 times a week	25 (13.89%)	21 (15.22%)	4 (9.52%)
4-5 times a week	11 (6.11%)	11 (7.97%)	-
Everyday	10 (5.56%)	8 (5.80%)	2 (4.76%)

TABLE 2 Choice of Milk Consumption

PB milk choice	Pooled data (n=168)	Thailand (n=130)	South Korea (n=38)
Soy milk	110 (65.48%)	87 (66.92%)	23 (60.53%)
Coconut milk	2 (1.19%)	1 (0.77%)	1 (2.63%)
Almond milk	29 (17.26%)	20 (15.38%)	9 (23.68%)
Oat milk	22 (13.10%)	18 (13.85%)	4 (10.53%)
Hazel nut milk	1 (0.60%)	1 (0.77%)	-

TABLE 3 Means and Reliability Test of Planned Behavioural Variables

Variables	Pooled Data (n=180)		Thailand (n=138)		South Korea (n=42)	
	Mean (SD)	α	Mean (SD)	α	Mean (SD)	α
Intention	4.703 (1.709)	0.930	4.797a (1.643)	0.930	4.393a (1.898)	0.927
Attitudes	5.227 (0.906)	0.785	5.304a (0.843)	0.796	4.971b (1.062)	0.779
SN	3.863 (1.260)	0.907	4.012a (1.171)	0.916	3.373b (1.426)	0.877
PBC	6.192 (0.938)	0.736	6.109[a] (0.990)	0.731	6.464[b] (0.684)	0.779

The frequency of PB milk consumption is shown in Table 1. There is no significant difference between Thailand and South Korea (p-value ≥ 0.05). Overall, participants do not normally consume PB milk with 34.44% having it less than once a month for example once every two to three months and another 24.44% tend to drink it one to three times per month. Regarding the choices of PB milk (Table 2), it was clear that, on average, soy milk is the most popular choice (65.88%) followed by almond milk (17.06%). This pattern is similar between two groups.

Table 3 presents mean scores and reliability tests (Cronbach's alpha: α) of intention, attitudes, subjective norms, and perceived behavioural control items of the questionnaire based on the agree/disagree seven-point Likert scale. In general, consumers could not say that they intend to drink PB milk and Thai and South Korean consumers are not statistically different. Consumers from these two countries have significant differences in terms of their attitudes toward PB milk, subjective norms (SN), and perceived behavioural control (PBC).

Acknowledgement

I would like to express my gratitude to the Faculty of Agro-Industry for the funding support

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P-19 NCYU

Molecular Identification of Parasitic Nematodes from Fecal Samples of Ruminants in Zoo

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Introduction

Haemonchus contortus is globally distributed and causes significant harm and economic loss to ruminant species in farms, ranches, and zoos. This parasite primarily infests the abomasum, sustaining itself and reproducing by consuming the host's blood. The eggs of the worm are excreted with the host's feces and, under suitable conditions, hatch and grow into infectious third-stage larvae. These larvae leave the feces under appropriate temperature and humidity conditions, migrate to the top of the grass, and are ultimately ingested by the definitive host through feeding behavior. Once inside the definitive host, they reproduce, thus completing a life cycle and repeatedly infecting ruminants.

Zoos regularly deworm ruminants to mitigate infection, but this has not resulted in significant improvement. Many studies indicate that *Haemonchus contortus* has developed drug resistance, rendering regular medication ineffective. Therefore, alternative solutions must be sought to reduce the infection rate in ruminants. The study uses random fecal samples from mouflon (*Ovis aries musimon*) in a Taiwanese zoo, observes the infection intensity under a microscope, and uses two molecular methods for identification. It is aimed to develop a non-invasive technique to monitor and control the parasite infections.

Results and Discussions

From 50 randomly picked fecal samples, the microscopic examination revealed that 8 samples did not contain any detectable parasite eggs. Fecal samples with a higher number of parasite eggs were then cultured. On the twelfth day of culture, the feces were removed and soaked using the Baermann technique for 12 hours. After the parasites had settled, microscopic examination revealed a large number of L3 larvae.

After genomic DNA was extracted from selected eggs and larvae, PCR was performed to amplify targeted CO1 gene for molecular identification. The results showed 100% similarity with the *Haemonchus contortus* reference sequence in GenBank.

左上下依轉胃線蟲蟲卵(40X40)，右上下依轉胃線蟲第三期幼蟲(40X40)

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P-20 NCYU

Parasite community of the endemic Swinhoe's lizard in Taiwan

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Introduction

Swinhoe's Tree Lizard (*Diploderma swinhonis*), an agamid lizard species endemic to Taiwan, exhibits significant sexual dimorphism and primarily subsists on a diet of various insects. We conducted a study on the parasites of this endemic species, sampling from two distinct locations within Taiwan. The objective was to compare the differences in parasite composition between these two locations. Furthermore, we analyzed the correlation between the host's snout-vent length (SVL) and sex, and the incidence of parasitic infection.

Interestingly, this species has been introduced to certain regions of Japan, where it is now considered an invasive alien species. Future research could compare our findings with data from Japan to explore the 'Enemy Release Hypothesis' in invasion biology. This hypothesis posits that when Swinhoe's Tree Lizards migrated from Taiwan to Japan, they may have lost their parasites during this process.

Results and Discussions

Table1. Comparison of data from different location.

	North Taiwan	Central Taiwan	Taiwan
Sample size	17	26	43
Mean SVL	7.1	6.4	6.7 (cm)
Prevalence	100%	88%	93%
Richness	7	9	11
Abundance	499	338	837

We found 11 species of parasites from 43 specimens of Swinhoe's tree lizards in two locations of north and central Taiwan (Table 1). Including 4 species of nematodes, 2 species of acanthocephalan, 2 species of trematodes, 1 species of cestode and 2 species of Pentastomid.

Figure 1 illustrates gender-based differences in parasite richness among hosts. Females carry significantly more parasite species than males and juveniles, with males also hosting a wider variety of species than juveniles, albeit not significantly so.

We examined the dominant parasitic nematode, *Strongyluris calotis*, from two locations to explore the correlation between host snout-vent length and parasite infection intensity. Simple linear regression results indicate a positive correlation between *S. calotis* infection intensity and host snout-vent length at both sites, with a stronger correlation observed in central Taiwan (Figure 2).

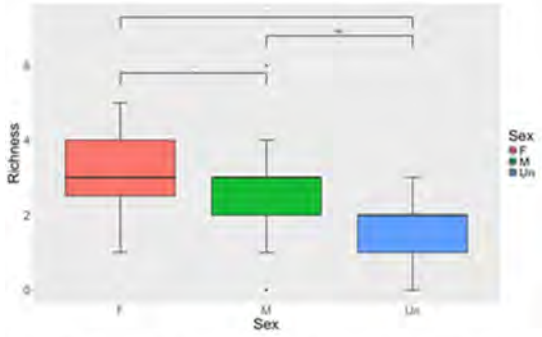

Figure 1. Boxplot of richness between different genders (and juveniles).

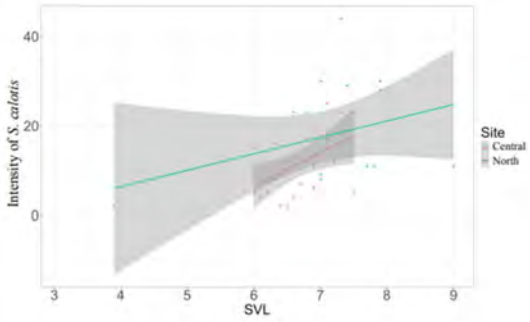

Figure 2. Simple linear regression of SVL and *S. calotis* richness at two locations.(central Taiwan : R-squared: 0.261, p-value: 0.021 ; north Taiwan : R-squared: 0.111, p-value: 0.19.)

Future work will expand sampling across more locations and increase host sample size for more accurate results. Comparisons with Japanese data are also planned to test the enemy release hypothesis in invasion biology.

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Parasite spillovers from invasive fishes in Taiwan

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Introduction

As one of the world's most vibrant trading and transportation hubs, East and Southeast Asia present a unique paradigm for the study of biological invasions. The island chains along the Indo-Pacific rims, extending from the Japanese archipelago, Okinawa Islands, Taiwan, Philippines, to Indonesia, are not only hotspots of biodiversity but also areas under significant threat from biological invasions. Invasive alien species often introduce co-invaders, such as symbiotic/pathogenic microbes or parasitic worms. This study examines an alien fish species that has invaded and now dominates many freshwater wetlands in Taiwan, investigating their parasitic infections during the invasion processes. By comparing the parasites of these fish in the invaded areas with those in their native areas, we can elucidate the hypothesized enemy release, spill-over, spill-back, and dilution effects resulting from species invasions and their impacts on infection dynamics.

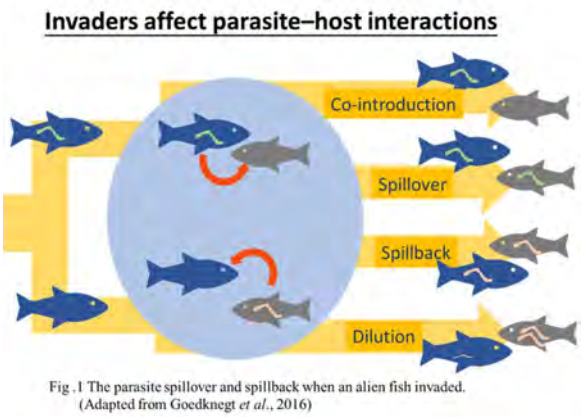

Fig .1 The parasite spillover and spillback when an alien fish invaded. (Adapted from Goedknegt *et al.*, 2016)

Channa Striata, native to Southeast Asia, was introduced to Taiwan for aquaculture. Its vitality and environmental adaptability are resilient. The snakehead fish are ferocious. They attack smaller fishes, turtles even juvenile birds and proliferates in large numbers in Taiwan without much natural enemies, becoming one of the biggest threat to local native fish in freshwater ecosystem in Taiwan.

Results and Discussions

This study, conducted from 2017 to 2020, had examined 665 fish species in two reservoirs in Pingtung County, Taiwan. Fish samples included alien fishes *Channa striata* (N=271), *Oreochromis* sp. (N=97), *Trichopodus trichopterus* (N=69), *Oxyeleotris marmorata* (N=65), *Cyprinus rubrofuscus* (N=14), *Amphilophus labiatus* (N=6), *Pterygoplichthys pardalis* (N=1) and native fishes, *Hemiculter leucisculus* (N=116), *Chanodichthys erythropterus* (N=15), *Paratanakia himantegus* (N=12). Seven types of intestinal parasites, including: 2 acanthocephalan, *Pallisentis* sp. and *Mediorhynchus* sp., 4 nematodes, *Camallanus* sp., *Camallanus cotti, Rhigonema* sp. and an unknown nematode, 1 trematode, *Azygia longa*, were discovered in the invasive snakehead fish. However, only 3 of them shared with also invasive fishes *Trichopodus trichopterus* and *Oxyeleotris marmorata*.

Based on these preliminary results, we suspected the invasion of snakehead fish (*Channa striata*) co-introduced some alien parasites, such as *Pallisentis* sp. and *Camallanus* sp. from their native range; consequently, these alien parasite spillover over to other invasive fish in the freshwater ecosystem in Taiwan.

Acknowledgment

The authors are grateful to the Prof. Da-Ji Huang and his research team at Chia Nan University of Pharmacy & Science for providing fish specimens used in the study.

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P-22 CMU

Polymorphism in lanthanide-glutamate-oxalate coordination polymers and their diverse catalytic activities toward atmospheric CO_2 cycloaddition

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Two new the monoclinic and triclinic polymorphic frameworks of $[Ln^{III}(NH_3{-}Glu)(ox)]{\cdot}2H_2O$, where Ln^{III}= La^{III} (I), Pr^{III} (II), Nd^{III} (III), Sm^{III} (IV), Eu^{III} (V), Gd^{III} (VI), Tb^{III} (VII), and Dy^{III} (VIII), $NH_3{-}Glu^- = NH_3^+$ containing glutamate, and ox^{2-} = oxalate, were synthesized and characterized. Their single-crystal structures were elucidated and described. The relationship between polymorphism and catalytic activities of lanthanide-glutamate-oxalate coordination polymers in the cycloaddition reactions of CO_2 with epoxides were studied. The catalytic performances of monoclinic and triclinic polymorphic frameworks were evaluated based on CO_2 cycloaddition with epichlorohydrin (ECH) under ambient CO_2 pressure and solvent-free conditions. Better performances of the monoclinic catalysts have been revealed and justified. The robustness of monoclinic catalysts over 10 cycles of catalysis was disclosed. In addition to ECH, the monoclinic catalysts also exhibited outstanding performance in the cycloaddition reaction of CO_2 with allyl glycidyl ether under ambient pressure.

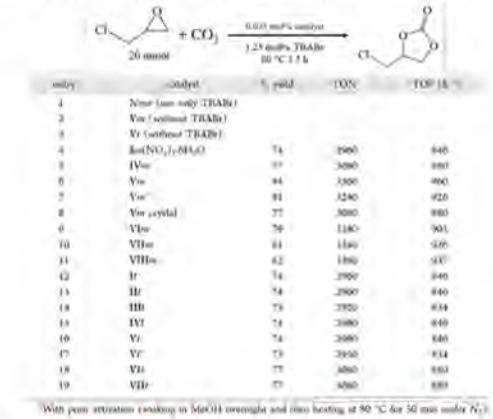
Introduction

To decrease atmospheric CO_2 levels, CO_2 capture and usage (CCU) technologies have been researched and developed aiming at reducing CO_2 emissions. One of the most sustainable outlooks is to use CO_2 as the C1 source for the synthesis of high-value chemicals and fuels. Among various possibilities, the production of cyclic carbonates from cycloaddition reactions of CO_2 with epoxides has been highlighted as it is pertinent to 100% atom economy and the cyclic carbonates have high economic values. Since CO_2 is stable and inert, the majority of the research work is on the development of high-performance catalysts for use at or near ambient temperature and pressure, as well as the reusability of the catalysts. Lanthanide coordination polymers (LnCPs) have emerged as promising alternatives because of their intrinsic Lewis acid nature. In addition, structures and therefore functionalities of the LnCPs can be enhanced by introducing functional groups, *e.g.* $-NH_2$, $-NO_2$, -N=N- into the organic linkers to promote their CO_2 adsorption capacity, selectivity and catalytic activity.

Results and discussions

The monoclinic and triclinic polymorphic frameworks of $[Ln^{III}(NH_3{-}Glu)(ox)]{\cdot}2H_2O$ were synthesized and characterized. The synergistic influences of the lanthanide contraction and synthesis parameters are effect on the formation of monoclinic (*m*) and triclinic (*t*) polymorphs. The dissimilarities of the two polymorphic frameworks were apparently manifested in diverse thermal stability but not chemical robustness. With a larger aperture into the framework void, the monoclinic polymorph (represented by **V***m*) allowed better accessibility to both N_2 and CO_2 and therefore larger BET surface area and effective void volume than the triclinic polymorph (represented by **V***t*). Stronger interactions with NH_3 and CO_2 implying stronger acidity and basicity could also be concluded for the monoclinic polymorph. The as-described structural features and properties of the monoclinic polymorphs evidently led to superiority in catalytic performance to the triclinic polymorphs (Table 1). The Bronsted acidic–NH_3^+ and Lewis basic O atoms of the organic linkers are responsible for effective catalysis (Fig. 1). Based on the experiments using **V***m*, the catalyst could be reused for at least 10 cycles without deterioration in its crystallinity and performance. In addition to ECH, **V***m* also exhibited catalytic activity in the reaction of AGE.

Table 1 Catalytic Performance of Non-activated Catalysts (unless Specified Otherwise) in Catalyzing CO_2 Cycloaddition with ECH at 80°C for 3.5 h under Ambient CO_2 Pressure and Solvent-less Conditions



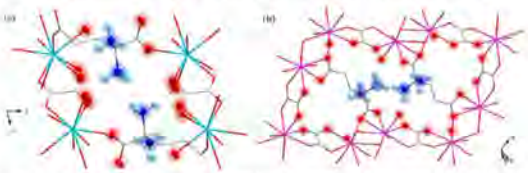


Fig. 1. Locations of potential acidic (blue) and basic (red) sites in the frameworks of (a) **V***t* and (b) **V***m* and their neighboring environment.

Acknowledgment

This research was supported by Chiang Mai University and the NSRF via the Program Management Unit for Human Resources & Institutional Development, Research and Innovation (grant number B40G660031).

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Situational Analysis of Self Care in People with Respiratory Diseases During PM2.5 Time

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Introduction

PM2.5 caused by forest burning, is classified as the major problems in the northern region of Thailand. [1] From the past studies, it has been found that PM 2.5 is associated with diseases or disorders related to respiratory system, such as asthma, chronic obstructive pulmonary disease, and cancer Nevertheless, air pollution from PM2.5 is a major problem of climate change in the upper north which affects the health of people in several areas. [2]

Objective

This descriptive research aimed to study the situational Analysis of self-care in people with respiratory diseases during PM2.5 Time.

Method

The data were collected by using qualitative methods, such as demographic questionnaire and focus group discussion guideline. The sample group were selected using purposive sampling, consisting of 22 cases in total: 19 older persons who were 60 years and over, diagnosed with respiratory disease (COPD and Asthma), and living in Sansai and Samoeng districts, Chiang Mai Province, and 3 service personnels. The data were analyzed using descriptive statistics and data classification health management issues.

Results and discussions

The results showed that most patients, 52.60 percent, were female with an average age of 71.95±9.32 years old, 57.90 percent of them completed primary school, 31.60 percent of them smoked, and 73.70 percent of them had never infected with Covid-19. From group discussions, it was found that during the past year, most cases were caused by PM2.5 and dust and smoke from open burning carried out by the people in the community while some cases were caused by overworking. The relapses often happened during the season transition, when the weather was highly humid, and when there were pollutions in the air. The participants (patient) would take care of themselves by using inhaler in the morning and evening and using emergency inhaler every time if their symptoms severe exacerbation occurred. Some managed by closing the house completely, wore a mask, and did not go outside. Due to the difference in the context of the area, the use of air conditioner and dust filter, and the use of technological communication tools, a semi-urban and rural area like San Sai District was better than a rural area like Samoeng District. Both areas commented that The local agencies had carried out campaigns and public relations to control the burning which was the cause of PM2.5 and air pollution, as well as finding ways to create public understanding about the origins, causes, and impacts to make the patients aware of the PM2.5 effects on their existing diseases. If the patients can manage their own health and the environment around their house, it would be possible to control and reduce relapses and the morbidity rate of respiratory disease caused by PM2.5 in people with respiratory disease in Chiang Mai Province. [3-4]

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P-24 NCYU

Spill-over or spill-back of helminth parasites from the invasive African sacred ibis in Taiwan

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Introduction

Threskiornis aethiopicus, the African sacred ibis, which indigenous to Africa has emerged as an invasive alien species that has significantly impacted Taiwan's ecology and agriculture in recent years. Initially introduced to Taiwan in 1979 as an ornamental bird, the species has since established a substantial wild population due to escape incidents. Subsequent sightings of the African sacred ibis have been reported across Taiwan, indicating a gradual expansion of its habitat range. In the absence of natural predators, the population of the African sacred ibis has proliferated.

Invasive alien species can impact native species through direct predation or competition. However, they may also introduce alien parasites, leading to spillover effects on native hosts. Consequently, this study seeks to answer the following question: Are the parasites of the African sacred ibis co-introduced, or are they native parasites that have spilled back to the African sacred ibis?

Results and Discussions

A total of 84 African sacred ibis have been dissected from six locations including Taipei, Hsinchu, Taichung, Chiayi, Gaoping, and Hualien Fig.1 (A). The parasites that have been discovered include two kinds of acanthocephalan: one is identified as *Southwellina hispida* Fig.1 (B); two trematodes: one is identified as *Patagifer* sp. Fig.1 (C), and one unidentified nematode.

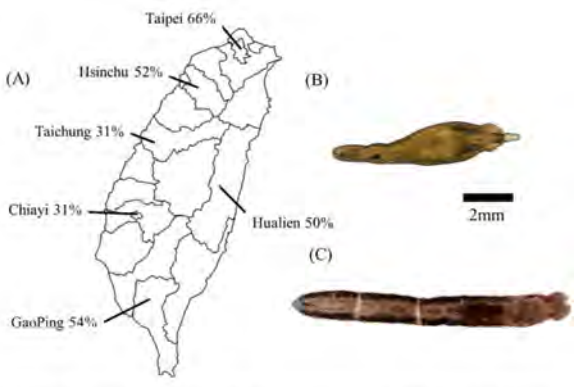

Fig. 1 (A) the parasite prevalence of the examined invasive African sacred ibis in Taiwan, (B) Acanthocephalan *Southwellina hispida*, (C) trematode *Patagifer* sp.

Preliminary results suggest the currently identified acanthocephalan (*Southwellina hispida*) in the invasive African sacred ibis is expected to be a spillback parasite from local waterfowls. This acanthocephalan species is a common parasite in Southeast Asian waterfowl and is expected to be found in local herons/egrets in Taiwan. The genetic diversity of this acanthocephalan population in native waterfowls is expected to be higher than that in the invasive African sacred ibis in Taiwan. While another trematode (*Patagifer* sp.) is likely co-introduced with the African sacred ibis to Taiwan. Our hypothesis suggests its genetic diversity would be significantly lower due to the founder effect.

This study is aimed to establishes basic data on the parasites of the invasive birds in Taiwan. Furthermore, the genetic tools will be applied to elucidate the possibility of parasite spillover or spillback, clarifying the impact of parasites or symbiotic microbes carried by invasive species on local species as well as the ecological consequences after the alien species invasion.

Acknowledgment

The authors are grateful to the Forestry and Nature Conservation Agency for providing specimens of the African sacred ibis used in the study.

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The Effectiveness of a Health Literacy Enhancement Program for Fine Particulate Matter Prevention for Village Health Volunteers in upper northern Thailand

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This study aimed to evaluate the effectiveness of a health literacy enhancement program for $PM_{2.5}$ prevention for VHVs in Upper Northern Thailand. The intervention group showed significant improvements compared to the control group across various EHL subdomains, indicating the program's impact in enhancing EHL.

Introduction

Fine particulate matter ($PM_{2.5}$) pollution has emerged as a significant life-threatening issue in upper northern Thailand. Numerous scientific studies have linked exposure to $PM_{2.5}$ to various health issues, including premature death [1,2]. Surprisingly, Lampang Province in upper northern Thailand ranked first among regional cities in terms of $PM_{2.5}$ concentrations in 2021 [3]. Due to the seasonal haze pollution situation in the Upper Northern region [4] and the limited research on environmental health literacy (EHL) promotion programs, this study aimed to evaluate the effectiveness of a health literacy enhancement program for $PM_{2.5}$ prevention for VHVs in Upper Northern Thailand.

Results and Discussions

A cluster randomized controlled trials with a comparison group was employed to conduct the study during January and March 2024. The total sample consisted of 76 respondents divided into an intervention group (n=37) and comparison group (n=38). All demographic characteristics of participants in both groups were similar in the initiation, including the EHL scores.

The findings from this study, analyzed using a two-way repeated measure ANOVA, revealed that the intervention group had a significant impact on enhancing EHL compared to the control group. This result aligns with a previous study conducted among VHVs in Bueng-Ka province, which found that VHVs had increased mean scores of EHL after program intervention [5].

Furthermore, across various subdomains of EHL, including the ability to access, understand, evaluate, and decision-making, the intervention group demonstrated substantial improvements from baseline (T_0) to post-program (T_1) and follow-up (T_2) assessments. These improvements were evidenced by higher mean scores and statistically significant interactions between time and group. The effect sizes (η^2) indicate a large impact of the intervention on EHL (Table I).

These results also indicate significant mean differences in EHL between different time points for the intervention group, with p-values <0.001 for T_1 vs T_0 and T_2 vs T_0 comparisons. However, there were no significant mean differences between T_2 and T_1 for the intervention group (p >0.05), except for the ability to understand, where a significant difference was observed (p =0.021). In contrast, for the control group, there were no significant mean differences between different time points (p >0.05) across all dimensions of EHL

These results underscore the effectiveness of targeted interventions in enhancing the capacity of VHVs to address environmental health challenges. Further research is warranted to explore the long-term sustainability and scalability of such interventions in diverse settings.

TABLE I EHL COMPARISON ACROSS TIME POINTS

EHL domains	Mean ±SD			Time	Group	TxG	η^2
	T_0	T_1	T_2	(T)	(G)		(TxG)
Ability to access							
Intervention group	3.0 ±0.8	4.2 ±0.5	4.4 ±0.8	75.5*	20.3*	49.0*	0.40
Control group	3.1 ±1.0	3.2 ±0.8	3.2 ±0.8				
Ability to understand							
Intervention group	2.9 ±0.6	4.4 ±0.4	4.3 ±0.4	114.5*	41.4*	81.7*	0.53
Control group	3.0 ±0.8	3.1 ±0.7	3.1 ±0.6				
Ability to evaluate							
Intervention group	3.1 ±0.7	4.4 ±0.4	4.3 ±0.5	65.0*	33.3*	48.4*	0.40
Control group	3.1 ±0.8	3.2 ±0.7	3.3 ±0.6				
Ability to decision-making							
Intervention group	3.2 ±0.5	4.5 ±0.4	4.4 ±0.5	73.7*	43.8*	48.8*	0.40
Control group	3.2 ±0.8	3.3 ±0.6	3.4 ±0.6				
Overall EHL							
Intervention group	3.1 ±0.5	4.4 ±0.3	4.3 ±0.4	125.7*	41.7*	86.5*	0.54
Control group	3.1 ±0.8	3.2 ±0.6	3.2 ±0.6				

* p-value < 0.05

Acknowledgment

The researchers express gratitude to the Graduate School of Chiang Mai University for their generous scholarships and to the Faculty of Public Health for their valuable support throughout the study.

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P-26 NCYU

To Explore the Regulatory Mechanisms of Extracellular Matrix Stiffness and NOX4 Oxidase on the Expression of NLRP3 in Colorectal Cancer Cells

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Introduction

The incidence of colorectal cancer (CRC) continues to rise, accompanied by an increasing mortality rate annually. The tumor microenvironment and mechanical support significantly influence not only the progression and severity of the disease but also the therapeutic outcomes and prognosis of patients. This study aims to investigate the impact of extracellular matrix (ECM) stiffness on the gene expression of NOX4, associated with oxidative stress, and the NLRP3 inflammasome, related to inflammatory responses in CRC cells. By understanding the regulatory mechanisms of cancer cell gene expression, this research seeks to offer new insights that could potentially inform future cancer treatments. The innovative goal of this study is to explore the relationship between ECM stiffness and gene expression in CRC cells, alongside the regulatory mechanisms of the NOX4 and NLRP3 genes. Additionally, the study aims to examine the molecular mechanisms underlying intracellular oxidative stress and inflammasome expression. The findings from this research are anticipated to provide improved methodologies and novel research directions for the future treatment of CRC.

Results and Discussions

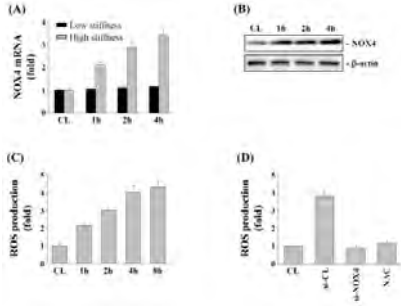

Figure 1. Effects of substrate stiffness on NOX4 expression and ROS production of CRC HCT-116 cells. We detected the expression level of NOX4 expression in HCT-116 cells which were cultured at artificial substrate with different stiffness. The results showed that NOX4 mRNA expression was the highest in high stiffness situation (Figure 1A). The protein expression of NOX4 of the HCT-116 cells cultured on artificial substrate with high stiffness is consistent with mRNA expression (Figure 1B). In addition, we found an increase in ROS production in HCT-116 cells under higher stiffness stimulation (Figure 1C). HCT-116 cells transfected with NOX4 siRNA or pretreated with ROS inhibitor NAC significantly abolished high stiffness matrix-induced ROS generation (Figure 1D).

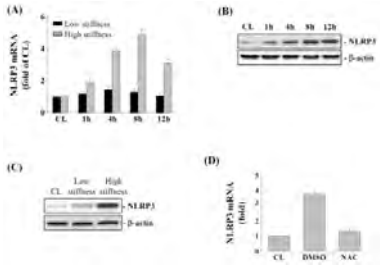

Figure 2. Effects of substrate stiffness on NLRP3 expression of CRC HCT-116 cells. To test whether matrix stiffness could initiate NLRP3 expression, HCT-116 cells were cultured at artificial substrate with different stiffness. We examined whether matrix stiffness was capable of inducing NLRP3 expressions in CRC cells. The cells stimulated by higher stiffness significantly induced NLRP3 mRNA (Figure 2A) and protein (Figure 2C) expressions in HCT-116 cells when compared to the low stiffness matrix-cultured cells. In addition, the time courses determined for the NLRP3 protein level revealed an increase within 1h and persisted for 12h in HCT-116 cells induced by high stiffness matrix (Figure 2B). HCT-116 cells pretreated with ROS inhibitor NAC significantly abolished high stiffness matrix-induced NLRP3 mRNA expression (Figure 2D).

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To upgrade the power tranmission efficiency in Taiwan by investigating the power output of three-phase synchronous machine and the power losses

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Introduction

The project aims to explore how to improve the efficiency of electricity transmission in Taiwan. The main objectives include: reducing line losses, improving transformer efficiency, utilizing smart grid technology, and leveraging power density technology. The research directions include: understanding the current status of Taiwan's power system and related development strategies; analyzing the experiences of other countries in optimizing grid design; exploring methods to improve transformers and enhance their efficiency; designing experiments to simulate the changes in electricity transmission efficiency in Taiwan under different improvement approaches.

Results and discussions

The experiments utilized three-phase synchronous machine, its cables and an electrical load box. The three-phase synchronous machine is connected to the electrical load box by wires. The three-phase synchronous machine is shown in Fig. 1, and the setup and can be referred to Fig. 2.

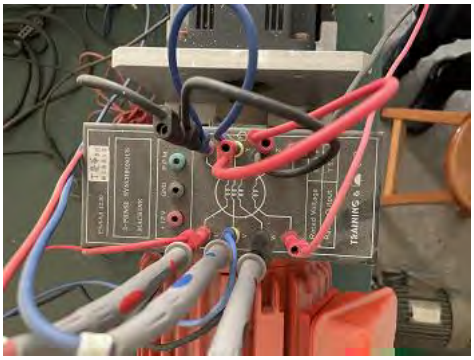

Fig. 1. The three-phase synchronous machine (the orange color) and its wiring.

Fig. 2. The three-phase synchronous machine (the orange color) is connected to the electrical load box by cables.

The power loss is divided into three parts for the experiments: (1) power loss on cables, (2) power loss on the three-phase synchronous machine, and (3) power loss due to the electrical load box connected.

(1) Power loss on cables. The experiment utilizes cables from different manufacturers. Each cable are connected to the three-phase synchronous machine individually at different time. The three-phase synchronous machine generates 750 W power, and transmitted by test cables to a small electrical load (no loss in this experiment). The power loss on each cables are measured and shows in the Fig. 3.

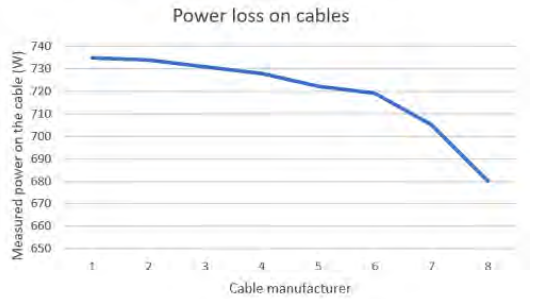

Fig. 3. The measured power on the different cables (labelled in numbers) are measured out of different values. It shows the power loss on the cable.

(2) Power loss on the three-phase synchronous machine. There are several types of loss in the machine, but the experiments will only concentrate on mechanical loss, for example, rotational loss and frictional loss.

(3) Power loss on the electrical load box. The loss is due to the reactance. Two types of reactance are discussed: capacitive reactance and inductive reactance. Capacitive reactance is an opposition to the change of voltage across an element, and similar idea, inductive reactance is an opposition to the change of current through an element. Either type of reactance will consume the generated energy from the three-phase synchronous machine and cause power loss.

Acknowledgment

The authors wish to thank the Department of Mechanical and Energy Engineering, National Chiayi University, for the support of my research. Also, the author likes to thank Dr. Yusi Shih, for his supervision to the 3rd Trilateral Symposium on Sustainability.

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P-28 KU

Total phenolic contents and antioxidative activities in the seed coat of oilseed plants

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Introduction

In recent years, Japanese people have tended to be more health-conscious and anti-ageing, and they have been interested in healthy food and functional compounds in food. Among them, the concern with antioxidants has been growing. Antioxidants are effective in removing reactive oxygen species, which are the cause of aging, cancer, and lifestyle-related diseases. It has been reported that there is a correlation between the intake of polyphenols in diet and early mortality rates.

Previously, we isolated and identified a catechol type lignan and neolignans from the seeds of tung tree fruits that exhibited strong antioxidant activity, and the catechol type lignan and neolignans are located in the seed coat of the tung tree seeds. Some study focused on antioxidants in seed tissues in adzuki been, black soybean, and sesame seed, it is suggested that general plant seeds accumulate more antioxidants in the seed coat than in the endosperm. However, there has been no comparative studies on the seed coats of different plants.

In this study, we compared the total phenol contents and antioxidative activities in different seed coats of Euphorbiaceae, legumes, nuts, and oil plants. In addition, we isolated and identified the active components in the seed coat of peanut (*Arachis hypogaea*), which showed the highest antioxidant activity.

Material and Methods

The samples used in this study were seed coat of adzuki been, black flower bean, black soybean, broad bean, chickpea, kidney bean, peanut, soybean, tiger bean, white flower bean, castor bean, jatropha, tung tree, noni, olive, pistachio, plum, and walnut.

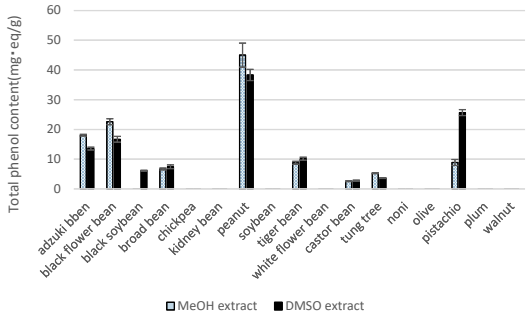

Fig.1 Total phenol content calculated by Folin-Ciocalteu method

Table1 Antioxidative activity(mg-eq/mL) measured by DPPH method

IC_{50}	MeOH ex.	DMSO ex.	IC_{50}	MeOH ex.	DMSO ex.
adzuki been	0.19	0.246	castor bean	0.831	0.733
black flower bean	0.136	0.181	jatropha	4.916	2.781
black soybean	3.985	0.466	tung tree	0.437	0.456
broad bean	0.433	0.320	noni	3.940	4.196
chickpea	>5	>5	olive	>5	>5
kidney bean	>5	>5	pistachio	0.397	0.175
peanut	0.067	0.083	plum	2.182	3.025
soybean	>5	>5	walnut	>5	>5
tiger bean	0.358	0.284			
white flower bean	>5	>5	Trolox(control)	6.563(μg/mL)	

The seed coat of each seed was peeled off and pulverized with a blender. The sample (0.2 g) was ground with a mortar and pestle and extracted with 1 ml of methanol (5 times), and the combined extract was filled up in a 5 mL volumetric flask (MeOH extract). In addition, the residue was extracted with 1 mL of DMSO (5 times), and the combined extract was filled up in a 5 mL volumetric flask (DMSO extract). The total phenolic content, the antioxidant activity, and the tannin content in the MeOH extract and the DMSO extract were determined using the Folin-Ciocalteu method, the DPPH method, and the tartaric acid reduction method, respectively.

The peanut seed coat (35.4 g) was extracted with methanol. The methanol extract (8.0 g) was subjected to a silica-gel column chromatography(CC), a reverse-phase CC, TLC, and HPLC to obtain the high antioxidative faction.

Results and Discussions

Figure 1 and table1 show the total phenolic contents and the antioxidant activities of different plants seed coats respectively. The total phenolic content of MeOH and DMSO extracts of peanut were 45.0 and 38.3 mg-eq/g, respectively. The antioxidant activity of MeOH and DMSO extracts of peanuts were 0.067 and 0.083 mg-eq/mL (IC_{50}), respectively. These showed the highest total phenolic content and antioxidative activity among the tested samples in this study. The NMR and LC-MS spectra the fraction indicated that the antioxidative compounds would be proanthocyanidin polymers.

Peanut is an important oilseed crop in the world. Peanut seed oil contains linolenic acid, oleic acid, omega-6 fatty acids, and omega-3 fatty acids. The peanut plant is unique, because its flowers grow above ground, and then the pods containing the seeds develop in the soil. However, there are significantly more microorganisms in the soil than above ground. This study suggests that the seed coat of peanuts may accumulate high amounts of antioxidative proanthocyanidins to protect themselves from microorganisms in the soil. The anti-microbial activities of the proanthocyanidins are under investigation.

Transcutaneious bilirubin-based screening reduces the need for blood exchange transfusion in Myanmar newborns: A single-center, retrospective study

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Introduction

Neonatal hyperbilirubinemia is a significant health problem in Myanmar. We introduced transcutaneous bilirubin (TcB) measurements in 2017 and developed an hour-specific TcB nomogram for early detection and treatment of hyperbilirubinemia in Myanmar neonates. This study aimed to evaluate whether our screening method for hyperbilirubinemia decreased the requirement of blood exchange therapy (ET).

This retrospective cohort study was conducted at the Central Women's Hospital, Yangon. Two groups were included as follows: group 1 (control group; comprising infants born in 2016 and screened on the basis of Kramer's rule), and group 2 (intervention group; comprising infants born in 2019 and screened by TcB measurement using a nomogram). The number of ETs was analyzed based on causes of hyperbilirubinemia and number of days after birth.

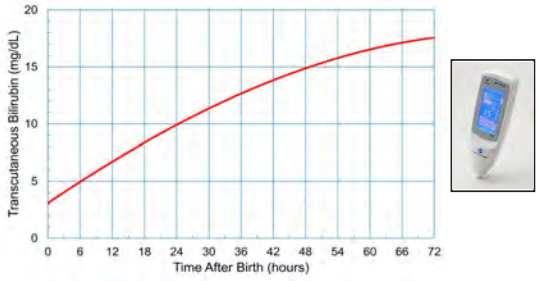

Figure 1. An hour-specific transcutaneous bilirubin nomogram for neonates in Myanmar (gestational age>35 weeks, birthweight > 2000g).

Results and Discussion

Groups 1 and 2 comprised 12,968 and 10,090 infants, respectively. Forty-six and two infants in Groups 1 and 2, respectively, required an ET. The odds ratio for ET was 18.0 (Group 1 to Group 2; 95% confidence interval [CI]: 4.8–67.1; p = 0.000). Serum bilirubin values at the time ET was administered were significantly higher in Group 1 than those in Group 2 (median: 23.0 and 16.8, respectively).

Table 1Characteristics of the Groups 1 and 2.

Characteristics	*n* (%)	
	Group 1	Group 2
Study population	12,968	10,090
Hospitalized neonates	2,932 (22.6)*	2,049 (20.3)*
Sex (Male)	1,622 (55.3) **	1,119 (54.6) **
Delivery (VD: CS)	1,339 (45.7) : 1,593 (54.3)	901 (44.0) : 1,148 (56.0)
Hyperbilirubinemia	2,067 (70.5) **	1,169 (57.1) **
Phototherapy	2,020 (68.9) **	1,133 (55.3) **
ET	46 (1.6) **	2 (0.1) **

Table 2 Patient characteristics and cases of hyperbilirubinemia in neonatal cases requiring ET in Groups 1 and 2

Characteristics	*n* (%), median (min-max)	
	Group 1 (n=46)	Group 2 (n=2)
Sex (Male)	28 (60.9): 18 (39.1)	2 (100): 0 (0)
Delivery (VD: CS: V: F)	25 (54.3): 19 (41.3): 1(2.2): 1(2.2)	0: 1 (50): 1 (50): 0
BW	3,000 (2,100-4,400)	2,900 (2,500-3,300)
G6PD deficiency	37 (80.4)	0 (0)
Day at ET	2 (1-16)	0 (0-0)
SB values at ET	23.0 (17.3-33.0)	16.8 (6-13.8)

VD: normal spontaneous vaginal delivery, CS: Cesarean section, V: vacuum, F: forceps, Day at ET: Day after birth which blood exchange transfusion was administered, SB values at ET: serum bilirubin values at day ET was administered

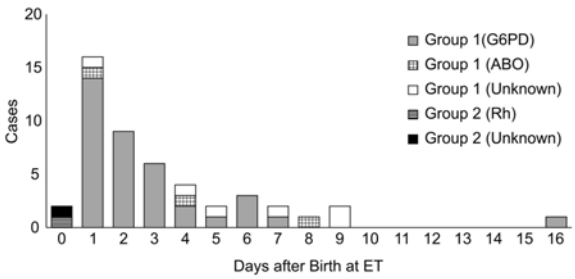

Figure 2. The number of cases that required ET according to the days after birth and causes of hyperbilirubinemia.

Conclusions

The management of hyperbilirubinemia using our screening method (TcB Nomogram) can effectively reduce the need for ET in neonates in Myanmar.

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P-30 KU

Transformation of Hip-Hop in Japan: Analysis of Lyrics and their Background

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Introduction

Hip-hop plays a role in singing about social issues, resistance to oppression, and individual experiences. By understanding how Japanese hip-hop has reflected society, we can gain deeper insights into the changes of the era. Therefore, this study examines how the lyrics of representative Japanese hip-hop songs have changed since the 1980s.

Previous Research

Hip-hop originated in African American communities believed to have begun with singing about slavery and discrimination. Later, it became a space where young people could express their struggles and conflicts (Yamashita 2019: 39-60). While this previous study discusses the history of hip-hop, it mainly focuses on the United States and does not cover the period from the 1980s, when hip-hop was introduced in Japan. Therefore, this study explores the history of Japanese hip-hop in conjunction with the social background of each era.

In Yamagoe'-s research, it mentions that during the community collapse due to poverty among Japanese youth, a unique sense of identity was built through the hip-hop community (Yamakoshi 2014: 13-22). This prior study suggests that hip-hop is recognized as a place for young people, but it does not explicitly state that it makes it easier for individuals to express their existence and experiences.

Furthermore, according to Yamazaki's research, in Japanese popular music, there is a tendency to emphasize rhythm and tone by accentuating the Japanese in an English-like manner, which has led to a trend of neglecting the meaning of lyrics (Yamazaki 2017: 1-11). However, although the evolution of rhythm and word choice in hip-hop has been explored, there has been no detailed discussion of how the content of hip-hop lyrics has changed. Thus, based on these prior studies, this study analyzes lyrics in accordance with the times and investigates how Japanese hip-hop has changed over the years.

Method

This study discusses the expressions and messages that Japanese hip-hop artists want to convey by analyzing the evolution of Japanese hip-hop through its lyrics and background. The research method involved using Oricon charts to investigate the top 10 hit hip-hop songs from the 1980s, when hip-hop was introduced to Japan, to the present (2024), and to examine their correlation with the social background of each period in Japan.

Findings and Impressions

Initially, Japanese hip-hop lyrics were heavily influenced by American hip-hop, lyrics, which focused, on social issues and singing about social inequality. However, contemporary lyrics increasingly express individuals' thoughts, backgrounds, and personal existences. Despite this shift, the appeal to society and the messages conveyed have remained consistent over time. Regardless of the changes in eras, this core aspect of hip-hop will likely continue to be passed down without being lost.

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