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ASNP
The Asian Society of Natural Products

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NATPRO 7

The 7th International Conference on Natural Products

October 18(Thu) – 20(Sat), 2018
Hotel Hyundai, Gyeongju, Korea

The Beginning of Asian Wave

The Asian Society of Natural Products

NATPRO: NATPRO7
On occaion of NATPRO7 organized by ASNP

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〈신간 도서〉

맥머리 유기화학 9판

역　　자 : 화학교재연구회
판　　수 : 9
발　　행 : 2017
페 이 지 : 1224
I S B N : 9788962184297

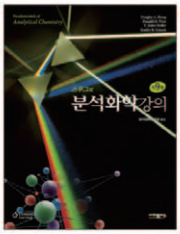
브라운의 유기화학 7판

역　　자 : 화학교재연구회
판　　수 : 7
발　　행 : 2016
페 이 지 : 1288
I S B N : 9788992603836

파비아의 분광학강의 5판

역　　자 : 문석식 외
판　　수 : 5
발　　행 : 2017
페 이 지 : 774
I S B N : 788992603959

스쿠그의 분석화학강의 9판

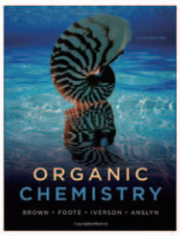


역　　자 : 분석화학연구회
판　　수 : 9
발　　행 : 2016
페 이 지 : 1056
I S B N : 9788992603867

분석화학실험

저　　자 : 분석화학/전기화학분과
판　　수 : 1
발 행 일 : 2018
페 이 지 : 320
I S B N : 9788992603157

Organic Chemistry 6/e

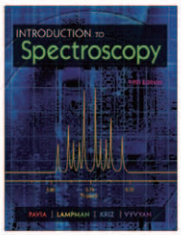


저　　자 : Brown
판　　수 : 6
발 행 일 : 2011
페 이 지 : 1296
I S B N : 9780840054982

Organic Chemistry 9/e

저　　자 : McMurry
판　　수 : 9
발 행 일 : 2016
페 이 지 : 1054
I S B N : 9789814773683

Introduction to Spectroscopy 5/e



저　　자 : Pavia
판　　수 : 5
발 행 일 : 2015
페 이 지 : 784
I S B N : 9781285460123

Biochemistry 6/e

저　　자 : McKee
판　　수 : 6
발 행 일 : 2016
페 이 지 : 840
I S B N : 9780190209957

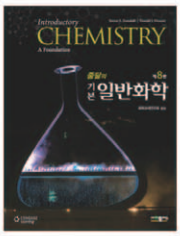
근간 줌달의 일반화학 10판

역　　자 : 화학교재연구회
판　　수 : 10
발 행 일 : 2019
페 이 지 : 900

옥스토비의 일반화학 7판

역　　자 : 화학교재연구회
판　　수 : 7
발　　행 : 2014
페 이 지 : 1240
I S B N : 9788962184334

줌달의 기본일반화학 8판



역　　자 : 화학교재연구회
판　　수 : 8
발　　행 : 2016
페 이 지 : 664
I S B N : 9788962184303

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(주) 사이플러스 서울특별시 마포구 잔다리로 101(서교동) 2F　전화: 02-332-6170, 6171　팩스: 02-332-6185

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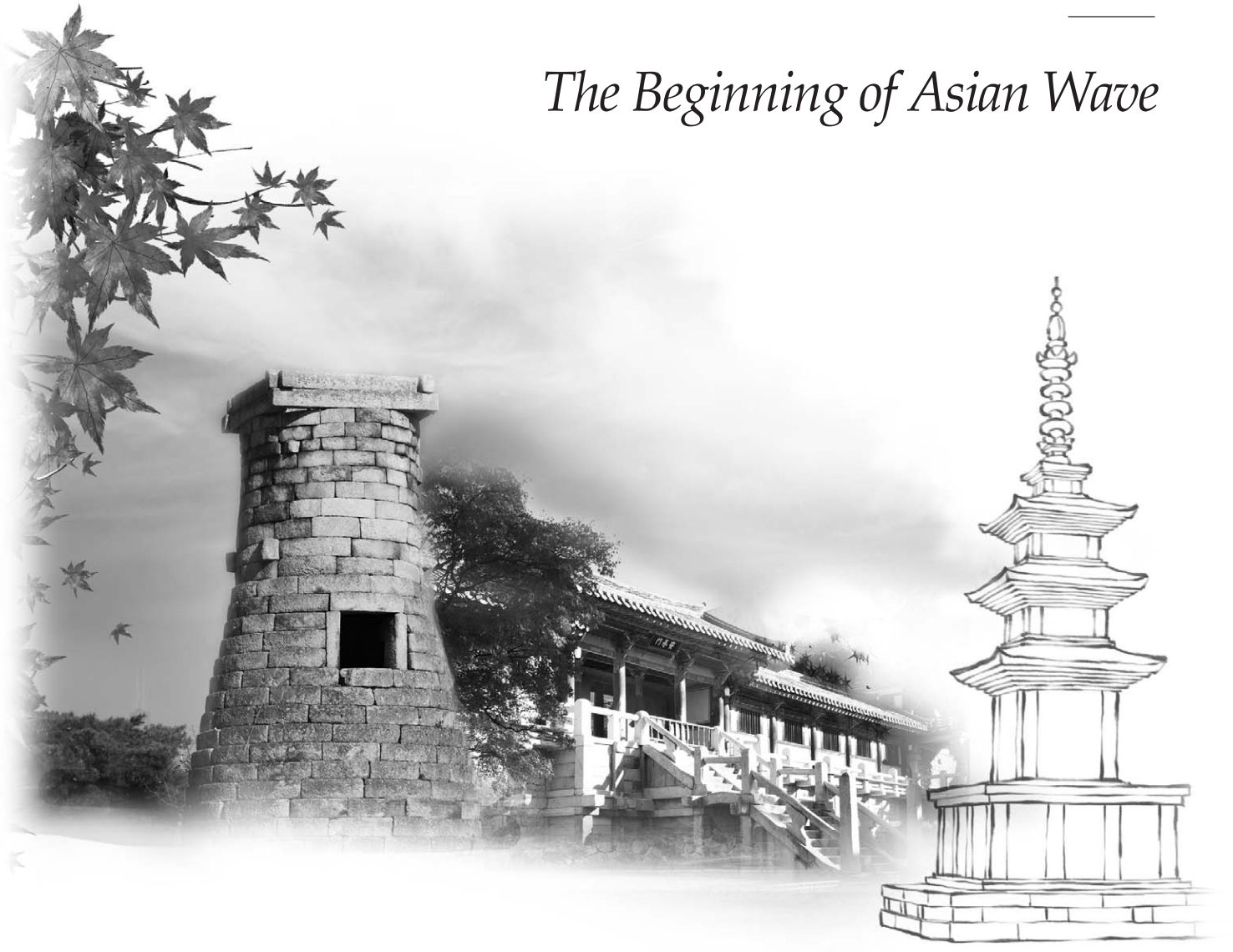

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Contents

Organizing Committee

Anton Bahtiar (ASNP Indonesia secretary)	University of Indonesia	Indonesia
Arunporn Itharat	Thammasat University	Thailand
Bungorn Sripanidkulchai	Khon Kaen University	Thailand
Hyang-Yeol Lee	Korea National University of Transportation	Korea
Hyunjin Han	Handong Herb	Korea
Jaehong Han (Chair)	Chung-Ang University	Korea
Jennifer Tan Sok Lim	World Vegan Organization	Singapore
Jin-Yong Kim	Dyne soze	Korea
Jiradej Manosroi	North-Chiang Mai University	Thailand
Jongkeun Choi	Chungwoon University	Korea
Jongsuk Lee	Gyeonggido Business & Science Accelerator	Korea
Kanit Vichitphan (ASNP Thailand secretary)	Khon Kaen University	Thailand
Kihun Park	Gyeongsang University	Korea
Maitree Suttajit	Phayao University	Thailand
Mihyang Kim	Phytobean	Korea
Monthaka Teerachaisakul	Ministry of Public Health	Thailand
Pornthap Thanonkeo	Khon Kaen University	Thailand
Somi Kim Cho	Jeju National University	Korea
Sonia D. Jacinto (ASNP Philippines secretary)	University of the Philippines	Philippines
Sun Chul Kang	Daegu University	Korea
Supayang Voravuthikulchai	Prince of Songkla University	Thailand

Manual for NATPRO7

NATPRO7 conference includes various activities, such as members' general meeting, exhibition, network building through the reception, tour and tea times. The three-day academic program includes invited and oral talks, student oral presentation, and poster presentations.

How NATPRO conference is organized

NATPRO conference is organized by ASNP and the hosting local organizer. The sessions are organized by the members, including ASNP directors and organizing committee members. The prospective session organizer proposes the session title to the organizer, based on the **Category of Natural Products (see Appendix A)**. Once the session organizer is accepted, he/she recruits speakers and submit the information to the organizer. The support for the invited speakers is provided by NATPRO organizing committee.

NOTES

Free tour on Oct 19 is limited to 135 persons. Make sure you attend. Otherwise, yield to others.

Poster award recommendation – 2 stickers are distributed and use each sticker for poster session 1 and 2, respectively.
Poster setup should be in the morning of the presentation day, and the removal will be at 18:00pm on Thursday and 12:30pm on Friday.

Meals – Halal food tables will be designated during the welcome reception dinner only for those whose diet preference was submitted to NATPRO7 organizer.

Student oral presentations will be on Thursday with the schedule of 10-min talk and 2-min Q&A.

A prayer room is available for the religious needs. The location is next to the ASNP member's lounge.

ASNP member's lounge is open to ASNP members on Oct 18 and 19. Members can enjoy free snack and beverage during the NATPRO7. Further inquiry on ASNP membership and future ASNP activity can be answered at the lobby on October 20, during the ASNP member service session.

Manual for ASNP Members at NATPRO7

The academic sessions of coming NATPRO7 were organized by ASNP members who searched invited and oral speakers under the consistent theme.[1] NATPRO7 is the 3-day academic festival and members' general assembly of ASNP. Hence, I think, the members' participation and advise to ASNP activity would be as important as the NATPRO7 academic activity.

Briefing on the academic activity

On Oct 18, 2018, the first day of NATPRO7, we will have three sessions in the morning, a plenary after lunch, followed by other three sessions and student oral presentations in the afternoon. Just keep in mind that NATPRO7 uses 4 rooms in the same floor of venue.

In **Session 1**, four scientists from Thailand and Korea present on marine natural products research, and chaired by Dr. Yongsoo Choi, a delegate from KIST Gangneung.[2] The government-invested institute performs mainly marine natural products research in Korea. The **Session 2**, presented by four invited speakers from Thailand, Korea, and Taiwan, present different approaches of natural products research and applications. The speakers may provide important points to be considered when you plan applied oriented natural products research. The session 2 is chaired by Dr. Jin-Yong Kim, ASNP director, representing a company merchandizing natural products materials. The **session 3**, perhaps flavored by medical and clinical applications of natural products, is chaired by Prof. Sun Chul Kang, ASNP director, who mainly works on the biological activity of natural compounds at the molecular biological level. In this session, Prof. Hahm, the well-known scientist among Thai researchers, will present too.

After lunch, the first poster session of NATPRO7, **Poster 1**, is held. Please attach the sticker distributed in your registration package on the best poster among 50 posters.[3] **Plenary speech** by Prof. Peter Howe will cover the application of natural products for maintaining health of aging population with a little touch on the Asian natural products materials. The following **Session 4**, chaired by ASNP Thai Secretary Prof. Kanit Vichitphan, will deliver natural product production and application to cosmetic applications. The cosmetic application of natural products research is more extended in **Session 5**, chaired by ASNP director Prof. Ki Hun Park. Thai research groups from universities and ministry of public health will present. The Indonesian ASNP members present in **Session 6**, chaired by Prof. Tsai from Taiwan. In session 6, you could find the status of Indonesian natural products research.

In the student sessions, ASNP officer and directors chair three sessions grouped based on the keywords. They will also evaluate oral presentation for the recommendation of best oral presentation awards.

1) ASNP-responsible keywords can be found on the web.
2) https://gn.kist.re.kr:8443/portal/main/main.do
3) The number of sticker will be used for recommendation of poster awards.

On the second day of NATPRO7, **Session 7** chaired by Prof. Dae-Ok Kim exhibits Korean natural products research by 4 outstanding Korean scientists. Another presentation of clinical applications of natural products is presented at **Session 8**, which was added by vegan talk, is chaired by Indonesian ASNP director Prof. Anton Bahtiar. **Session 9**, a Korean session, will be open for industrial participants to functional foods and cosmetics commercialization. After two invited talks, Q&A and discussion are moderated by ASNP vice president Prof. Jaehong Han. Don't forget to attach the other sticker for the recommendation of the best poster in the second poster session.

On the last day of NATPRO7, clinical application and the mechanism study of natural products are presented in **Session 10** chaired by ASNP director Prof. Sonia D. Jacinto. In **Session 11** and **12**, chaired by ASNP director Dr. Mihyang Kim and Prof. Pornthap Thanonkeo, respectively, various approaches of natural products applications are also presented. It is unfortunate for you not to be able to attend all the interesting sessions. However, ASNP will organized a special thematic symposium continuously in many locations.

Briefing on the ASNP member's activity

Members[4] can attend various activity and meetings jointed to NATPRO7, depending on their functions. Detailed information can be found at the different parts of NATPRO7 abstract book. Besides, NATPRO7 opens ASNP member's lounge[5] where every ASNP member can relax while enjoying free snack and beverage. ASNP member can also purchase the ASNP souvenirs to show proud ASNP membership.

■ **Oct 17, 2018**

- **VIP welcome reception** **17:30-20:00:** Dinner for Guests and Invited speakers - **Sapphire (2F)**

■ **Oct 18, 2018**

- **Opening Ceremony** **10:00-10:20am: Hall B + C**
  Welcoming Speech; ASNP president, Professor Soo-Un Kim
  Congratulatory Speech; Thai Royal Embassy in Seoul, His excellency Mr. Singtong Lapisatepun
  VIP Photo time
  Conference Report; NATPRO7 organizer, Professor Jaehong Han
- **BOD meeting** **16:20 – 16:50pm – Jade**
  Officers appointments, ASNP operation, accounting, budget, Constitutions & Bylaws
- **Welcome Reception** **18:00 – 21:00pm – Hall B+C**
  Introduction of VIP and ASNP Officers
  Announcement of Sponsors
  Toast
  Dinner with Social time – Introduction of each participating group

4) ASNP is a non-governmental organization and member's support through annual membership due is a key financial income of ASNP. Accordingly, ASNP's first priority is the benefits to the members.

5) Located next to prayer room.

■ **Oct 19, 2018**

- **ASNP General Meeting 09:00 – 09:40pm – Hall B+C**
  ASNP operation and accounting in 2018, 2019 ASNP plan and budget, approval of officers
- **ASNP BOD Dinner 18:00 – 21:00pm – TBA**

■ **Oct 20, 2018**

- **Closing Ceremony 11:10 – 12:30pm – Hall B+C**
  Concluding Remark; ASNP president, Professor Soo-Un Kim
  NATPRO7 organizer, Professor Jaehong Han
  Award ceremony; ASNP credit system, Travel grants,
  Best Oral – ASNP, Metabolites
  Poster awards – ASNP, Metabolites
  NATPRO8 presentation

ASNP officers

ASNP officers are key features in the running of ASNP. During NATPRO7, officers may attend to VIP dinner on Oct 17, the opening ceremony, lunch with invited speakers, ASNP board meeting, and welcome reception dinner on Oct 18, ASNP general meeting, ASNP committee meeting, free tour, and dinner with ASNP directors on Oct 19, and award/closing ceremony on Oct 20. If you need a transportation, please contact NATPRO7 organizer Prof. Jaehong Han.

Regular members

ASNP regular members may attend the opening ceremony and welcome reception dinner on Oct 18. During the welcome reception dinner, all group of participants are expected to introduce themselves. The ASNP general meeting on Oct 19 is the most important event for ASNP members to express their opinion on the ASNP activity. Regular members are expected to approve the decision of ASNP BOD and recommend auditors. After general meeting, you can enjoy free tour with lunch at the historic places of Gyeongju. During the closing ceremony on Oct 20, members can found out where would be the next NATPRO8 hosting country.

Student members

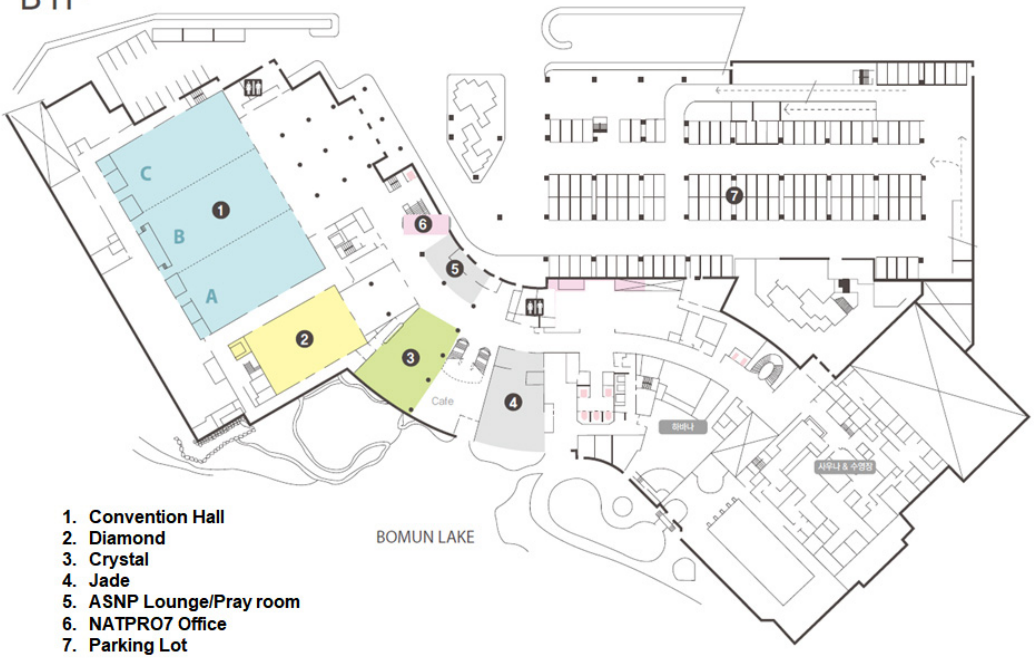
ASNP student members can enjoy the same privilege to the regular members. Besides, many awards, including best presentation and travel grant award, are given to ASNP student members. Many awards come with the prize money,[6] so that you hope for the best.

6) Prize money is given in Korean won cash.

Venue and Floor Plan

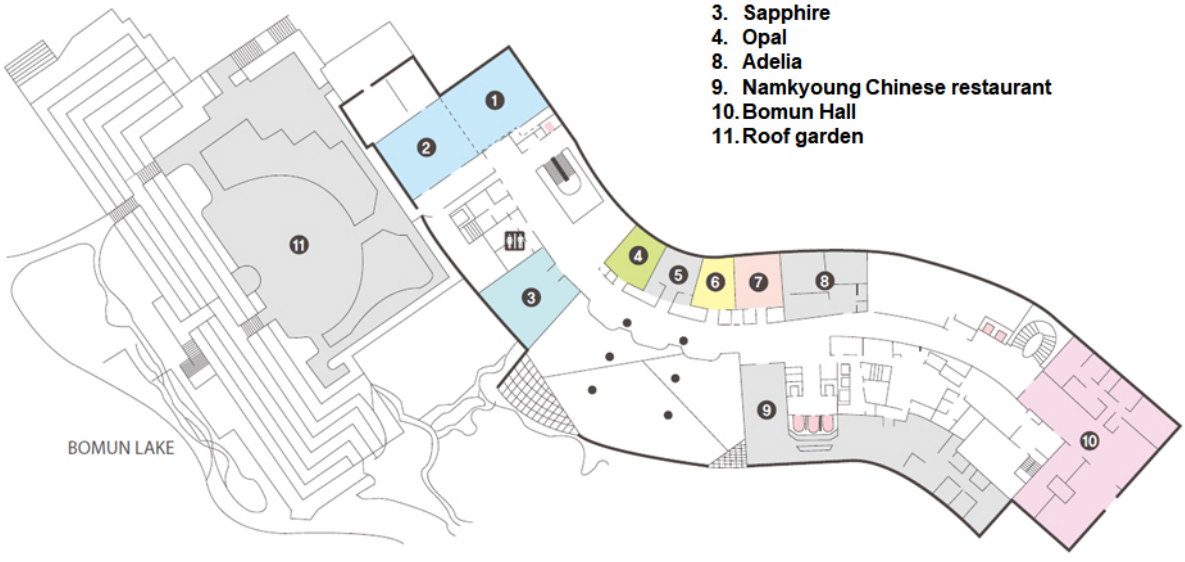
Gyeongju Hyundai Hotel

B1F



1. Convention Hall
2. Diamond
3. Crystal
4. Jade
5. ASNP Lounge/Pray room
6. NATPRO7 Office
7. Parking Lot

2F



1. Emerald
2. Ruby
3. Sapphire
4. Opal
8. Adelia
9. Namkyoung Chinese restaurant
10. Bomun Hall
11. Roof garden

Daily Program

Location: Hotel Hyundai Gyeongju, Gyeongju, Korea.

Day 1 (Oct 18, Thursday)

Time \ Place	Lobby	Convention B+C	Convention A	Diamond	Crystal	Jade
08:30-10:00	Registration & Exhibition				Poster setup	
10:00-10:20		Opening ceremony				
10:20-12:00			Session 1	Session 2		Session 3
13:00-14:00					Poster 1	
14:00-14:40		Plenary				
14:40-16:20			Session 4	Session 5		Session 6
16:20-16:50					Coffee break	ASNP Board Meeting
16:50-17:50			Student 1	Student 2		Student 3
18:00-21:00		Reception Dinner				

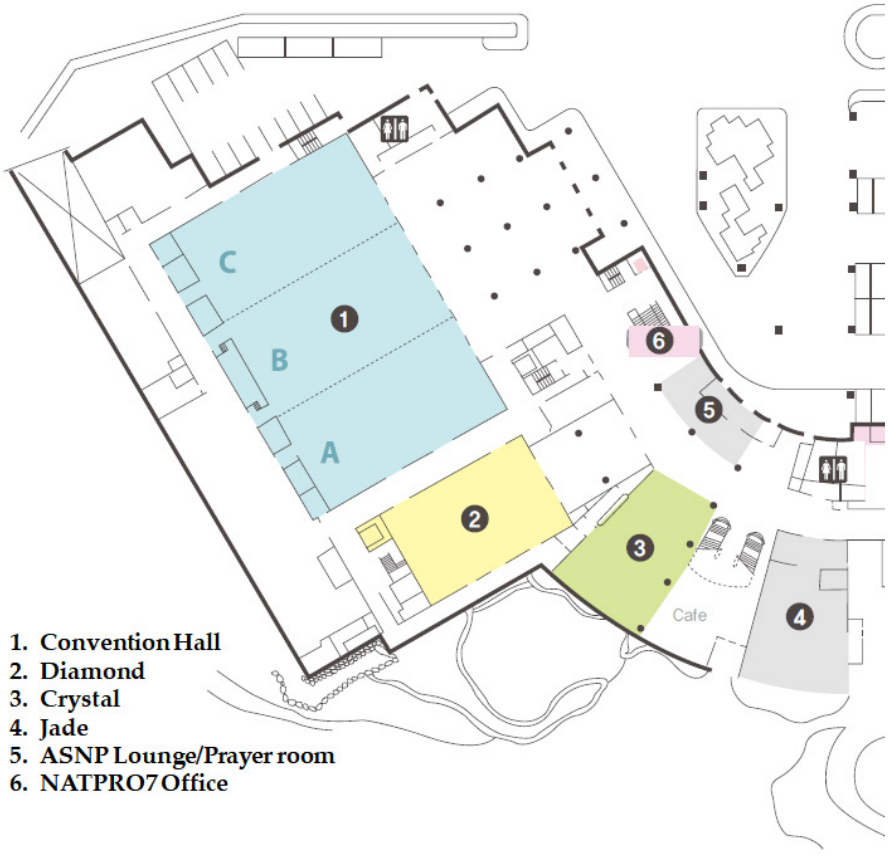
Day 2 (Oct 19, Friday)

Time \ Place	Lobby	Convention B+C	Convention A	Diamond	Crystal	Jade
08:30-09:00	Registration & Exhibition				Poster setup	
09:00-09:40		ASNP general meeting and BOD certificate presentation				
09:40-11:20			Session 7	Session 8		Session 9
11:20-12:20					Poster 2	ASNP Committee Meeting
12:30-18:00	Tour with lunch			KSABC NPD session		GBSA session

Day 3 (Oct 20, Saturday)

Time \ Place	Lobby	Convention B+C	Hall A	Diamond	Jade
9:30-11:10	ASNP member service		Session 10	Session 11	Session 12
11:10-12:30		Award and Closing ceremony			

Program by Hall



Lobby (Floor B1F)

Date	Time	Program
Oct 18	08:30 – 18:00	Registration
	10:30 – 17:00	Exhibition
Oct 19	08:30 – 12:30	Registration
	09:00 – 12:30	Exhibition
Oct 20	09:30 – 12:30	ASNP member service

Convention Hall B+C (Floor B1F)

Date	Time	Program
Oct 18	10:00 - 10:20	Opening ceremony - Congratulatory speech - Welcome speech - Group photo - Conference report
	14:00 - 14:40	Plenary Lecture
	18:00 - 21:00	Reception dinner - Participant introduction - Sponsorship - Show program
Oct 19	09:00 - 09:40	ASNP general meeting and BOD certificate presentation
Oct 20	11:10 - 12:30	Award and Closing ceremony

Convention Hall A (Floor B1F)

Date	Time	Program
Oct 18	10:20 - 12:00	Session 1
	14:40 - 16:20	Session 4
	16:50 - 17:50	Student Session 1
Oct 19	09:40 - 11:20	Session 7
Oct 20	09:30 - 11:10	Session 10

Diamond Hall (Floor B1F)

Date	Time	Program
Oct 18	10:20 - 12:00	Session 2
	14:40 - 16:20	Session 5
	16:50 - 17:50	Student Session 2
Oct 19	09:40 - 11:20	Session 8
	12:30 - 18:00	KSABC NPD session
Oct 20	09:30 - 11:10	Session 11

Crystal Hall (Floor B1F)

Date	Time	Program
Oct 18	13:00 - 14:00	Poster Session 1
	16:20 - 16:50	Coffee Break and Networking
Oct 19	11:20 - 12:20	Poster Session 2

Jade Hall (Floor B1F)

Date	Time	Program
Oct 18	10:20 – 12:00	Session 3
	14:40 – 16:20	Session 6
	16:50 – 17:50	Student Session 3
Oct 19	09:40 – 11:20	Session 9
	12:30 – 18:00	GBSA session
Oct 20	9:30 – 11:10	Session 12

Program Schedule

Oct 18, Thursday, 14:00-14:40 | Hall B+C

Plenary Lecture — Chair: ASNP President, Soo-Un Kim

PL-1 14:00-14:40

Natural Products for Preventive Health in Ageing Populations

Peter Howe*

Institute for Resilient Regions, University of Southern Queensland and Clinical Nutrition Research Centre, University of Newcastle, Australia

Oct 18, Thursday, 10:20-12:00 | Hall A

Session 1 — Chair: KIST, Yongsoo Choi

IS1-1 10:20-10:45

Development on Harvesting Technique of Bioactive Pigments from Marine Bacteria

Chutiwan Dechsakulwatana[1*], Vassana Musa[2] and Preecha Phuwapraisirisan[3]

[1]Institute of Marine Science, Burapha University, Chonburi 20131, Thailand, [2]Program of Biotechnology, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand, [3]Natural Product Research Unit, Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

IS1-2 10:45-11:10

New Marine Natural Products Sources: Extreme Environments

Inho Yang*

Department of Convergence Study on the Ocean Science and Technology, Korea Maritime and Ocean University, Busan 49112, Korea

IS1-3 11:10-11:35

Discovery of Bioactive Natural Products from Marine Microbes

Hyukjae Choi*

College of Pharmacy, Yeungnam University, 280 Daehak-ro, Gyeongsan-si, Gyeongsangbuk-do, Republic of Korea

IS1-4 11:35-12:00

Organic and Biosynthesis of β-Carbolines

Hyang-Yeol Lee*
Department of Biotechnology, Korea National University of Transportation, 61 Daehak-ro, Jeungpyeong-gun, Chungbuk 27909, Republic of Korea

Oct 18, Thursday, 10:20-12:00 | Diamond

Session 2 Chair: ASNP director, Jin-Yong Kim

IS2-1 10:20-10:45

Thai Medicinal Plant Recipes from the Manosroi III Database Containing Opium, Marijuana, Kratom and Tobacco: Possible Applications and Commercialization in Modern Medicine

Jiradej Manosroi* and Aranya Manosroi
Division of Cosmetic Technology, Faculty of Engineering and Technology, North-Chiang Mai University and Manose Health and Beauty Research Center, Chiang Mai 50200, Thailand

IS2-2 10:45-11:10

Thai Medicinal Plant Recipes from "Manosroi III" Database for Health and Beauty

Aranya Manosroi*
Division of Cosmetic Technology, Faculty of Engineering and Technology, North-Chiang Mai University/ Manose Health and Beauty Research Center, Chiang Mai 50200, Thailand

IS2-3 11:10-11:35

Stemness and Differentiation Potential-Recovery Effects of Sinapic Acid against Ultraviolet-A-Induced Damage through the Regulation of P38 MAPK and NF-κB

Sae Woong Oh, Seung Eun Lee, Ju A Yoo and Jongsung Lee*
Department of Integrative Biotechnology, College of Biotechnology and Bioengineering, Sungkyunkwan University, Suwon City, 16419 Gyunggi Do, Republic of Korea

IS2-4 11:35-12:00

Monitoring Polyphenol by LC-MS/MS in Rat and Its Comparative Pharmacokinetics of a Single compound, Single Botanic Extract and Multiple Botanic Complex

Tung-Hu Tsai*
National Yang-Ming University / National United University, 155 Li-Nong Street Section 2, Taipei 112, Taiwan

Oct 18, Thursday, 10:20-12:00 | Jade

Session 3 — Chair: ASNP director, Sun Chul Kang

IS3-1 10:20-10:45

Probiotic Kimchi as Prevention of Gastrointestinal Cancer

Ki Baik Hahm[1*], Ji Young Oh[2], Dong Yoon Lee[2], Jeong Min An[1], Eun A Kang[1]
[1]CHA University Medical School, [2]CJ Food

IS3-2 10:45-11:10

Alcoholic Fatty Liver Damage Protection of Natural Products

Seong Taek Oh[1], Sukkum Chang[2], Se Ho Kim[3] and Jae Gyu Park[4*]
[1]College of Pharmacy, Yeungnam University, Gyeongsan 38541, Republic of Korea, [2]Department of Biotechnology, Daegu University, Gyeongsan 38453, Republic of Korea, [3]Department of Biotechnology, Yeungnam University, Gyeongsan 38541, Republic of Korea, [4]Advanced Bio Convergence Center(ABCC), Pohang Technopark Foundation, Pohang, 37668 Republic of Korea

O3-1 11:10-11:35

Restoring the Efficacy of Available Antibiotics against Extensively Drug-Resistant *Acinetobacter baumannii* by Myrtaceae Ethanolic Extracts

Dennapa Saeloh[1,2*], Monton Visutthi[3], Marisa Leeha[4], Surasak Limsuwan[2,5] and Supayang P. Voravuthikunchai[2,4]
[1]Faculty of Medical Technology, Prince of Songkla University, Songkhla, Thailand, [2]Natural Product Research Center of Excellence, Prince of Songkla University, Songkhla, Thailand, [3]Biology Program, Faculty of Science and Technology, Nakhon Ratchasima Rajabhat University, Nakhon Ratchasima, Thailand, [4]Department of Microbiology, Faculty of Science, Prince of Songkla University, Songkhla, Thailand, [5]Faculty of Traditional Thai Medicine, Prince of Songkla University, Songkhla, Thailand

O3-2 11:35-12:00

Benzofuran Derivatives from the Leaves of *Oparanthus teikiteetinii* (Asteraceae)

Opeyemi Joshua Olatunji[1*], Aurelie Urbain[2], and Phila Raharivelomanana[3]
[1]Faculty of Thai Traditional Medicine, Prince of Songkla University, Hat Yai, 90112, Thailand, [2]Université de Strasbourg, CNRS, IPHC UMR 7178, F-67000 Strasbourg, France, [3]Université de Polynésie française, EIMS UMR 241 EIO, Faa'a Tahiti, French Polynesia

Oct 18, Thursday, 14:40–16:20 | Hall A

Session 4 Chair: ASNP Thai Secretary, Kanit Vichitphan

IS4–1 14:40–15:05

Isoflavonoids Production from Cell Culture of *Pueraria candollei* and Molecular Characterization of Genes Involved in Isoflavonoids Production

Pornthap Thanonkeo[1,2*], Sudarat Thanonkeo[3] and Preekamol Klanrit[1,2]
[1]Department of Biotechnology, Faculty of Technology, Khon Kaen University, Khon Kaen 40002, Thailand, [2]Fermentation Research Center for Value Added Agricultural Products, Khon Kaen University, Khon Kaen 40002, Thailand, [3]Walai Rukhavej Botanical Research Institute, Mahasarakham University, Mahasarakham 44150, Thailand

IS4–2 15:05–15:30

A Comparative Analysis of Two Fatty Acid Hydratases from *L. Acidophilus*: Site-Directed Mutagenesis Studies Define Key Amino Acids Responsible for Substrate Promiscuity and Regioselectivity

Bekir Engin Eser[1], Michal Poborsky[1], Shigenobu Kishino[2], Michiki Takeuchi[2], Anita Ljubic[3], Charlotte Jacobsen[3], Jun Ogawa[2], Peter Kristensen[4*] and Zheng Guo[1*]
[1]Department of Engineering, Aarhus University, 8000 Aarhus, Denmark, [2]Division of Applied Life Sciences, Graduate School of Agriculture, Kyoto University, Kyoto 606-8502, Japan, [3]Division of Food Technology, National Food Institute, Technical University of Denmark, 2800 Kgs. Lyngby, Denmark, [4]Faculty of Engineering and Science, Department of Chemistry and Bioscience, Aalborg University, 9220 Aalborg, Denmark

IS4–3 15:30–15:55

Plant Stem Cell for Anti-Aging

Sang Hyun Moh[*]
BIO-FD&C Co., Ltd, Korea

IS4–4 15:55–16:20

Antioxidant, Anti-Tyrosinase Activities and Formulation of Facial Mask from Kombucha Tea

Surapol Natakankitkul[1*], Sujinun Yapakai[1], Anongnapa Chuenjit[1], Suwalee Kiatkarun[2] and Worrapon Wangkananon[3]
[1]Department of Pharmacy Science, Faculty of Pharmacy, Chiang Mai University, Chiang Mai 50200, Thailand, [2]Tea Gallery Group (Thailand) Co., Ltd. 365/1 Moo 1, Thasala, Chiang Mai 50000 Thailand, [3]Mintech Laboratory Co., Ltd. 15/4 Moo 1, Bammai, Pakket, Nonthaburi 11120 Thailand

Oct 18, Thursday, 14:40-16:20 | Diamond

Session 5 — Chair: ASNP Director, Ki Hun Park

IS5-1 15:00-15:20

Current Policy and Strategic Plan in Research and Development of Herbal Products and Traditional Medicine in Thailand: Challenge and Reform

Monthaka Teerachaisakul[1*] and Suriya Wongkongkathep[2]
[1]Thai Traditional Medicine Research Institute, the Department of Thai Traditional and Alternative Medicine, [2]Chairman of the Working Group on Strategic for Research and Innovation of Herbal Products, Thailand

IS5-2 15:20-15:40

Immunomodulatory Activity of Ethanolic Extracts from Deph-Rungsith Formulary and Its Composite Plants on T-Cell Proliferation

Niramai Fangkrathok[1,2], Bungorn Sripanidkulchai[2*], Monthaka Teerachaisakul[3], Kamonwan Bancheun[3]
[1]Faculty of Agricultural Technology, Burapha University Sakaeo Campus, Sa Kaeo 27160, Thailand, [2]Center for Research and Development of Herbal Health Products, Faculty of Pharmaceutical Sciences, Khon Kaen University, Khon Kaen 40000, Thailand, [3]Thai Traditional Medicine Research Institute, Department of Thai Traditional and Alternative Medicine, Ministry of Public Health, Nonthaburi Province 11000, Thailand

O5-1 15:20-15:40

Immunomodulatory Activity of Ethanolic Extracts from Deph-Rungsith Formulary and Its Composite Plants on T-Cell Proliferation

Niramai Fangkrathok[1,2], Bungorn Sripanidkulchai[2*], Monthaka Teerachaisakul[3], Kamonwan Bancheun[3]
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O5-2 15:40-16:00

Bioactivities of *Wedelia trilobata* Extract: Antioxidation, Antimelanogenesis, Anti-Inflammation and Anti-Acne Effect

Jintana Junlatat[1*], Jenjira Wetchaphan[1], Patcharamai Chobdee[1], Suphada Suttisin[1], and Bungorn Sripanidkulchai[2]
[1]Faculty of Thai Traditional and Alternative Medicine, Ubon Ratchathani Rajabhat University, Thailand [2]Center for Research and Development of Herbal Health Products, Faculty of Pharmaceutical Sciences, Khon Kaen University, Thailand

O5-3 16:00-16:20

Development of Topical Films Containing Phytoestrogenic *Curcuma comosa* Extract for Skin Aging Reduction and Clinical Study

Sarunya Tuntiyasawasdikul and Bungorn Sripanidkulchai*
Faculty of Pharmaceutical Sciences, Khon Kaen University, Khon Kaen 40002, Thailand

Oct 18, Thursday, 14:40-16:20 | Jade

Session 6 Chair: Prof. Tung-Hu Tsai

O6-1 14:40-15:00

Ethnobotanical Inventory of Medicinal Recipes Used by Dayak Ethnic in Palangka Raya City

Nurul Qamariah*, Rezqi Handayani, Susi Novaryatiin, M. Rizky Fadhil Pratama
Pharmacy Department, Faculty of health sciences, Universitas Muhammadiyah Palangkaraya, Central Kalimantan, Indonesia

O6-2 15:00-15:20

The Potential Herbs of Medicinal Forests from Central Kalimantan as an Inhibitor of *Staphylococcus aureus*

Rezqi Handayani*
Faculty of Health Science, Universitas Muhammadiyah Palangkaraya, Central Kalimantan Indonesia

O6-3 15:20-15:40

***In Vitro* Determination of Antioxidant, Antityrosinase, Anticollagenase, and Antielastase Activity of *Thalassia Hemprichi* Extract as Active Ingredient for Anti-Aging Cosmetics**

Effionora Anwar[1*], Nely Suryani Nopi[1], Kiki Zakiyah[1] and Tati Nurhayati[2]
[1]Faculty of Pharmacy, Universitas Indonesia, Kampus UI Depok 16424, [2]Departement Teknologi Hasil Perairan, Fakultas Perikanan dan Ilmu Kelautan, Institut Pertanian Bogor, Kampus IPB Darmaga, Jalan Agatis, Bogor 16680, Indonesia

IS6-1 15:40-16:00

Preclinical Studies of *Ageratum conyzoides* L. and *Hedyotis corymbosa* L. Extracts-Loaded Nanoparticle Gel on Papain Induced Osteoarthritis

Anton Bahtiar[1*], Mia Permawati[1] and Effionora Anwar[2]
[1]Department of Pharmacology and Toxicology, [2]Department of Pharmaceutics, Faculty of Pharmac, Universitas Indonesia, Kampus UI Depok 16424

O6-4 16:00-16:20

Antimicrobial Activity of Triterpenoid Saponins from *Polyscyas guilfoylei* L.H. Bailey

Berna Elya[1*], Soleh Kosela[1], Hanita Omar[2]

[1]Faculty of Pharmacy, Universitas Indonesia, Kampus UI Depok, Indonesia 16424, [2]Chemistry Division, Centre for Foundation Studies in Sciensce, University Malaya, Malaysia

Oct 19, Friday, 09:40-11:20 | Hall A

Session 7 Chair: Prof. Dae-Ok Kim

IS7-1 09:40-10:05

Analysis of COMT Inhibitors from Plant Source and Its Impact on Bioavailability of Phytochemicals

Soon-Mi Shim*

Dept. of Food Science and Biotechnology, Sejong University

IS7-2 10:05-10:30

The Effects of *Bupleurum falcatum* on the Chemotherapy-Induced Peripheral Neuropathy

Gyeongbeen Lee[1], Jiwon Choi[2], Yeon-Ju Nam[1], Myung-Jin Song[1], Jin Kyu Kim[1], Woo Jung Kim[1], Pansoo Kim[1], Jin Koo Lee[3] and Yongmun Choi[1*]

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IS7-3 10:30-10:55

Analysis of Furanocoumarins in Grapefruit and Their Metabolites in Plasma and Urine Using UPLC-MS/MS

Sanggil Lee*

Department of Food Science and Nutrition, Pukyong National University, Korea

IS7-4 10:55-11:20

Development of Hepatoprotective Functional Food Using Garlic Extract Fermented with Lactic Acid Bacteria

Sung Jin Lee and Johann Sohn*

SK Bioland, Food R&D Center, 152, Manhae-ro, Danwon-gu, Ansan, Gyeonggi 15407, Republic of Korea

Oct 19, Friday, 09:40–11:20 | Diamond

Session 8 Chair: ASNP director and Indonesian Secretary, Anton Bahtiar

IS8–1 09:40–10:05

Research and Drug Development of Thai Traditional Remedies for NCDs Treatment

Arunporn Itharat[1,4*] Seewaboon Sireeratawong[2], Piya pinsornsak[3], Intouch Sakpakdeejaroen[1,4], Pakakrong Thongdeeying[1,4], Sunita Makchuchit[1,4], Sumalee Panthong[1,4], Puritat Kanokkungsadan[1,4], Nichamon Mukkasombut[1,4] and Waipoj Chanvimalueng[3]

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IS8–2 10:05–10:30

Research on Thai Traditional Medicine for Women Health

Nuanjan Jaiarre[*]

Department of Applied Thai Traditional Medicine and Center of Excellence on Applied Thai Traditional Medicine Research(CEATMR), Faculty of Medicine, Thammasat University, Rangsit campus, Pathumthani, 12120, Thailand

IS8–3 10:30–10:55

Rice Bran Extracts Provide Protective Effects on Diabetes Mellitus and Hypertension

Veerapol Kukongviriyapan[1*], Upa Kukongviriyapan[2], Patchareewan Pannangpetch[1], Supawan Thawornchinsombut[3]

[1]Department of Pharmacology, [2]Department of Physiology, Faculty of Medicine, [3]Department of Food Technology, Faculty of Technology, Khon Kaen University, 40002, Thailand

IS8–4 10:55–11:20

Going Vegan: The Path of the Future

Jennifer Tan Sok Lim[*]

WVO Singapore Office, 17, Harper Road, Singapore 369679

Oct 19, Friday, 09:40-11:20 | Jade

Session 9 Chair: ASNP Vice-President, Jaehong Han

IS9-1 09:40-10:10

Novel Multifunctional Natural Ingredient for Skin Care from Korean Native Plant

Jin-Yong Kim, Jin-A Lee, Tae Mi Yoon and Tae Ho Cho*

Antimicrobial Materials Lab., Dyne soze Co., Ltd., R&D Center, Yongin, 16827, Republic of Korea

IS9-2 10:10-10:40

Approval Procedure and Present Conditions of Functional Ingredient for Health Functional Food in Korea

Yong Kwan Kwon*

National Institute of Food and Drug Safety Evaluation, Ministry of Food and Drug Safety, Republic of Korea

R & I Forum 10:40-11:20

Q & A followed by discussion

Moderator: Jaehong Han

Oct 20, Saturday, 09:30-11:10 | Hall A

Session 10 Chair: ASNP director and Philippine Secretary, Sonia D. Jacinto

IS10-1 09:30-09:55

The Potential Applications of Riceberry Rice-Bran Phytochemicals in Preventive and Clinical Medicine

Vijittra Leardkamolkarn*

Mahidol University, Bangkok, Thailand

IS10-2 09:55-10:20

***In vitro* and *in vivo* Anti-Angiogenic Potential of Carvacrol Nanoemulsion**

Sun Chul Kang* and Imran Khan

Department of Biotechnology, Daegu University, Gyeongsan, Gyeongbuk 38453, Republic of Korea

IS10-3 10:20-10:45

Anticancer Activities of the Selected Phytochemicals and Their Therapeutic Implication in Human Gastric Cancer Cells

Somi Kim Cho[1,2*]

[1]Faculty of Biotechnology, College of Applied Life Sciences, SARI, Jeju National University, Jeju 690-756, Republic of Korea, [2]Subtropical/Tropical Organism Gene Bank, Jeju National University, Jeju 63243, Republic of Korea

O10-1 10:45-11:10

Nanofibers Mat and Hydrogel Patch-Based Tamarind Seed Polysaccharide Containing Natural Active Thai Herbal Ingredients

Khanittha Chawananorasest[1*], Jate Panichapakdee[2], Chatporn Klaykaew[3], Benjabhorn Sethabouppha[4], Patsuda Seangthongdee[1], Anchisa Promta[1] and Praphakorn Kaemchantuek[1]

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Oct 20, Saturday, 09:30-11:10 | Diamond

Session 11 Chair: ASNP director, Mihyang Kim

IS11-1 09:30-09:55

A Path to Industrial Utilization of Natural Products

Supayang P. Voravuthikunchai[*]

Department of Microbiology, Faculty of Science and Natural Product Research Center of Excellence, Prince of Songkla University, Thailand

O11-1 09:55-10:20

Chemical Constituents and Biological Activities from Rutaceae Plants

Suda Chakthong[*]

Department of Chemistry, Center of Excellence for Innovation in Chemistry, and Natural Product Research Center of Excellence, Faculty of Science, Prince of Songkla University, Hat Yai, Songkhla, 90112, Thailand

O11-2 10:20-10:45

Potential Applications of Compounds from Thai Plants as Bioactive Ingredients

Wilawan Mahabusarakam[1,5*], Souwalak Phongpaichit[2,5], Siriphun Hiranyachattada[3], Ramida Watanapokasin[4]

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O11-3 10:45-11:10

Antibacterial Activity of Thai Polyherbal Formulations Used for Skin Diseases

Jongkon Saising[1], Katesarin Maneenoon[2], Oraphan Sakulkeo[2], Kanpirom Changhlek[3], Taddow Choothong[3], Sirinrat Temprom[3], Sutathip Tongo[3] and Supayang Piyawan Voravuthikunchai[4*]

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Oct 20, Saturday, 09:30-11:10 | Jade

Session 12 Chair: Prof. Pornthap Thanonkeo

IS12-1 09:30-09:55

Thai Traditional Medicine Research Networking and Integration with Conventional Medicine: A Development of Process Innovation

Krit Pongpirul[1,2*] and Monthaka Teerachaisakul[3]

[1]Department of Preventive and Social Medicine, Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand, [2]Department of International Health, Johns Hopkins Bloomberg School of Public Health, Baltimore, MD, USA, [3]Thai Traditional Medicine Research Institute, Department of Thai Traditional and Alternative Medicine, Ministry of Public Health, Bangkok, Thailand

O12-1 09:55-10:20

Efficacy of *Thunbergia laurifolia* Lindl. on Detoxification: An Updated Systematic Review and Meta-Analysis

Wiraphol Phimarn[1], Kritsanee Saramunee[1], Prasob-orn Rinthong[2] and Bunleu Sungthong[2*]

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O12-2 10:20-10:45

Botanical Characterization and *in vivo* Propagation of an Endangered Ethnomedicinal plant, *Curculigo orchioides* Gaertn. (Hypoxidaceae)

Harold M. Carag[1,2*] and Lourdes B. Cardenas, Dr.rer.nat.[2]

[1]*Institute of Biology, College of Science, University of the Philippines Diliman, Quezon City, Philippines 1101, Philippines,* [2]*Institute of Biological Sciences, College of Arts and Sciences, University of the Philippines Los Baños, College, Los Baños, Laguna 4031, Philippines*

O12-3 10:45-11:10

Structure-Based Study of Conessine as a Potential Efflux Pump Inhibitor in *Pseudomonas aeruginosa*

Juntamanee Jewboonchu[1], Dennapa Saeloh[2,3], Thanyaluck Siriyong[3,4], Supayang P. Voravuthikunchai[3,5] and Varomyalin Tipmanee[1,3*]

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Student Oral Presentation Sessions

Oct 18, Thursday, 16:50-17:50 | Hall A

Student Oral Session 1 Chair: Department of Thai Traditional and Alternative Medicine, Monthaka Teerachaisakul

S1-1 16:50-17:02

Novel Insight of *GRS1* (*Glucoraphasatin synthase 1*) Regulating Biosynthesis of Glucoraphasatin in Chinese Cabbage (*Brassica rapa L. ssp. pekinensis*) During Growth and Development

Adji Baskoro Dwi Nugroho, Aditya Nurmalita Pervitasari and Jongkee Kim*

Department of Integrative Plant Science, Chung-Ang University, Anseong, 17546, Korea

S1-2 17:02-17:14

Stability of Panaxynol and Panaxydol Isolated from *Panax Ginseng*

Gem Stephen Raña and Jaehong Han*

Metalloenzyme Research Group and Department of Plant Science and Biotechnology, Chung-Ang University, Anseong 17546, Korea

S1-3 17:14-17:26

Simultaneous Determination of Scoparone, Geniposide and Rhein in Rat Plasma Using Ultra-High Performance Liquid Chromatography Tandem Mass Spectrometry: Application Herbal Medicines to Pharmacokinetics Study

Tun-Pin Hsueh[1,2] and Tung-Hu Tsai[1*]

[1]Institute of Traditional Medicine, School of Medicine, National Yang-Ming University, Taipei 11221, Taiwan, [2]Department of Chinese Medicine, Kaohsiung Chang Gung Memorial Hospital and Chang Gung University College of Medicine, Kaohsiung 83301, Taiwan

S1-4 17:26-17:38

FT-IR Microspectroscopy Analysis of Beta-Glucan Structure from Spent Yeast *Saccharomyces cerevisiae* TISTR 5339

Raksmey Thin[1,2], Atiya Techaparin[1], Poramaporn Klanrit[3,4] and Jirawan Apiraksakorn[1,5*]

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S1-5 17:38-17:50

Properties of Cellulose Extracted from Banana (Kluai Namwa) Peel

Konlarat Phirom-on[1,2] and Jirawan Apiraksakorn[2,3*]

[1]Graduate School, Khon Kaen University, Thailand, [2]Department of Biotechnology, Faculty of Technology, Khon Kaen University, Thailand, [3]Fermentation Research Center for Value-added Agricultural products, Faculty of Technology, Khon Kaen University, Thailand

Oct 18, Thursday, 16:50-17:50 | Diamond

Student Oral Session 2 Chair: ASNP director, Bungorn Sripandikulchai

S2-1 16:50-17:02

Putative Identification of Cytotoxic Compounds from an Isolate of a Philippine Endemic Plant against Human Colon Carcinoma Cells (HCT-116) Using High-Resolution Mass Spectrometry

Jeff D. Dela Cruz[1,2] and Sonia D. Jacinto[1*]

[1]Institute of Biology, University of the Philippines - Diliman, Quezon City, Philippines, [2]Institute of Chemistry, University of the Philippines - Diliman, Quezon City, Philippines

S2-2 17:02-17:14

Antioxidant Activities from *Syzygium gratum* (Wight) S.N. Mitra var. gratum Young Leaf Extracts

Wilailuck Leamklang[1], Ekaruth Srisook[2,4], Chatchawin Petchlert[3,4*]

[1]Biological Science Graduate Program, Faculty of Science, Burapha University, Chon Buri, 20131, Thailand, [2]Department of Chemistry, Faculty of Science, Burapha University, Chon Buri, 20131, Thailand, [3]Department of Biochemistry, Faculty of Science, Burapha University, Chon Buri, 20131, Thailand, [4]Center of Excellence for Innovation in Chemistry (PERCH-CIC), Faculty of Science, Burapha University, Chon Buri, 20131, Thailand

S2-3 17:14-17:26

Bioactivity Studies for Cosmetics Application of Koon (*Cassia fistula*) Extract

Phongchai Kanjanamanee[1], Aranya Manosroi[1,2], Supakorn Silakate[1], In Chul Lee[3], Amando Bu Young Choi[3] and Jiradej Manosroi[1,2*]

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S2-4 17:26-17:38

Antioxidant and Tyrosinase Inhibition Activities of Laurel Clock Vine (*Thunbergia laurifolia* Lindl) Extracts

Wiroon Khaminta[1], Aranya Manosroi[1,2], Ruthaphan Santianotai[1], Amando Bu Young Choi[3], In Chul Lee[3] and Jiradej Manosroi[1,2*]

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S2-5 17:38-17:50

AKT Upregulation by Morin Hydrate Suppresses *E. coli* (Clinical Isolate 3347) Induced Sepsis via Caspase-1 in Male Wistar Rats

Chanchal Sharma and Sun Chul Kang[*]

Department of Biotechnology, College of Engineering, Daegu University, Jillyang, Naeri-ri, Gyeongsan, Gyeongbuk-38453, Republic of Korea

Oct 18, Thursday, 17:02-17:50 | Jade

Student Oral Session 3 Chair: ASNP director, Jongsuk Lee

S3-1 17:02-17:14

Irritant Reaction of Sahastara Remedy Ethanolic Extract on the Skin of Healthy Volunteers

Puritat Kanokkangsadal[1], Panlop chakkavittumrong[2] and Arunporn Itharat[1,3*]

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S3-2 17:14-17:26

Total Phenolic, Flavonoids Content and Cytotoxic Activity of *Hibiscus sabdariffa* Leaves Extracts against Human Liver and Intrahepatic Bile Duct Cancer Cell Lines

Patsorn Worawattananutai[1], Srisopa Ruangnoo[2,3] and Arunporn Itharat[2,3*]

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S3-3 17:26-17:38

Safety of Sahastara Remedy Extract Capsule in Treating Primary Osteoarthritis of the Knee Compared with Diclofenac (Clinical Trial Phase II)

Narin Kakatum[1], Puritat Kanokkangsadal[2], Piya Pinsornsak[3] and Arunporn Itharat[3,4*]

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S3-4 17:38-17:50

Safety of Prasaprohyai Ethanolic Extract Capsules in Healthy Volunteers (Clinical Trial Phase I)

Nichamon Mukkasombut[1], Waipoj Chanvimalueng[2] and Arunporn Itharat[1,3*]

[1]Department of Applied Thai Traditional Medicine, Faculty of Medicine, Thammasat University, Pathumthani,12120 Thailand, [2]Department of Otolaryngology, Faculty of Medicine, Thammasat University, Pathumthani, 12120 Thailand, [3]Center of Excellence in Applied Thai Traditional Medicine Research (CEATMR), Thammasat University, Klongluang, Pathumthani 12120, Thailand

Poster Sessions

Oct 18, Thursday, 13:00-14:00 | Crystal

Poster Session 1

P1 13:00-14:00

Posters with P1-number

Oct 19, Friday, 11:20-12:20 | Crystal

Poster Session 2

P2 11:20-12:20

Posters with P2-number

NATPRO 7

The 7th International Conference on Natural Products

October 18(Thu) - 20(Sat), 2018
Hotel Hyundai, Gyeongju, Korea

The Beginning of Asian Wave

Plenary Lecture

PL-1

Natural Products for Preventive Health in Ageing Populations

Peter Howe*

Institute for Resilient Regions, University of Southern Queensland and Clinical Nutrition Research Centre, University of Newcastle, Australia

Keywords: preventive health, nutraceuticals, vasoactive nutrients, endothelial dysfunction, resveratrol

As the world population rapidly ages, particularly in Asia, the socioeconomic burden of increasing disability calls for greater emphasis on preventive measures to maintain optimal mental as well as physical fitness. Diet and lifestyle recommendations are failing to address the epidemic of obesity and associated non-communicable diseases in affluent societies and the rising cost of therapeutic management is untenable. Functional foods and supplements (nutraceuticals) offer a viable alternative. Asian societies have benefited from traditional use of a wide variety of natural products predominantly of plant origin, the attributes of which are only now becoming recognized and adopted by Western societies. However, authorities must ensure that products are not only safe for consumers but fulfil the promised health claims. This calls for greater investment in high quality research to fully exploit the potential of natural products. Our research on bioactives including cocoa flavanols, omega-3 and resveratrol that support endothelial function and counteract systemic inflammation exemplifies this. Acting throughout the circulation, the effects of these *vasoactive* nutrients extend beyond the heart to impact the microvasculature in all tissues. It is not surprising that they can help protect against diabetes and dementia as well as heart disease, when one recognises the contribution of endothelial dysfunction to these conditions. Increased knowledge of underlying mechanisms will enable us to predict health benefits, those who are most likely to benefit and combinations of bioactives that will maximise benefit. Such predictions need to be validated in well-designed clinical trials to ascertain optimal intakes and delivery of bioactives to underpin health claims.

NATPRO 7

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October 18(Thu) - 20(Sat), 2018
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The Beginning of Asian Wave

Invited Oral Presentations

IS1-1

Development on Harvesting Technique of Bioactive Pigments from Marine Bacteria

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Keywords: marine bacteria, bioactive pigment, adsorbent resin, violacein, *Pseudoalteromonas luteoviolacea*, prodigiosin, *Pseudoalteromonas rubra*

Violacein and prodigiosin are bioactive violet and red pigments, respectively, produced by bacteria as pigments. They are currently important for pharmaceutical and cosmatics applications. Currently, supply of violacein and prodigiosin cannot meet the requirement of industrial purpose. Industrial product harvests require large scale fermentation and numerous organic solvents for the extraction and isolation process. This research demonstrated a potential technique for the isolation and purification of violacein and prodigiosin from fermentation broth of *Pseudoalteromonas luteoviolacea* and *Pseudoalteromonas rubra*, respectively. Biomass fermentation of marine sponge-associated bacteria collected from coastal of Thailand was subjected to six different adsorbent resins, such as HP20, XAD2, XAD4, XAD7, XAD16 and XAD1180, to evaluate the efficiency of violacein and prodigiosin production. Dispersion of XAD1180 enhanced the yield of violacein by 1.8-folds (3.05 g/L) after 16 h of cultivation, particularly when 2% w/v of XAD1180 was added to the ferment. In addition, harvest of the produced prodigiosin was improved by using adsorbent resins. Addition of 1% w/v of Diaion HP20 increased total prodigiosin recovery up to 1.5 folds, 2.0 gL-1.

IS1-2

New Marine Natural Products Sources: Extreme Environments

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Keywords: marine natural products, cold water natural products, Actinomycetes

Marine organisms are one of the sources for the active natural products with novel chemical structures. The extreme environments, such as polar, deep-sea, and cold water, are rising sources providing new chances with novel environmental niche. For example, the increase of marine natural products from the cold-water-derived microbes was from 22% to 71% for the last 10 years. Herein, I described some of natural products derived from the extreme marine environment which covers the Antarctic, deep-sea, and mud-flat.

IS1-3

Discovery of Bioactive Natural Products from Marine Microbes

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Keywords: marine bacteria, marine cyanobacteria, marine natural products, structure elucidation

Marine organisms are well known sources of structurally novel and pharmacologically active natural products. Particularly, marine microbes are widely accepted as the real and sustainable producers of marine natural products. A bloom forming marine cyanobacteria, *Leptolyngbya crossbyana* was found to produce antimicrobial compounds and anti-inflammatory compounds. Based on the NMR guided isolation and spectroscopic data analysis, the structures of biologically active compounds were revealed. An extract of a marine bacterial strain in the genus of Bacillus was revealed to produce anti-allergic compounds. Their planar structures and absolute configurations were elucidated by the combination of analytical techniques including spectroscopic data analyses, chemical derivatization, and biosynthetic gene cluster analysis. In the presentation, structure elucidation of biologically active marine natural products and their biological activity will be discussed.

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IS1-4

Organic and Biosynthesis of β-Carbolines

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Keywords: β-carbolinesb, reaction in water, Pictet-Spengler cyclization

β-Carboline alkaloids defined as heterocyclic amines with the 9H-pyrido[3,4-b]indole structure are widely distributed in the plants, marine creatures, insects and mammalians etc. Due to their pharmacological activity, they are biologically important and considered to be active components of the medicinal plants. The Pictet-Spengler cyclization of the tryptamine and aldehyde substrate, secologanin, produces tetrahydro-β-carboline alkaloids that occur in medicinal plant, *Catharanthus roseus*. Various tetrahydro-b-carboline compounds have also been synthesized in water.

IS2-1

Thai Medicinal Plant Recipes from the Manosroi III Database Containing Opium, Marijuana, Kratom and Tobacco: Possible Applications and Commercialization in Modern Medicine

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Keywords: Thai medicinal plant recipes, Manosroi III database, opium, marijuana, kratom, tobacco

Thai Medicine Plant Recipes Database Manosroi III (MS III) has been developed by Prof. Dr. Jiradej Manosroi and Prof. Dr. Aranya Manosroi since 1993. This MS III database collected recipes from all regions of Thailand including Lanna Kingdom region. At present, the MS III Database includes 87,414 out of 200,000 expected recipes. The narcotic plants, opium (*Papaver somniferum* L.), marijuana (*Cannabis sativa* L.), kratom (*Mitragyna speciosa* (Korth.) Havil.) and tobacco (*Nicotiana tabacum* L.) were searched from the MS III Database. From the total of 87,414 recipes, the number of recipes which contained opium, marijuana, kratom and tobacco were 457, 231, 51 and 61 respectively. Opium was used as analgesic, sedative, anti-tussive, anti-emetic, anti-diarrhea and mouth ulcers. Marijuana was used for the treatment of cancer, urticaria, insomnia, hemorrhoids and gaunt. Kratom was used to treat diarrhea, fever, diabetes, gastric ulcers and vomiting. Tobacco was used to cancer, asthma, leprosy, hemorrhoids and wound. The evidences of using these plants in folklore wisdom for over 700 years, which conferred the clinical study in modern drug discovery can be further investigated for new therapeutic regimen and new drug as well.

IS2-2

Thai Medicinal Plant Recipes from "Manosroi III" Database for Health and Beauty

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Keywords: Thai medicinal plant recipes, Manosroi III database, food supplements, cosmetics

Thai Lanna region has its own folklore wisdoms in various fields including pharmaceuticals, cosmetics and food supplements. The medicinal plant recipes were recorded in the dead script "Lanna script" in palm leaves, mulberry pulp paper or Siamese rough bush paper. The recipes were recorded in the Manosroi database program. Recipes for health (food supplements) and beauty (cosmetics) such as skin lightening, anti-aging, anti-acne, anti-hair loss and grey hair treatment can be searched from this database using keywords. Several recipes from the "Manosroi III" database have been developed as high commercial potential cosmetic and food supplement products. The extract from *Terminalia chebula* gall (called "Kot Phung Pla" in Thai and frequently found in many rejuvenile and longevity recipes) entrapped in elastic niosomes showed high physico-chemical stability and transdermal absorption through rat skin and an improved skin elasticity and roughness in human volunteers. The LG-10C recipe (containing 5 plants) exhibited immunomodulatory and telomerase activity enhancement in cell lines. The EDR2-N03 recipe (containing 5 plants) showed high phosphodiesterase (PDE) inhibition activity and sexual behavior improvement in the paroxetine-induced sexual dysfunction male ICR mice. The N040 recipe (containing 10 plants) gave high anti-proliferative activity on HeLa (cervical carcinoma) cell line and inhibited tumor weight in HeLa xenograft nude mice model. When developed in capsules, it gave about 62.5% of the cervical cancer patient response. This presentation has demonstrated the commercial potential of several cosmetic and food supplement products from "Manosroi III" database.

IS2-3

Stemness and Differentiation Potential-Recovery Effects of Sinapic Acid against Ultraviolet-A-Induced Damage through the Regulation of P38 MAPK and NF-κB

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Keywords: human mesenchymal stem cells, stemness, differentiation potential, HIF, sinapic acid, UVA toxicity

Ultraviolet A (UVA) irradiation exerts negative effects on stemness and differentiation potential of stem cells. This study aimed to explore the effect of sinapic acid on UVA-irradiation-induced damages to stemness and differentiation potential of human-adipose-tissue-derived mesenchymal stem cells (hAMSCs) and its UVA-antagonist mechanisms. Sinapic acid attenuated UVA-induced reduction in the proliferative potential and stemness by upregulating OCT4, SOX2, and NANOG. In addition, sinapic acid significantly recovered UVA-induced reduction in expression level of hypoxia-inducible factor (HIF)-1α. The antagonist effect of sinapic acid against stemness damage was mediated by reduceing PGE2 production through inhibition of p38 MAPK and NF-κB. Moreover, sinapic acid attenuated UVA-induced reduction in differentiation potential by downregulating the expression of macrophage migration inhibitory factor (MIF) and Kruppel-like factor (KLF) 2 gene while activating AMP-activated protein kinase (AMPK). UVA-induced inhibition of adipogenic differentiation was mediated by reducing MIF production through suppression of NF-κB. Taken together, these findings suggest that sinapic acid may ameliorate UVA-irradiation-induced reduced stemness and differentiation potential of hAMSCs. Therefore, sinapic acid might have potential as an antagonist agent to attenuate damages caused by UVA.

IS2-4

Monitoring Polyphenol by LC-MS/MS in Rat and Its Comparative Pharmacokinetics of a Single compound, Single Botanic Extract and Multiple Botanic Complex

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Keywords: drug-drug interaction, LC-tandem mass spectrometry, pharmacokinetic, botanic medicine

To investigate a comparative pharmacokinetics of a single compound, single botanic extract and multiple botanic complex, a sensitive, validated specific performance liquid chromatography tandem mass spectrometry (HPLC-MS/MS) method was developed for the analysis of polyphenol mangiferin in rat plasma. This validated method was applied to a comparative study on the pharmacokinetics and oral bioavailability of mangiferin following administration of mangiferin (a single compound), *Anemarrhenae Rhizoma* extracts (a single-herb extract), and a multiple botanic complex extract. Chromatographic separation was carried out on a reverse phase C18 column with the mobile phase consisting of methanol (containing 0.1% formic acid) and 0.1% (v/v) formic acid by gradient elution with negative electrospray ionization (ESI) interface in multiple-ion-monitoring (MRM) mode with m/z 421.0->301.0. A conscious and freely moving rat model was used for pharmacokinetic study of mangiferin. The pharmacokinetic results demonstrated that the oral bioavailability of mangiferin for the single compound administration was significantly lower than that of both the *A. Rhizoma* extracts and a multiple botanic complex extract. This phenomenon may be due to botanic ingredient-ingredient multiple compounds interaction. The results demonstrated that the area-under concentration versus time curve (AUC) value and bioavailability for the oral administration of single compound, mangiferin, was significantly lower than that of both the single herb and herbal preparation. This phenomenon may be due to herbal ingredient-ingredient or botanic-botanic interaction.

IS3-1

Probiotic Kimchi as Prevention of Gastrointestinal Cancer

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Keywords: probiotic kimchi, *Helicobacter pylori*, gastric cancer, colon cancer, prevention

Dietary intervention to ameliorate *Helicobacter pylori*-associated gastric carcinogenesis might be ideal due to long-term intervention and efficient rejuvenation of precancerous atrophic gastritis. Stimulated with our previous accomplishment that probiotic kimchi efficiently prevented *H. pylori*-gastric cancer, in this study, we compared the efficacy of three kinds of kimchi, specially recipe cancer preventive fermented kimchi (cpkimchi), fermented standard recipe kimchi (skimchi), and non-fermented Japanese style kimchi (kimuchi) on *H. pylori*-initiated, high salt promoted gastric cancer model and explored ER stress and antioxidative mechanisms initiated with RNAseq analysis. On animal models assessed on 24 and 36 weeks after *H. pylori* infection, we found cpkimchi afforded the best outcome of rejuvenating atrophic gastritis and significantly decreased tumorigenesis compared to skimchi and kimuchi, analyzed with gross lesion and pathological scores ($P<0.01$). On comparison of inflammatory cytokines and other genes implicated in *H. pylori*-associated atrophic gastritis, COX-2, IL-1b, IL-6, iNOS, NF-kB, STAT3, VEGF, and PDGF, highest inhibition was achieved with cpkimchi, while not in skimchi or kimuchi. Using RNAseq analysis, we found transcriptomes implicated in ER stress, oxidative stress, inflammation and apoptosis were pivotally targeted in amelioration of *H. pylori* infection. Using homogenated from 24 and 36 weeks of each group, we could confirm elevated expressions of p-PERK, IRE, ATF6, p-elf, and XBP1 in control group were significantly decreased with dietary intake of cpkimchi, while not with either skimchi or kimuchi. Also significant increased expressions of HO-1, GPX, g-GCS, and GSTpi were noted with cpkimchi. Conclusively, dietary intervention of special recipe kimchi, cpkimchi, can be possible for the prevention of *H. pylori*-associated carcinogenesis.

IS3-2

Alcoholic Fatty Liver Damage Protection of Natural Products

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Keywords: *Molinga oleifera, Angelica gigas*, alcoholic fatty liver, western blotting, Tc^{99m}

Alcoholic steatohepatitis has caused alcohol consumption and the liver damage is due to diet habits of alcohol administration. We investigated the abilities of *Molinga oleifera* and *Angelica gigas* including their components to protect live accumulation of triglyceride. *M. oleifera* leaf and *A. gigas* were analyzed by HPLC and NMR and evaluated for alcoholic liver damage protection. *M. oleifera* leaf extract and decursin of *A. gigas* showed interesting liver protection activity. As a results, flavonoids were found from *M. oleifera* extract by HPLC, indicated that, among 7 components, the content of flavonoid was 8.2mg of 3-O-caffeoylquinic acid, 5.0mg of 4-O-caffeoylquinic acid, 6.3mg of multiflorin B and 8.1mg of Quercetin-3-O-ß-D-glucoside. In *A. gigas*, decursin and decursinol angelate were prepared by semi-synthetic method. Prevention of alcoholic steatohepatitis was evaluated by histologic data from C57B/L6 mice.

IS4-1

Isoflavonoids Production from Cell Culture of *Pueraria candollei* and Molecular Characterization of Genes Involved in Isoflavonoids Production

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Keywords: gene cloning, isoflavonoids, plant tissue culture, *Pueraria candollei*

Pueraria candollei (commonly known as "white kwao krua") is an endangered medicinal plant which has been reported to synthesize and accumulate a high level of isoflavones in its tuberous roots, such as daidzin, daidzein, genistin, genistein and puerarin. The amount of these bioactive compounds in the natural growing plants is highly dependent on various factors, such as geographical location, climate and disease. An alternative approach for the production of these bioactive compounds such as plant cell culture has been intensively studying. In this paper, the production of daidzein and genistein from callus and hairy root cultures of *P. candollei,* and the molecular cloning and characterization of chalcone synthase (*PcCHS*), isoflavone synthase (*PcIFS*) and 2-hydroxyisoflavanone dehydratase (*PcIFD*) genes were investigated. Callus cultures were established from various parts of explants and their growth profiles and isoflavones production in MS medium were determined. Although the growth profiles of all calli were not significantly different, callus originated from stem accumulated greater daidzein and genistein contents than the others. Over 2- and 3-fold of growth and isoflavones production, respectively, were illustrated at 32±2°C, as compared with those at 25±2°C. Both daidzein and genistein contents in callus established from stem were approximately 34-fold higher than in tuberous roots. The hairy root cultures of *P. candollei* were established using *Agrobacterium rhizogenes* ATCC15834, and their growth and isoflavones production under various cultivation conditions were evaluated. As found in this study, the MS was proved to be a good cultivation medium for the growth and isoflavones production of hairy root cultures. Light and dark conditions did not affect the growth and isoflavones production. Sucrose concentration of 4.5% (w/v) promoted the growth of hairy root cultures, however the concentration of 3.0% (w/v) preferred for daidzein and genistein accumulation. An incubation temperature of 22±2°C and agitation speed of 110 rpm found to be the best conditions for isoflavones production. Molecular cloning of *PcCHS*, *PcIFS* and *PcIFD* genes and their characterization and expression profiles were conducted. The full-length open reading frame (ORF) of *PcCHS* was 1170 bp, encoded for 389 amino acid residues with the relative molecular mass of 42.6 kDa, while that of *PcIFS* was 1566 bp encoded a polypeptide of 521 amino acid residues with the relative molecular mass of 58.9 kDa. Furthermore, the ORF of *PcIFD* was 972 nucleotides in length encoded a polypeptide of 323 amino acid residues with the relative molecular mass of 35.5 kDa. All these genes belong to a multigene family, and their expressions were detected in leaf, stem, and root of the plant. Temperature, UV-B and wounding treatments stimulated the expression of all these genes.

IS4-2

A Comparative Analysis of Two Fatty Acid Hydratases from *L. Acidophilus*: Site-Directed Mutagenesis Studies Define Key Amino Acids Responsible for Substrate Promiscuity and Regioselectivity

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Keywords: biotechnology, fatty acid hydratases, hydroxy fatty acids, enzyme engineering, substrate promiscuity

Hydroxy fatty acids (HFAs) are valuable natural derivatives of unsaturated fatty acids with potential uses in pharmaceutical, cosmetics and plastics industries. The presence of a hydroxy group introduces a new functionality to the less reactive part of a fatty acid molecule, giving HFAs distinct physical and chemical properties. An important route for biosynthesis of HFAs in nature is the stereo- and regio-selective hydration of the double bond of unsaturated fatty acids by the enzyme fatty acid hydratase (EC 4.2.1-). Many of the fatty acid hydratases described to date have limited substrate promiscuity and mainly active against C18 unsaturated fatty acids. Besides, regioselectivity is also limited and insertion of hydroxyl group is generally into the C10 position to produce 10-hydroxy fatty acid. However, broadening the substrate range and regioselectivity of hydratases might render a diverse set of HFAs that can exhibit improved properties for various applications. A recently identified fatty acid hydratase from *Lactobacillus acidophilus*, named as FA-HY1, demonstrated broad substrate range and regiodiversity by hydrating various double bond positions of C16 to C22 fatty acids (1). Moreover, *L. acidophilus* possesses one more fatty acid hydratase in its genome, named as FA-HY2, which has 76 % similarity to FA-HY1. Unlike FA-HY1, FA-HY2 can only produce 10-hydroxy fatty acids from C16 and C18 fatty acids, similar to the rest of the fatty acid hydratases studied so far. In order to determine the basis of this selectivity difference between the two enzymes, we performed a comparative analysis of active site residues based on a crystal structure of another similar fatty acid hydratase (2). Among the residues that are different between the two enzymes, three residues (histidine, threonine and isoleucine) attracted our attention, especially due to their proposed interaction with the carboxylate end of the bound substrate within the active site. When we mutate these three residues in FA-HY2 to the corresponding residues in FA-HY1, we can obtain variants that exhibit a significant shift in regioselectivity and substrate promiscuity towards that of FA-HY1, rendering a broader substrate scope and regiodiverse products. Our results indicate that the extent of shift from FA-HY2 to FA-HY1 is dependent on the identity of the fatty acid substrate used, paving the way for designing tailor-made fatty acid hydratases with desired substrate specificity and regioselectivity for production of non-natural HFAs for various purposes. Furthermore, we demonstrate the HFA production activity of wild-type enzymes and their variants against extracts of microalgae species that contain a complex mixture of unsaturated fatty acids.

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IS4-3

Plant Stem Cell for Anti-Aging

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Keywords: plant stem cell, rose stem cell, lotus stem cell, anti-aging, SMART-RC^2, NET

Plant stem cells such as the rose stem cell and the lotus stem cell are widely used as active materials in the field of cosmeceuticals due to various effects such as whitening, wrinkle improvement and hair growth. Plant stem cells have a typical ability to form complete entities, and each type of plant stem cell has a unique phytochemical. These phytochemicals have various anti-aging effects based on antioxidant and anti-inflammatory actions. Plant cell culture technology can be used to culture plant cells indefinitely from a cell line derived from one plant seed, without damaging the natural environment. It is to obtain undifferentiated cell masses called callus from germination, and cell lines are selected and cultured in a bioreactor. In the case of large-scale culture of plant cells in a bioreactor, there is a method of increasing a specific phytochemical by adding a chemical elicitor such as methyl jasmonate to the cell culture media in bioreactors which is conventional method. Here we have developed unique plant cell culture technique for accumulating phytochemicals to the cells using of radiofrequency wave as a physical elicitor. This is called SMART-RC^2 (Secondary Metabolite Accumulated Radiofrequency Technology with Recontrolled Cell Culture). This technology that utilizes this high-frequency waveform can accumulate secondary metabolites in plant cells during cell culture. This technology has been certified by the Ministry of Trade, Industry and Energy as a new excellent technology (NET). Plant cell materials using this technology will be widely used in cosmeceuticals, health functional foods, and pharmaceuticals.

IS4-4

Antioxidant, Anti-Tyrosinase Activities and Formulation of Facial Mask from Kombucha Tea

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Keywords: antioxidant, anti-tyrosinase, facial mask, kombucha tea

Kombucha tea is one of the trendiest drinks in the health food of the beauty market because it's high in probiotics. Korean beauty brands have promoted a large numbers of cosmetic products filled with topical probiotic benefits. The aims of this study were to measure the total phenolic content, antioxidant, anti-tyrosinase activities and formulation of facial mask from kombucha tea. We brewed our own kombucha tea and SCOBY as the ingredients of face mask. Folin-Ciocalteu assay was performed to evaluate total phenolic contents. The fermentation released slightly higher amount of phenolics, 826.91 ppm gAE. Free radical scavenging activity of kombucha tea was evaluated using DPPH and ABTS assay. TEAC were 1,021.12 and 1,785.52 ppm, respectively. Then, kombucha tea was incorporated into gel base as a facial mask at 10% concentration. Anti-tyrosinase activity of kombucha facial mask was 55.86%. The facial mask was applied in 26 volunteers to evaluate the moisturizing effects by Corneometer®. The result showed significantly higher moisture content after use the mask than the gel base with averaged 54.51%. After removed the mask, all volunteers said that their skin felt smooth and had natural shine with no itchy or irritation. The results indicate the kombucha facial mask may be used as new alternative cosmetic products.

IS5-1

Anti-Photo-Aging Potentials of Thai Flower Extracts

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Keywords: *Lagerstroemia speciosa*, skin photo-aging, UVA-irradiation, hydrogen peroxide-induced oxidative stress, MMPs, collagen

With the prosperity of colorful flowers that are blossomed in the late spring to summer at different regions of Thailand, these flowers are felt down without utilization. Our screening data on several extracts from the local flowers in the northeast have demonstrated their high anti-oxidative and anti-tyrosinase activities. Photoaging is one of an important skin aging process that causes the people to be aged at earlier age. Natural ingredients with anti-oxidative, anti-tyrosinase, anti-wrinkle activities are incorporated into the cosmeceutical products. Many colorful flowers were collected and extracted with alcohol then tested for their bio-activities related to skin photo-aging. Among 12 types of colorful flowers, *Lagerstroemia speciosa* (Inthanin-nam in Thai) has shown potential bio-activities to protect the photo-aging process. Ethanolic extract of *L. speciosa* flower exhibited strong anti-oxidative activity in comparable range of ascorbic acid. The extract inhibited the activities of skin aging-related enzymes including hyaluronidase, elastase and tyrosinase. It is interesting to reveal that at the same tested concentrations, the extract increased the proliferation of human dermal fibroblasts in a dose-dependent manner at higher level than the positive cell proliferation stimulator, ascorbic acid. The intrinsic anti-aging effect of the extract had been observed in the hydrogen peroxide-treated human keratinocytes. Flow cytometric analysis had demonstrated that the extract significantly reduced the H_2O_2-treated keratinocyte populations in early apoptotic, late apoptotic and necrotic stages in comparable ranges of ascorbic acid. Under UVA-irradiation, the extract protected the cell death of both keratinocytes and fibroblasts with a significant decrease in the reactive oxygen species and a significant increase in the levels of anti-oxidative enzymes, including superoxide, catalase and glutathione peroxidase. Moreover, pretreatment with the extract significantly inhibited UVA-induced TNF-alpha, IL-1beta and IL-6 genetic expressions in keratinocytes. In fibroblasts, pretreatment with the extract significantly inhibited the UVA- induced an elevation of MMP-1, MMP-2 and MMP-9 and a reduction of type-1 procollagen. The results indicate the protective effects of this flower extract for skin intrinsic and photo-aging abilities via anti-oxidative stress, inflammatory mediators, MMP production and collagen synthesis, suggesting that the extract can be considered as a good natural material to be potentially used as an anti-aging ingredient in skin care formulations.

IS5-2

Current Policy and Strategic Plan in Research and Development of Herbal Products and Traditional Medicine in Thailand: Challenge and Reform

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Keywords: policy, strategic plan, herbal product, traditional medicine, Thailand

Biodiversity especially plant is the most important source of medicines for several thousands of years. Thailand is the tropical country rich in medicinal plants called *"Samun Prai Thai"*. The recent Constitution of the Kingdom of Thailand state that *"A person and a community shall have the right to manage, maintain and utilize natural resources, environment and biodiversity…"* reflecting an important given by the government on the medicinal plant and traditional medicine issue. Our government has promoted the use of "*Samun Prai Thai*" and launched the first National Master Plan on the development of Thai Medicinal Plants (2017-2021) in year 2017. In this plan, there are six subcommittees including subcommittee on Research and Innovation. The key strategy is composed of research and innovation in plantation and raw material, industry and innovation platform, medical services and reformation of research management system which could bring a huge challenge to the country.

IS6-1

Preclinical Studies of *Ageratum conyzoides* L. and *Hedyotis corymbosa* L. Extracts-Loaded Nanoparticle Gel on Papain Induced Osteoarthritis

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Keywords: *Ageratum conyzoides*, *Hedyotis corymbosa*, osteoarthritis, papain, inflammation

At present, there is no available treatment effectively preventing or reversing progressive joint damage, therefore, development of innovative treatments as an option for OA (osteoarthritis) treatment. Drugs used are generally a class of NSAIDs (Anti Inflammatory Non-Steroids) which are more effective as a pain reliever in moderate to severe cases, but can increase the risk of serious gastrointestinal and cardiovascular (McCulloch et al., 2017). In the previous studies, the *Ageratum conyzoides* L. extract could lower levels of TNF-α that can decrease inflammation and MMP-9 levels, which lead to prevention of cartilage degradation in osteoarthritis. *Hedyotis corymbosa* L. extract has a preventive effect on the inflammation that occurs in knee joint induced by sodium iodoacetate. In this study, the combination of *A. conyzoides* and *H. corymbosa* were formulated in a nanoemulsion carrier system and mixed with a gel base to form nanoemulgel. The production of nanoemulgel is aimed at increasing the penetration of quercetin and hydrophobic, acidic ursolates. To this end, 50 white male Sprague Dawley rats were divided into 8 groups. All groups, except the control group, were enjected with papain to obtain osteoarthritis condition. After 28 days of OA induction, all group starts to get treatments. The control and the negative group received gel base topically, and the positive group received sodium diclofenac gel topically. A combination of *A. conyzoides* and *H. corymbosa*-loaded nanoparticles gel was treated to four groups at different doses. The last group received non-nanoparticles combination extract gel. Each group received the treatment until day 70. After 42 days of treatment, blood samples were collected for serum analysis, and the knee joint was subjected to histology analysis. From the results, Nanoemulgel of the combination of *A. conyzoides* and *H. corymbosa* have good charactheristic as gel dosage form. By Franz diffusion analysis, nanoemulgel has good penetration. It was found that the combination of the extracts could recover inflammation after papain injection better than the non-formulated extract.

Reference

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IS7-1

Analysis of COMT Inhibitors from Plant Source and Its Impact on Bioavailability of Phytochemicals

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Keywords: COMT, flavonol, catechins, excipient food, bioavailability

Flavonols are known as catechol-containing flavonoids could positively affect absorption of catechins due to their strong affinity to catechol-*O*-methyl transferase (COMT), which can methylate and excrete catechins. COMT inhibitory activity among quercetin, fiestin, kaempeferol, and myricetin. The current study examined the effect of quercetin and fisetin on epi-catechins (ECs) absorption by using a Caco-2 cell and an *in vivo* study. Intestinal transport of total catechins by Caco-2 cell was enhanced from 1.3 to 1.6-fold and 1.4 to 1.7-fold by adding quercetin and fisetin, respectively, compared to the control. While EC had the highest value of intestinal transport (169% of control) in 10% quercetin treatment, EGC (235%), EGCG (244%), and ECG (242%) were significantly transported at 5% mixture of quercetin and fisetin ($p<0.05$). In *in vivo* pharmacokinetic study, the area under plasma concentration-time curve (AUC, ng*h/mL) were also higher in rats orally administered EGCG with 10% quercetin (365.5±25.5) or 10% fisetin (825.3±46.7) than those with EGCG single intake (111.3±13.1). Methylated quercetin and methylated fisetin was determined (*m/z)* 317.24 and *m/z* 301.25 $[M+H]^+$ with their own product ions, respectively. Results indicate quercetin or fisetin is superior to ECs for methylation by COMT. In addition, The digestive stability of total epi-catechins from GT with the addition of 2% *Dendropanax morbifera* (DM) was up to 1.12 times higher than that of onion peel (OP). The combination effect of OP with DM, observed in 2% of OP+DM at the 1 to 4 ratio (w:w), significantly increased (1.31 times) the digestive recovery of total epi-catechins ($p<0.05$). The remarkable cellular uptake of EC (185.36%) and ECG (188.08%) were found in 4%OP+DM (4:1, w:w), and those of EGC (112.30%) and EGCG (136.27%) were shown in 2%OP+DM (4:1, w:w), and 1%OP+DM (1:1, w:w), respectively. The peak plasma concentrations of total epi-catechins from GT, GT+5%OP, GT+5%DM, and GT+2%OP+2%DM were 1044.78 ± 609.10, 2267.18 ± 3734.38, 1270.35 ± 547.59, and 714.53 ± 499.27 ng/mL, respectively. Co-ingestion of GT with flavonols rich excipient food possibly enhance the absorption of epi-catechins because flavonols act as not only enhancer of digestive stability but also modulator of biotransformation of epi-catechins.

IS7-2

The Effects of *Bupleurum falcatum* on the Chemotherapy-Induced Peripheral Neuropathy

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Keywords: *Bupleurum falcatum*, chemotherapy, neuropathic pain, mechanical hypersensitivity

Neuropathic pain refers to a complex syndrome which is caused by a lesion or disease of the somatosensory system. The symptoms of neuropathic pain include abnormal sensitivity to otherwise innocuous stimuli (allodynia) or hyperalgesia which is described as an increased sensitivity to painful stimuli. Induction of hyperexcitability in primary sensory neurons is resulted from maladaptive changes in sensory nervous system after nerve injury and has been proposed as a mechanism for neuropathic pain. Currently available therapeutics for the treatment of neuropathic pain include tricyclic antidepressants, serotonin noradrenaline reuptake inhibitors, the anticonvulsants gabapentin and pregabalin, and opioids. However, in addition to adverse effects, these drugs showed limited response in patients with neuropathic pain, providing a rationale to explore new drug classes acting on novel targets and with better efficacy/safety profile. In this talk, I will present a recent work on the discovery of the herbal medicine that significantly alleviated chemotherapy-induced mechanical hypersensitivity in mice.

IS7-3

Analysis of Furanocoumarins in Grapefruit and Their Metabolites in Plasma and Urine Using UPLC-MS/MS

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Keywords: grapefruit, furanocoumarin, UPLC-MS/MS

As photoactive compounds, furanocoumarins were extracted from grapefruit (whole, flesh, peel and juice) using Agilent QuEChERS (Quick, Easy, Cheap, Effective, Rugged and Safe) Extract kit which is widely used to extract pesticides from fruits and vegetables. Seven furanocoumarins: bergaptol, psoralen, 8-methoxypsoralen (8-MOP), bergapten, 6',7'-dihydroxybergamottin (6',7'-DHB), epoxybergamottin, and bergamottin in grapefruit (whole, flesh, and peel) and grapefruit juice were measured using UPLC-MS/MS. Also, the concentration of furanocoumarins after ingestion of grapefruit or grapefruit juice in the plasma and urine of 6 healthy young adults were determined. Except for 8-MOP, 5 furanocoumarins were detected in grapefruit or grapefruit juice. Bergamottin and 6',7'-DHB were predominant compounds in grapefruit flesh and juice and plasma while bergaptol and 6',7'-DHB were major compounds detected in the urine. The results demonstrated that bergamottin and 6',7'-DHB was metabolized to bergaptol. These findings indicate that furanocoumarins from grapefruit can be absorbed and metabolized in the body and reliably measurable in plasma and urine after ingestion.

IS7-4

Development of Hepatoprotective Functional Food Using Garlic Extract Fermented with Lactic Acid Bacteria

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Keywords: hepatoprotective, functional food, garlic, *Lactobacillus plantarum*, liver

Garlic has been reported to have numerous beneficial effects, like antioxidant, anticancer, antibacterial, cholesterol-lowering, antiinflammatory, and antidiabetic properties. One of the well-known processed garlic products, aged black garlic, is produced by an aging process at a condition of high temperature and humidity. Even though there are numerous good effects of aged black garlic, it has the serious defect that the manufacturing process takes more than 30 days.

SK bioland Co., Ltd. has developed products with enhanced functional properties compared to raw garlic, using a short-term manufacturing process. We manufactured fermented garlic extract using *Lactobacillus plantarum* (LAFGE) and it showed an improved garlic-specific pungent taste and aroma. In particular, the manufacturing process of LAFGE requires only 3 days. We reported that garlic-derived organosulfur compounds (OSC) from LAFGE, including cycloalliin, S-allyl cysteine (SAC), S-methyl cysteine (SMC), and S-ethyl cysteine (SEC), were increased during the fermentation compared to non-fermented garlic extract. Furthermore, consistent with the increases of such OSC, the antioxidant activity of LAFGE was enhanced compared to non-fermented garlic extract.

In pararell, the ameliorating effects of LAFGE on non-alcoholic fatty liver were investigated using oleic acid-induced steatotic HepG2 cells. Treatment with 1 mg/mL LAFGE decreased intracellular lipid accumulation approximately 1.5-fold, compared to that achieved with non-fermented garlic extract. LAFGE reduced fatty acid influx into hepatocytes through down-regulation of FAT/CD36 mRNA expression in the steatotic HepG2 cells. LAFGE showed concentration-dependent down-regulation patterns in protein expression of SREBP-1c and FAS, as determined by Western blot. These results suggest that LAFGE treatment improves hepatic steatosis triggered by the imbalance of hepatic lipid metabolism owing to oleic acid treatment.

Using in vivo animal model, we investigated the hepatoprotective effects of LAFGE on alcohol-induced fatty liver damage. The weight of liver tissue of the LAFGE diet groups decreased in a dose-dependent manner compared to that of the normal diet group. The activities of typical serum enzymes such as ALT, AST, and ALP were low in the LAFGE 200 mg/kg administered group. The LAFGE 200 mg/kg administered group significantly decreased values of TBIL and DBIL, which are an important index of liver damage. LAFGE also ameliorated alcohol-induced hepatic lipid accumulation in histological analysis dose-dependently. In addition, total GSH and reduced GSH levels in LAFGE-treated groups were gradually recovered up to normal levels.

Furthermore, a double-blind, randomized, placebo-controlled clinical trial showed that LAFGE improved hepatic function in adults with mild hepatic dysfunction.

The overall results indicated that LAFGE improved unique tastes and odors of raw garlic through lactic acid fermentation technology and thus could be a commercially potential material for hepatoprotective functional foods against non-alcoholic/alcoholic fatty liver.

IS8-1

Research and Drug Development of Thai Traditional Remedies for NCDs Treatment

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Keywords: roselle, ginger, Benjakul, Thai traditional remedy, chronic diseases, NCDs product

Thai Traditional medicine (TTM) has long been used to prevent and treat many diseases in Thailand. Its knowledge regard to treat on holistic health. The illness and sickness caused from imbalance in patient's body. The prevention and treatment of diseases are balancing in body and mind. In this topic will give principle of TTM for treatment non-communicable diseases or NCDs such as hypertension, diabetic, dyslipidemia, allergy, osteoarthritis including cancer which showed the highest of dead in Thailand. Herbal foods and herbal drugs in National Drug lists for NCDs treatment which were researched by CEATMR were regarded in this topic. The drug development of these herbal drug was researched by following the WHO drug discovery guide line. We studied on cultivar, growing, extraction, biological and pharmacological activities related chronic diseases such as anti-inflammatory, antioxidant and related activities, also include toxicity in animal and human model. The clinical research was also regarded in this presentation. Four selective herbal product which were mentioned are complete research line and can used in human such as roselle, ginger, Benjakul and cancer remedy. Roselle tablets were developed to be used for the treatment of antihypertension, antidiabetics, dyslipidemia, etc. Ginger was investigated to be antihistamine or antiallergy and it was developed to be ginger extract capsule to test in clinical trial phase 2 with rhinitis patients by comparison with Loratadine. Thai Traditional Remedy called Benjakul (BJK remedy) which has been widely used adaptogenic drug were mentioned in this topic. It was also investigated on clinical researched for anticancer on stage 4 lung cancer, anti-inflammation in osteoarthritis (OA) and dyslipidemia. Cancer preparation of Kumpramong temple was researched to use for treatment cancer patients. These researches are only examples for investigating herbal drugs of CEATMR. Their results should have benefit for treatment chronic diseases and also safe. These herbal drugs are alternative drug of choice for reduce using chemical drugs which are not safe for using in long period time.

IS8-2

Research on Thai Traditional Medicine for Women Health

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Keyword: women health, Thai traditional medicine, postpartum care

The Thai traditional scriptures, Maha-chotarat and Prathom-jinda are knowledge about women's health and contain information of medicinal plants and food plants that can prevent and treat the symptoms of women's' diseases such as dysmenorrhea, reproductive cancer and breast cancer, in addition to common symptoms during pregnancy such as morning sickness, breast milk production, and others.

The Maha-chotarat scripture describes two types of menstruation, Lohit-prokatitod as primary dysmenorrhea where there is an absence of pelvic pathology and Lohit-tujalittod as secondary dysmenorrhea, menstrual disorders caused by a distinct organic disease, such as pelvic inflammation, endometriosis, fibroids, myoma uteri, adenomyosis and ovarian cyst. Menstrual disorders arise from the four elements not being in balance and it leads to illness. Thai folk doctors believe that menstrual disorders are one of the causes of cancer. Normally, women have menstruation every month and may have some menstrual pain. It is normal if there is discomfort during menstruation, such as menstrual pain, nausea and muscle pain. The menstruation is not normal if there are more illnesses such as high fever, breast cysts, heavy vaginal bleeding, adenomyosis and ovarian cyst. These symptoms may develop into ulcers in the uterus or breast and eventually become cancer. Thai medicinal and food plants are used to treat menstrual pain (primary and secondary dysmenorrhea) and reduce the risk of cancer by reducing inflammation. Herbal preparations for cancer and inflammation are composed of many medicinal and food plants to balance the four body elements (Earth, Water, Wind and Fire). Such medicinal and food plants also destroy cancer cells and reduce side effects or other symptoms; e.g., pain, fever, nausea and abscesses.

Plant species such as finger root (*Boesenbergia rotunda* Linn), pepper (*Piper nigrum* Linn), cassumunar ginger (*Zingiber cassumunar* Roxb.), ginger (*Zingiber officinale* Roscoe.), shampoo ginger (*Zingiber zerumbet* (L)Smith), Hua-Khao-Yen (Thai name) (*Dioscorea birmanica* Prain & Burkill) and Leard-Ngaam remedy (Thai name) (the remedy for primary dysmenorrhea) have long been used to treat women's health and is described in Maha-chotalat scripture. Research has found that they have high antioxidant activity, can inhibit nitric oxide and prostaglandins (the pro-inflammatory mediator that increases uterine contraction during menstrual period) and are cytotoxic ingredients to breast cancer cells via SRB assay. Notably, except for *Z. zerumbet* they all have high cytotoxic activity against cancer cells but no toxicity against human normal cells.

The Prathom-jinda scriptures give instruction regarding fertilization and maternal care during pregnancy including childbirth and postpartum care. Medicinal plants listed in Prathom-jinda scriptures are still used for treating symptoms during pregnancy, and some medicinal plants are daily used in Thai food. They include ginger (*Zingiber officinale* Roscoe), lemon grass (*Cymbopogon citratus*, DC.) and banana blossom (*Musa acuminata* Colla) and many others. Ginger rhizome are composed of gingerol and shogaol that act as carminatives and aromatic stimulants to the gastrointestinal tract and are widely used to treat flatulence, nausea and vomiting, all of which are commonly found during pregnancy. Research has also found ginger can reduce morning sickness. Further, banana blossom is an ingredient in a popular food curry of Thailand called Kangliang that Thai folk doctors commonly use for stimulating breast milk production. In addition, herbal steam and hot pot are used for postpartum care.

In summary, traditional Thai medical principles and modern research are accessible and effective tools to apply the medicinal and food plants for preventing and treating of women's diseases. Maintenance and promotion of women's health by the mechanisms of antioxidation, anti-inflammation, anti-uterine contraction, and cancer risk reduction can be standard best practice. In the same way, food plants listed in Prathom-jinda scriptures can reduce drug use during pregnancy and postpartum. Such usage is safer for women than taking modern drugs.

IS8-3

Rice Bran Extracts Provide Protective Effects on Diabetes Mellitus and Hypertension

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Keyword: rice bran hydrolysates, diabetes, hypertension, insulin resistance

A large body of evidences documents that diabetes mellitus (DM) is a major risk factor for cardiovascular disease (CVD) including atherosclerosis, coronary heart disease, and renal disease. Several predisposing factors affecting the development of DM and CVD have been identified, for instances sex, age, dyslipidemia, insulin resistance and hypertension. Some of them are preventable via life style modification and pharmacotherapy. Rice bran, derived from the outer layer of rice grain, contains a number of nutritional and non-nutritional constituents which have showed to have insulin sensitizing effect. Rice bran hydrolysates (RBH) prepared from Thai Hom-Mali Rice by alkaline solubilization and protease digestion were used in the studies. RBH was fed to metabolic syndrome rats induced by feeding with high carbohydrate and high fat (HCHF) diet. Rats developed insulin resistance and dyslipidemia in association with elevation of lipogenic and proinflammatory gene expression. The abnormalities were improved by RBH treatment. In a similar model, rats developed high blood pressure with stiffening of arteries. Treatment with RBH ameliorated hypertension and prevention of vascular remodeling in association with down-regulated NADPH oxidases and up-regulated eNOS. In diabetic db/db mice, animals were fed with normal chow diet or RBH for 8 weeks. Mice developed severe hyperglycemia with diabetic nephropathy. RBP treatment improved insulin sensitivity, FBS and urinary albumin/creatinine ratios, prevention of the thickening of glomerular basement membrane and kidney fibrosis. The effects of RBH were associated with suppression of proinflammatory cytokines, proangiogenic, fibrotic and collagen expression. The studies indicate the potential use of RBH for the prevention diabetes and cardiovascular diseases.

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IS8-4

Going Vegan: The Path of the Future

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Keywords: vegan, future, food industry, vegan products, lifestyle

There are evidences of people abstaining from eating animal products as far back as 500 BCE, namely Greek Philosopher and Mathematician: Pythagoras. He believed in the humane treatment of animals and would explain to his followers and countrymen on why he was against the consumption of animal flesh which affected human psyche. Pythagoras had a striking appearance: tall, handsome and even 'God-like', like a descendent of Greek Gods Apollo and Zeus. This abstinence from meat consumption however was not Pythagoras' original idea, most likely he was influenced by the priests of Ancient Egypt, where the rejection of eating meat was already recognized 5000 years ago.

In November 1944, Donald Watson called a meeting with several other Vegetarians to discuss the non-dairy vegetarian diets and lifestyles. He introduced the word 'Vegan'; a new word derived from the first three letters and last two letters of 'Vegetarian'. Donald Watson said: it marked the "beginning and end of vegetarian" and thus The Vegan Society in UK was established by him 74 years ago.. A vegan (strict vegetarian) does not consume meat, dairy products, eggs, honey, or any product derived from an animal. A vegan diet can (and should) be a wide variety of delicious, nutritious foods, including vegetables, grains, nuts, legumes, seeds, and fruits. Vegans don't wear or use leather, fur, silk, wool and products made with animal ingredients, products that are filtered using animal parts (such as some wines, beers, and white sugars), and products that have been tested on animals. Veganism is not just simply a dietary preference, it is a lifestyle by choice which places priority in life, health and the environment.

Today there is a gigantic issue: Vegan products are not easily available by the mass public or to the commoners. Prices of Vegan products tend to be sky high, which makes living a Vegan Lifestyle a struggle. The daily lives of most people are also hectic nowadays. Most people don't have the time or energy to cook their own meals, so it's about time for us to look into the manufacturing of easily accessible Vegan Products to cater to the people around the world.

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IS9-1

Novel Multifunctional Natural Ingredient for Skin Care from Korean Native Plant

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Keywords: *Sedum takesimense* Nakai, multifunction, antimicrobial, anti-inflammation, anti-acne, skin brightening

Sedum takesimense extract (STE, Seomgrin THC™) is a novel ingredient that has anti-inflammation, antimicrobial and skin brightening activities. *S. takesimense* is a native plant of Dokdo and Ulleungdo, and is known as a perennial succulent herb of Crassulaceae. The major active compounds of STE is 2,4,6-trigalloyl glucose and 1,2,4,6-tetragalloyl glucose. The STE has broad spectrum antimicrobial activity against to *Escherichia coli*, *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Propionibacterium acnes*. Especially, STE showed a remarkable effect on controlling of *P. acnes* and the MIC value was at 150 μg/ml which is 13 times stronger than azelaic acid. The extract at 400 μg/ml showed potent anti-inflammatory activity that reduce the production of nitric oxide by 92% and suppress the expression of IL-1b and TNF-α by 86% and 68%, respectively. And the antioxidant activity of STE was evaluated by DPPH and ABTS free radical scavenging activity, its IC_{50} value was 111.35 μg/ml and 39.2 μg/ml. Furthermore, STE strongly inhibited tyrosinase activity and melanin production as comparable to kojic acid and arbutin. So STE is a promising new multifunctional cosmetic material.

IS9-2

Approval Procedure and Present Conditions of Functional Ingredient for Health Functional Food in Korea

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Keywords: MFDS, functional ingredient, approval procedure, health functional food, evaluation

Ministry of Food and Drug Safety, MFDS, evaluates standards and specifications, safety, functionality of functional ingredient for health functional food as ingredient or element individually recognized which controlling nutrients for the structure or functions of the human body or providing beneficial effects to health purposes, such as physiological effects. Approval of functional ingredient for health functional food is government permission system through functional health foods deliberation committee and evaluation of submitted document related to the standards and specification, safety, functionality based on the "Regulation on Approval of Functional Ingredient for Health Functional Food" (Ministry of food and drug safety notification No. 2016-141). Functional ingredients for health functional food are evaluated characteristics of the ingredients, current status of approval and use in domestic or foreign countries, manufacturing methods and related data, specification on marker compound and data on test method, safety and functionality contents included human study and related data. Finally, functional ingredient for health functional food through functional health foods deliberation committee The treatment period necessary for the approval of ingredient shall be within 120 days from the date of receiving. Functional ingredient for health functional food consists of notified ingredient and individually recognized ingredient. MFDS approved notified ingredient 96, individually recognized ingredient 592 until now. MFDS hold assorted discussion, civil briefing session for technical support and provision of information according to increasing health functional food market in korea.

IS10-1

The Potential Applications of Riceberry Rice-Bran Phytochemicals in Preventive and Clinical Medicine

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Keywords: riceberry, gramisterol, anti-cancer, immune enhanching, STAT1 & 3 signaling

Riceberry is a black rice cultivar that has been developed from a cross-bred of two native Thai rice. The bran extracts of *Riceberry* are considered precious since they contain pigmented chemicals, phytonutrients and other derivatives. The crude DCM and MeOH extracts of *Riceberry* bran possess putative chemopreventive properties in human cancer cell lines such as HL-60, MCF-7 and Caco-2 by inhibition of cell proliferation and induction apoptosis. The mechanism of action in the cells is variable phases of cell cycle arrest mediated by p53 tumor suppressor protein. The effect of the DCM extract is stronger than the MeOH extract and higher on HL-60 > MCF-7 > Caco-2 cells. LC-MS and GC-MS analysis of the purified bran extracts indicates that anthocyanins and plant sterols dominate in the MeOH and the DCM extract, respectively. The sterols are considered the major contributors to apoptotic mechanism in the sensitive cell. Specific sterols in the DCM extract are explored from the unsaponified fraction of *Riceberry* rice bran (RBDS) by separation and reversed-phase HPLC. Four isolated fractions are demonstrated anti-proliferation effect against a mouse leukemic (WEHI-3) cell line (IC50 ranged 2.80 to 467.11 μg/mL). Further purification and structural characterized using normal-phase HPLC, GC-MS, LC-MS and NMR reveal phytosterols and triterpenoids sub-fractions. The sub-fractions that demonstrated strong anti-leukemic cell proliferation (IC50 = 2.80 and 32.89 μg/mL) contain phytosterols (24-methylene-ergosta-5-en-3β-ol, 24-methylene-ergosta-7-en-3β-ol, fucosterol, and gramisterol) and triterpenoids (cycloeucalenol, lupenone, and lupeol). Assessment for the mechanism of action of these phytochemicals (RBDS and gramisterol) in WEHI-3 cells reveals significant anti-cancer activities and also induced apoptosis. Pre-clinical studies performed in a mouse model of AML reveal that daily feeding with the RBDS significantly increase the mice survival rate and improve the leukemic conditions. The treated mice significantly increase the amount of $CD3^+$, $CD19^+$, and $CD11b^+$ immune function-related cells, and elevate the serum levels of IFN-γ, TNF-α, IL-2, and IL-12β cytokines, but suppress IL-10 level. At the tumor sites, $CD11b^+$ cells are polarized and become active phagocytosis. *In vitro* treatment of mice normal immune cells with gramisterol alone or a combination of gramisterol with cytokines released from RBDS-treated leukemic mice splenocytes culture synergistically increase pSTAT1 transcriptional factor that up-regulate the genes controlling cell survival and function. Similar treatments significantly decrease pSTAT3 signaling that regulates transcription of genes controlling tumor growth and proliferation. The data suggest that gramisterol is a significant anti-cancer lead compound in *Riceberry* bran extract.

IS10-2

In vitro and *in vivo* Anti-Angiogenic Potential of Carvacrol Nanoemulsion

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Keywords: CANE, angiogenesis, A549, *in vivo*, *in silico*

The effect of carvacrol on angiogenesis is still unrevealed, and the molecular mechanism unclear. Our previous study demonstrated the role of carvacrol in lung carcinoma apoptosis. Here, we evaluated the role of carvacrol on angiogenesis in lung adenocarcinoma cells *in vitro* and *in vivo*. We observed that carvacrol nanoemulsion (CANE) reduces the growth of lung adenocarcinoma A549 cells as well as MMP levels in a dose-dependent manner. Exposure to CANE decreased the activation of MAP kinase p38 as well as ERK. We found CANE reduced expressions of VEGF and CD31 in A549 cells *in vitro* as well as *in vivo*. Moreover, our *in* silico study also indicates binding of carvacrol to COX-2 and VEGF at active site and allosteric site of CD31 with low binding energy. Overall, CANE induces anti-angiogenic effects in A549 *in vitro, in silico* and *in vivo*, thereby establishing the anti-angiogenic effect of CANE in cancer.

IS10-3

Anticancer Activities of the Selected Phytochemicals and Their Therapeutic Implication in Human Gastric Cancer Cells

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Keywords: anticancer activities; human gastric cancer; phytochemicals

Cysteine-rich angiogenic inducer 61 (CYR61) is an extracellular matrix-associated protein involved in survival, tumorigenesis, and drug resistance. We examined the effects of flavones against CYR61-overexpressing human gastric adenocarcinoma AGS (AGS-cyr61) cells. Among the tested flavones, quercetin had the lowest 50% inhibitory concentration (IC_{50}) and significantly reduced the viability of AGS-cyr61 cells compared with AGS cells. Quercetin: (1) reduced multidrug resistance-associated protein 1 and nuclear factor (NF)-kappa B p65 subunit levels; (2) reversed multidrug resistance; (3) inhibited colony formation and induced caspase-dependent apoptosis; and (4) suppressed migration and down-regulated epithelial–mesenchymal transition-related proteins in AGS-cyr61. We also we found that the natural product 2,4-di-tert-butylphenol (DTBP) induces senescence in human gastric adenocarcinoma AGS cells as evidenced by upregulation of p21 and Rb and increased β-galactosidase activity. DTBP induces mitotic catastrophe and generates multinucleated cells, which is accompanied by an increase in the proportion of polymerized tubulin, possibly caused by inhibition of histone deacetylase 6 (HDAC6) enzyme activity. *In silico* docking analysis showed that DTBP docked at the entrance of the ligand-binding pocket of the HDAC6 enzyme. Accordingly, DTBP represents a promising lead structure for the development of HDAC6 inhibitors, with an improvement in specificity conferred by modification of the cap group.

IS11-1

A Path to Industrial Utilization of Natural Products

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Keywords: natural product, antibacterial, anti-inflammatory, anti-oxidant, medicinal plant, nanomaterial

Scientific knowledge on natural products with functional properties, legislative actions to reduce the use of synthetic compounds, as well as consumer demand for high-quality products have led to an increase in their applications. This review aims to illustrate context information on the potential commercial uses of extracts from natural sources. The main commercial applications of extracts from natural sources discussed here comprise their applications as antibacterial agents applied to cosmetic, pharmaceutical and food industries. Nanotechnology may be particularly advantageous in treating bacterial infections. Nanoparticles are increasingly used to target bacteria as an alternative to antibiotics. Looking at the growing concern about the environment and sustainability, nanomaterials from natural sources are receiving great attention in the scientific community as well as in industrial sectors. The talk will be focused on the nanomaterials derived from natural products and their potential applications in different industrial sectors with specific reference to biomedical devices. Examples include the utilization of nanoparticles synthesized from medicinal plants in antibacterial coatings for medical devices to prevent infections. The antibacterial mechanisms of nanoparticles are poorly understood, but the currently accepted mechanisms include oxidative stress induction, metal ion release, and non-oxidative mechanisms. In this review, we discuss the antibacterial mechanisms of nanoparticles against microorganisms and the factors that are involved.

IS12-1

Thai Traditional Medicine Research Networking and Integration with Conventional Medicine: A Development of Process Innovation

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Keywords: traditional and alternative medicine, research network, Thailand

Conventional medicine has dominated the Thai healthcare system for decades. Despite the strong national policy to promote Thai Traditional Medicine (TTM) practice, healthcare professionals especially medical doctors have asked for scientific evidence. This talk aims to share Thailand experience in research networking as part of the strategy to integrate with conventional medicine. Memorandum of Understanding between Chulalongkorn University and Department of Thai Traditional and Alternative Medicine, Ministry of Public Health introduced the Chula-MOPH Research Fellow (CMRF). The fellows were recruited from throughout the country to participate in a 12-month program which aimed to provide basic research skill and experience conducted with help of conventional health professions. The participation of the research project came from both the regional and central organizations. The CRMF 1 was first started in year 2016. Ten out of 40 project ideas were selected by a panel of experts for the concurrent project-investigator development with central financial and logistic supports. Three projects won the National Herb Expo and one project was accepted for poster presentation at an international COPD conference. CMRF 2 was launched in the following year with more than 450 project ideas, 48 of which from 4 regions were selected and received joint central-regional financial and logistic support and collaboration with local universities. Clinical trial registration and local research ethic facilitation were done. One project was led by an obstetrician and gynecologist in training. Twenty two projects were accepted for poster and oral presentation at national and international conferences. Instead of many small investigator-initiated projects, CMRF 3 introduced four nationally sponsored multicenter multiple-setting randomized controlled trials: (1) Royal Thai Massage for Sub-acute Stroke, (2) Topical Herbal Recipes for Knee Osteoarthritis, (3) Oral Herbal Recipes for COPD, and (4) Oral and Topical Herbal Receives for Diabetes Mellitus. Both the interventions and the outcome measurements were standardized. TTM's Element (Dhatu) Principles were also clarified for objective measurement. Most importantly, Royal Colleges of Medicine of Thailand and Royal College of Physiatrists of Thailand were actively involved. In conclusion, this process was successfully initiated and performed. Research networking between national agencies, local universities, and practitioners has been the key strategy to close the gap between traditional and conventional medicine in Thailand.

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03-1

Restoring the Efficacy of Available Antibiotics against Extensively Drug-Resistant *Acinetobacter baumannii* by Myrtaceae Ethanolic Extracts

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Keywords: *Acinetobacter baumannii*, combination, meropenem, Myrtaceae

Acinetobacter baumannii has been known as a major cause of nosocomial bacterial infections. Alternative treatments have become a priority to threat the bacterial infections. Myrtaceae family has contained a variety of antibacterial compounds. This study was to investigate restored antibacterial efficacy of antibiotics in combination with ethanolic extracts of 13 plant species in the myrtle family against extensively drug-resistant (XDR)－*A. baumannii*. The synergism of meropenem and the extracts was assessed. For meropenem, minimum inhibitory concentration (MIC) was in a range of 16－128 μg/ml and minimum bactericidal concentration (MBC) was between 32－256 μg/ml while MIC values of all plant extracts were more than 1,000 μg/ml. The extracts from seven plant species demonstrated synergistic activity with meropenem against all clinical isolates as well as the reference strain, ATCCC 19606. *Eucalyptus globulus*, *Syzygium aromaticum*, and *Xanthostemon chrysanthus* displayed profound synergistic effects with fractional inhibitory concentration index (FICI) values less than 0.125 to 0.5, resulted in 2 to more than 8-fold decrease in MIC values of meropenem. The resistance modifying ability of the extract was further evaluated. The extracts at concentrations of 6.25, 12.5, 25, 50, and 100 μg/ml increased the inhibitory effect of 1/4 MIC meropenem against *A. baumannii* by 32.6－46.9, 45－51, 51.1－63.3, 56.7－86.9, and 87.7－91.3%, respectively. The results suggested that the candidate plant species improve the activity of current ineffective meropenem against drug-resistant *A. baumannii* and may serve as a therapeutic option for XDR－*A. baumannii* infections. At present, time－kill assay, synergistic effects with other classes of antibiotics, and mechanisms of synergy are being explored.

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03-2

Benzofuran Derivatives from the Leaves of *Oparanthus teikiteetinii* (Asteraceae)

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Keywords: *Oparanthus teikiteetinii*, benzofuran derivatives, GLP-1 secretion

Oparanthus teikiteetinii is belongs to the *Asteracea*e family and it is an endemic plant native to the Marquesas Islands, French Polynesia [1-2]. There is no report on either the traditional uses, phytochemical or pharmacological studies of the plant. In our search for natural GLP-1 secretagogues, the leaves extract from *O. teikiteetinii* exhibited a significant activity in an *in vitro* assay. Further phytochemical investigation into the bioactive fraction using various chromatographic techniques led to the isolation of four new benzofuran derivatives together with 13 known compounds. The structure of the isolated compounds was deduced based on 1D and 2D NMR analyses. Furthermore, the isolated compounds were screened for their cytotoxicity and for their ability to stimulate GLP-1 secretion in STC-1 cells. This is the first report on phytochemical composition and biological activities of *O. teikiteetinii*.

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05-1

Immunomodulatory Activity of Ethanolic Extracts from Deph-Rungsith Formulary and Its Composite Plants on T-Cell Proliferation

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Keywords: Deph-Rungsith, psoriasis, immunomodulatory activity

Deph-Rungsith formulary is a Thai traditional medicine for treatment of psoriasis which is an immune-mediated skin disease or frequently called as T-cell mediated disease. This formulary consists of 16 herbal plants. *Ligusticum sinense* is a major composition (27.2%) following with *Kaempferia galanga* (9.1%) and the other 14 plants (4.55% each). The objective of this study was to determine the effect of Deph-Rungsith formulary and its composite plant extracts on *in vitro* murine T-cell proliferation. Splenocytes from BALB/cMlac mouse were separated and induced T-cell proliferation by using mitogen, phytohaemagglutinin (PHA). Cytotoxicity and proliferation index were analysed by using rezasurin reduction assay. The ethanolic extract of Deph-Rungsith formulary showed no cytotoxicity (>200 μg/ml) and strong suppressive effect on PHA-induced splenocyte proliferation in dose dependent manner. For composite plant extracts, *Saussurea costus* showed highest cytotoxicity following with *Aquilaria malaccensis*, *Pterocarpus santalinus*, *Euphorbia antiquorum*, *Limnophila rugose, Eupatorium fortunei*, *Mimusops elengi*, *Diospyros decandra* and *Cuminum cyminum* with IC_{50} of 14.84±2.86, 17.78±1.44, 27.93±6.45, 38.06±3.27, 63.53±4.99, 66.11±8.93, 111.82±8.89, 137.17±10.85 and 175.15±23.25 μg/ml, respectively. While *L. sinense*, *Angelica dahurica*, *Angelica sinensis*, *Abroma augusta*, *Pogostermon cablin*, *Foeniculum vulgare* and *K. galangal* showed no cytotoxicity in tested concentration range (12.5-200 μg/ml). Ten composite extracts exhibited suppressive effect on PHA-induced splenocyte proliferation in a dose dependent manners especially *L. sinense*, *A. dahurica*, *S. costus*, *E. fortunei, P. cablin* and *M. elengi* extracts which showed strong suppressive activity. On the other hand, four composite plant extracts showed stimulatory effect in dose dependent manners especially *D. decandra*, *A. malaccensis* and *E. antiquorum* which showed strong stimulatory activity on PHA-induced splenocyte proliferation. *F. vulgare* and *P. santalinus* showed no immunomodulatory activity. These results indicated that the strong immunosuppressive effect of Deph-Rungsith formulary might be contributed by its main composite plants especially *L. sinense*. However, the composite plants which showed immunostimulatory effect might help to attenuate and balance those immunosuppressive effect of the main composite plants in formulary. Therefore, with these immunomodulatory effects, Deph-Rungsith formulary may be a future potential candidate for drug development in the treatment of psoriasis via the suppression of T-cell activity.

05-2

Bioactivities of *Wedelia trilobata* Extract: Antioxidation, Antimelanogenesis, Anti-Inflammation and Anti-Acne Effect

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Keywords: *Wedelia trilobata*, anti-tyrosinase, anti-oxidant, anti-inflammation, *Propionibacterium acnes*

This research aims to study the biological activities of *Wedelia trilobata* (L.) Hitch which is a plant in Asteraceae family and normally found in tropical region of Asia. It has traditionally been used for antiseptic, treatment of fever and pain. In this study, leaf, flower and stem parts of *W. trilobata* were separately collected, extracted with 50% ethanol and dried, under rotary evaporator and lyophilizer. After that, the extracts were tested for anti-oxidative, anti-tyrosinase and anti-*Propionibacterium acnes* properties. It was found that the flower extract of this plant showed the highest anti-oxidation with half maximum inhibitory concentration (IC_{50}) value at 5.50±0.10 μg/mL, followed by the extracts of leaf and stem. For anti-tyrosinase investigation, the flower extract also exhibited the highest activity with IC_{50} values at 0.752 mg/mL. In addition, the flowers extract revealed high activity against *P. acne* with minimal inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) at 3.90 mg/mL and 7.81 mg/mL, respectively. Therefore, the flower extract of *W. trilobata* was selected for anti-inflammation activity examination and further product development in gel form. For anti-inflammatory effect, flower extract (at 25-100 μg/ml concentration) significantly inhibited the expression of COX-2 and IL-1β genes in the dose-dependent manner. Moreover, the gels containing the flower extract (0.25, 0.50, 1 and 5%) were developed and tested for anti-P. acne activity. These formulated gels showed anti-*P.acne* activity in a dose-dependent manner. The results of this study are particularly useful for the development of herbal medicine to become the recognized products especially for facial care products.

05-3

Development of Topical Films Containing Phytoestrogenic *Curcuma comosa* Extract for Skin Aging Reduction and Clinical Study

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Keywords: *Curcuma comosa*, diarylheptanoids, topical film, skin aging

Phytoestrogens have been found to delay signs of skin aging in post-menopausal women, in a way similar to the effects of estrogens. Diarylheptanoids from a rhizome of traditional Thai herb named *Curcuma comosa* (*C. comosa*) is considered to be a novel class of phytoestrogens. The aims of this study were to develop the topical films for delivery of diarylheptanoids and evaluate the accumulation of diarylheptanoids within the skin. The efficacy of topical films, including skin moisturization, skin elasticity, and anti-wrinkle effects were also evaluated. The films of *C. comosa* extract were characterized for their physical properties. *In vitro* release behavior and skin accumulation were also evaluated using Franz-diffusion cells. Twenty healthy volunteers were enrolled to daily apply the films onto the back of their left hand and left corner of eye before bedtime for one month. Evaluation of safety (by skin patch test), efficacy (based on Corneometer or Visioscan), and satisfaction were carried out at baseline and every two weeks until the end of the study. The films showed the satisfying physical properties, providing high release and accumulation of diarylheptanoids within the skin (2, 4, 8, 12, 24 h). In the clinical study, the films did not cause skin irritation and significantly increased skin hydration and skin elasticity at week 2 and week 4. Although *C. comosa* films did not result in significant decrease on skin roughness and wrinkles. The tendency of improvement of theses skin parameters was observed. All volunteers were satisfied with the films. The developed films have shown a great potential for improving skin dryness and providing anti-wrinkle effects. This suggesting that the films may be topically used as an alternative therapy for skin aging in peri- and post-menopausal women.

06-1

Ethnobotanical Inventory of Medicinal Recipes Used by Dayak Ethnic in Palangka Raya City

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Keywords: ethnobotany, ethnopharmacology, Dayak, Palangka Raya city

Dayak community has a long history on the knowledge of medicinal plants from the forest as one of the methods to ward off the health problems. The knowledge of medicinal plants based on the experience and it has been passed down from generation to generation. But nowadays, there is a worldwide problem connected with the possible loss of ethnobotany knowledge because of the lack of the interest of young people. Therefore, In the present study, the survey focused on medicinal plants used by Dayak ethnic in Palangka Raya city has been done. The results showed that 10 traditional medicinal recipes are known as curative plants in this area. The botanical names, forms of preparation, multiple usages and applications are described here. Herbal remedies were mostly used as decoction to treat diseases. The administration was oral in most cases, followed by topical applications. For some of the plants it was found many interesting scientific investigations but for some, it was found no studies at all such as black ginseng, langise, and teratak manuk. Some of these plants certainly have the potential for further investigation.

06-2

The Potential Herbs of Medicinal Forests from Central Kalimantan as an Inhibitor of *Staphylococcus aureus*

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Keywords: medicinal forest, traditional medicines, inhibitory test, *Staphylococcus aureus*

Central Kalimantan is one of the largest provinces in Indonesia with a wealth of medicinal herbaceous plant species. This province was the origin of various medicinal plants such as tabat barito, akar kuning, pasak bumi, and some other medicinal plants that were useful for human health. Inhibitory effect of ethanol extracts of Hati Tanah *(Angiotepris* Sp*)* tubers and Sangkareho leaves (*Callicarpa longifolia* Lam.) against *Staphylococcus aureus* was studied at the concentration of 1%, 5%, 10%, and 15%. Both plants have been utilized by the community as traditional medicines to treat minor to moderate injuries such as postpartum. The inhibition zones for the extract of Hati Tanah was 15,63 mm, 16,97 mm, 25.42 mm, and 28.40 mm, and for Sangkareho leaves was 1 mm, 2.68 mm, 3.9 mm, and 6.2 mm, respectively. Inhibitory test has also been performed with the *N*-butanol fraction of Hati Tanah tubers ethanol extract. The inhibition zones were 15.65 mm, 23.20 mm, 24.15 mm, and 26.25 mm at the same concentrations. Medicinal forest plants of Hati Tanah tubers and Sangkareho leaves from Central Kalimantan have a potential in inhibiting and killing *S. aureus.*

06-3

In Vitro Determination of Antioxidant, Antityrosinase, Anticollagenase, and Antielastase Activity of *Thalassia Hemprichi* Extract as Active Ingredient for Anti-Aging Cosmetics

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Keywords: *Thalassia hemprichii*, antioxidant, antityrosinase, anticollagenase, antielastase

Aging is a natural process in human because the accumulation of oxygen derived free radicals leading to activation of tyrosinase, collagenase and elastase can eventually contribute to cellular and tissue damage. Antioxidant bioactive ingredient from plants like *Thalassia hemprichii* could inhibit aging process. To determination of antioxidant, antityrosinase, anticollagenase, and antielastase activity of *T. hemprichii* extract as active ingredient for anti-aging cosmetics, it was extracted with ethanol 50% using maceration extraction method for 2 h. Then, antioxidant, antityrosinase, anticlolegenase, and antielastase activity of the extract was determined. The value of IC_{50} for each assay was determined as IC_{50} 83.48 μg/mL, IC_{50} 1378.62 μg/mL, IC_{50} 0.51 mg/mL, and IC_{50} 0.48 μg/mL, respectively. Therefore, *T. hemprichi* extract has been proven as antioxidant, antityrosinase, anticollagenase, and antielastase. It has a potential to be active ingredient of anti-aging cosmetics.

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06-4

Antimicrobial Activity of Triterpenoid Saponins from *Polyscyas guilfoylei* L.H. Bailey

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Keywords: triterpenoid saponin, *Polyscyas guilfoylei* L.H. Bailey, *Microsporum canis*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*

Three triterpenoid saponins, 3-O-[β-D-glucopyranosyl (1→2)- β-D-glucoropyranosyl] oleanolic acid (Polysciasaponin P_5) (**1**), 3-O-[β-D-glucopyranosyl (1→2)-β-D-glucoropyranosyl] 7-oxo-oleanolic acid (**2**) and 3-O-[β-D-glucopyranosyl (1→4)-β-D-glucopyranosyl (1→2)-β-D-glucoropyranosyl] oleanolic acid (Polyciasaponin P_2) (**3**) were isolated from *Polyscyas guilfoylei* L.H. Bailey. The structures of **1**-**3** were elucidated by IR, MS, NMR spectroscopies and confirmed from the comparison of their spectroscopic data with those reported in the literature. Antimicrobial assay of the isolated compounds showed significant activities to *Microsporum canis*, but these compounds were not active to *Staphylococcus aureus* and *Pseudomonas aeruginosa.*

010-1

Nanofibers Mat and Hydrogel Patch-Based Tamarind Seed Polysaccharide Containing Natural Active Thai Herbal Ingredients

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Keywords: hydrogel patch, electrospinning, nanofibers, tamarind seed polysaccharide, *Tamarindus indica* Linn.

Electrospinning, a fabrication technique can be used to create nanofibrous non-wovens from a variety of starting materials. Biopolymers are derived from naturally occurring matter such as shells, mushrooms, wood and plants seed, according to their sustainability, eco-efficiency, industrial ecology, biodegradable, biocompatibility and renewability from nature[1,2]. It has been reported as nontoxic and used in food and pharmaceutical industrials, drug-release material in textile printing field[3]. Tamarind seed polysaccharide (TSP) is one of natural polymer was extracted from *Tamarindus indica* Linn. seed. This work aimed to develop the hydrogel patch and electrospun nanofibers derived from TSP, polyethylene glycol (PEG) and polyvinyl alcohol (PVA) mixtures. TSP was extracted from tamarind seed kernel powder of from four sources. Each kernel powder of tamarind seed was prepared into a clear solution, centrifuged after overnight and then precipitated by alcohol, collected and dried in the oven. The powder was prepared in difference ratios of 20%, 40%, 50%, 60% (TSP: PEG) and 10% (TSP: PVA). Drug release, chemicals composition and chemicals profiling were analyzed by HPLC and ^{1}H NMR, FT-IR SEM for the electrospinning system which was operated at 15 kV and 40kV, respectively. The results illustrated that its mixture of PVA was more suitable nanofibers and fibers mat than that with PEG while 50% (TSP: PEG) was the best results compared to other ratios. The hydrogel was comprised of active Thai herbal active compound providing herbal patches for future research on drug delivery system and oral care product development.

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011-1

Chemical Constituents and Biological Activities from Rutaceae Plants

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Keywords: Rutaceae, *Aegle marmelos*, *Clausena excavata*, *Feroniella lucida*, *Zanthoxylum nitidum*

The Rutaceae family has about 140 genera, consisting of herbs, shrubs and small trees which grow in all parts of the world and which are used in traditional medicine. Over the past ten years, phytochemical studies have been conducted on material extracted from members of the Rutaceae plants. Chemical constituents of the green fruits of *Aegle marmelos,* the stems of *Clausena excavata*, the twigs of *Feroniella lucida* and the stems and roots of *Zanthoxylum nitidum* were examined. In such work, the main isolated compounds from these plants are furanocoumarins, carbazole alkaloids, lignans and dihydrobenzophenanthridine alkaloids. Many of constituents were found to possess cytotoxicity, antifungal and antibacterial activities.

011-2

Potential Applications of Compounds from Thai Plants as Bioactive Ingredients

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Keywords: xanthones, flavonoids, phloroglucinols, antibacterial, antioxidative, cytotoxicity

The health benefits of natural products have received much interest. Many compounds isolated from plants have great potential for application as nutraceuticals, functional food ingredients and medicinal uses. Many of plants growing in the southern Thailand have been used in traditional medicine. With the aim of searching for bioactive compounds, the extracts of the plants were tested on biological activities, and the chemical compositions of the extracts were further determined. Xanthones from *Garcinia mangostana, G. cowa* and *G. dulcis*, and acylphloroglucinols from *Rhodomyrtus tomentosa* and *Cratoxylum lanceolatus* showed strong activity against the growth of *Staphylococcus aureus* ATCC25923 and MRSA SK1. *Athraquinones from Morinda elliptica* exhibited strong antifugal activity to *Microsporum gypseum*. Xanthones from *G. mangostana* and *C. cochinchinense*, and xanthones, biflavonoids and prenylated benzoquinones from *G. dulcis* revealed antioxidative activity. Xanthones from *C. cochinchinense* and flavonoids form *Artocarpus elasticus* displayed cytotoxic activity to cell lines. Biflavonoids and prenylated benzophenones from *G. dulcis* were effective on hypotension and diuretic action. The finding indicated that Thai plants have great potential as sources of bioactive ingredients.

011-3

Antibacterial Activity of Thai Polyherbal Formulations Used for Skin Diseases

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Keywords: antibacterial activity, polyherbal formulation, skin, *Staphylococcus*

Ethnobotanical information on skin diseases was obtained from local traditional herbal healers in Songkhla province, Thailand. Twenty five formulations were extracted and screened for antibacterial activity against *Staphylococcus aureus* ATCC 25923. Two formulations exhibited potent activity and then were tested against *Staphylococcus aureus* and *Staphylococcus epidermidis* isolated from skin infections. Formulation 1 included *Anacardium occidentale* L., *Zingiber montanum* (Koenig) Link ex Dietr., and *Aloe vera* (L.) Burm.f while formulation 2 comprised of *Garcinia mangostana* L. and *Nicotiana tabacum* L. The inhibition zones of formulation 1 and 2 against 40 clinical isolates were between 5.9−15.0 mm. Minimal inhibitory concentration (MIC) and minimal bactericidal concentration (MBC) of both formulations against staphylococcal isolates ranged from 16 to 1,024 µg/ml. Time-kill curves were assessed at 1/2 Í MIC, MIC, 2 Í MIC, 4 Í MIC and 8 Í MIC by counting viable bacterial cells after time intervals. The colony numbers of most isolates were reduced 99.9% within 2−4 h after treated with 2−4 Í MIC of these formulations. The findings revealed that both herbal formulations possessed effective antibacterial activity against staphylococcal skin infection. The results suggest that the formulations have the potential for further drug development for the treatment of skin infections.

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012-1

Efficacy of *Thunbergia laurifolia* Lindl. on Detoxification: An Updated Systematic Review and Meta-Analysis

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Keywords: *Thunbergia laurifolia* Lindl., detoxification, systematic review, meta-analysis

In Thai Traditional Medicine, *Thunbergia laurifolia* Lindl. (TL) leaves are used as an antipyretic and detoxifications. There were also studies of TL on hepatoprotective activities[1], detoxification and drug addiction treatment.[2] However, there were no systematic review and meta-analysis to assess its efficacy for detoxification in human study. MEDLINE, CINAHL, Cochrane Central of clinical trial, ThaiLis and hand-searching were searched from the inception date of June 24, 2018 using scientific and common synonyms of TL, or detoxification. Clinical controlled human intervention trials on TL in any dosage forms without comedication were included in this study. The methodological quality of studies was assessed using Cochrane's risk of bias assessment. Eight studies met the inclusion criteria but only five trials performed Randomized controlled trial (RCT). Meta-analysis showed that TL decrease the risk of intoxication using reactive paper (MD=-7.38; 95%CI=-2.18, -25.00; p=0.001). Detoxification mechanism might be from accelerating the excretion of toxic substances.[3] No serious adverse event had been observed from the recruited studies. In conclusion, this systematic review and meta-analysis suggests that TL has potential to improve detoxification of toxic substances.

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012-2

Botanical Characterization and *in vivo* Propagation of an Endangered Ethnomedicinal plant, *Curculigo orchioides* Gaertn. (Hypoxidaceae)

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Keywords: *Curculigo*, Ayurveda, medicinal, quality assurance

Economically valuable medicinal plant, *Curculigo orchioides* Gaertn. was identified using taxonomic characters and was studied for morpho-anatomical characterization and plant propagation. Researchers interchangeably use rhizome, rootstock, and tuberous roots to refer to the specific plant part which is harvested for its medicinal value. Botanical description was intended to ensure the quality assurance firstly at the collection of the plant in the wild before proceeding to marketing stages, manufacturing, and production of the traded drug. Results confirmed that the underground axis was identified as a fleshy, vertical rhizome which is pulled firmly by contractile roots to the ground. The stele arrangement showed an atactostele, typical in most monocot stems. Anatomical observations also revealed the abundance of starch cells and the presence of mucilage. These may also contribute to the medicinal value of the plant. As an internationally produced drug which is effectively utilized as nutritive tonic, overexploitation of the plant population in the wild had raised conservation concerns. In this regard, we did cultivation and propagation techniques for the plant. However, attempts on seed germination were not successful due to the plant species' deep physiological dormancy. Rhizome cuttings (83% shoot development) proved to be a better alternative in addressing the shortage in supply of this drug plant. Whether the generated shoots can develop new rhizomes is still to be ascertained.

012-3

Structure-Based Study of Conessine as a Potential Efflux Pump Inhibitor in *Pseudomonas aeruginosa*

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Keywords: conessine, efflux pump inhibitor, molecular docking, *Pseudomonas aeruginosa*, virtual screening

Previous studies proposed conessine, a steroidal alkaloid compound from *Holarrhena antidysenterica* (Apocynaceae), as a novel efflux pump inhibitor candidate due to its synergistic effect with levofloxacin against MexAB-OprM efflux pump of *Pseudomonas aeruginosa*. However, lack of clarified molecular mode of action of the natural product remains a hindrance for moving natural product forward to a clinical phase. Therefore, scientific proof through molecular information is necessary and computational approaches are to be introduced to circumvent this issue. In this study, molecular docking was carried out to reasonably speculate the interaction of conessine to the pump protein along with its tentative binding site, compared to known natural compounds. Molecular docking suggested possibility of conessine as a potential efflux pump inhibitor. To elucidate more atomistic details, MexB embedded in bilayer membrane via molecular dynamics was simulated to understand the binding affinity as well as molecular behaviour of conessine bound to MexB pump, compared with no-ligand state and other known experimental inhibitors.

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S1-1

Novel Insight of *GRS1* (*Glucoraphasatin synthase 1*) Regulating Biosynthesis of Glucoraphasatin in Chinese Cabbage (*Brassica rapa L. ssp. pekinensis*) During Growth and Development

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Keywords: Chinese cabbage, glucosinolates, glucoraphasatin, *GRS1* (*Glucoraphasatin synthase 1*)

The *Glucoraphasatin synthase 1* (*GRS1*) encodes a 2-oxoglutarate-dependent dioxygenase to produce the glucoraphasatin (GRH) from glucoerucin (GRE) through dehydrogenation reaction. GRH is predominant and unique in radish plant, in that the presence of GRH has not been reported in other brassica plants thus far. However, our study revealed that *GRS1* and its product, GRH, also existed in Chinese cabbage. BLAST search using *RsGRS1* in the Chinese cabbage database identified a highly homologous gene, named as *BrGRS1* (Bra033397, gene ID). Furthermore, the genomic structures and deduced amino acid sequences of *BrGRS1* and *RsGRS1* showed a high similarity, indicating that *BrGRS1* possibly possesses the same catalytic function to *RsGRS1*. Analysis of GSLs profile and *BrGRS1* expression were determined on leaf and root tissues of Chinese cabbage during growth. As a comparison, *RsGRS1* in radish was also examined with the same stage of development. Transcript level of *RsGRS1* was strongly expressed in the leaf tissue during vegetative growth, resulting high GRH content in vegetative tissue of radish. In contrast, transcript levels of *BrGRS1* and its product GRH were predominantly detected in the root tissue. Consequently, Chinese cabbage exhibited low level of GRH in the root tissue. The present study has revealed that *GRS1* gene and GRH also exist in Chinese cabbage besides radish plant.

S1-2

Stability of Panaxynol and Panaxydol Isolated from *Panax Ginseng*

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Keywords: *Panax ginseng*, polyacetylenes, panaxynol, panaxydol, stability

The root of the *Panax ginseng* C.A Meyer has been widely recognized for its medicinal purposes. Along with ginsenosides, polyacetylenes have been found from the roots of *P. ginseng*. Panaxynol and panaxydol are the major polyacetylenes and believed to be partly responsible for the pharmacological activities of ginseng. However, it is known that most polyacetylenes are thermally unstable and may undergo photodecomposition if exposed to UV light. In this study, the stability of panaxynol and panaxydol was monitored by TLC and UHPLC. The results showed that the isolated compounds stored in the refrigerator did not show any signs of degradation, and cold storage could actually suppress the degradation of these compounds. However, the isolated compounds that exposed in room temperature storage decomposed quickly. Panaxynol was more stable than panaxydol which completely decomposed at room temperature.

S1-3

Simultaneous Determination of Scoparone, Geniposide and Rhein in Rat Plasma Using Ultra-High Performance Liquid Chromatography Tandem Mass Spectrometry: Application Herbal Medicines to Pharmacokinetics Study

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Keywords: scoparone, geniposide, rhein, tandem mass, herbal medicine

The herbal formula Yin-Chen-Hao-Tang consisting of *Artemisia capillaris* Thunb, *Gardenia jasminoides* Ellis, and *Rheum officinale* Baill has been reported anti fibrosis properties. Aim of this study was to reveal the pharmacokinetic characteristics of bioactive compounds in this herbal formula. A new selective high performance liquid chromatography-tandem mass spectrometry (HPLC-MS/MS) method was developed and validated for simultaneous determination of scoparone, geniposide, and rhein in rat plasma. A pharmaceutical herbal powder was quantified and administrated to rats at doses of 1 g/kg and 3 g/kg orally by gavages, respectively. The results show that the maximum concentration (Cmax) and the area under the curve of scoparone, geniposide, and rhein were higher than proportional to dose in rat plasma, while Tmax and half-life consisted with the group of 1 g/kg. The clearance of higher dose (3 g/kg) also decreased than proportionally of low dose. The results of nonlinear pharmacokinetic properties of scoparone, geniposide, and rhein in Yin-Chen-Hao-Tang suggested a rapid absorption and possible accumulation of bioactive compounds through oral administration. Saturation of metabolism pathway or herbal ingredient−ingredient or herb − herb interaction that make nonlinear kinetics could be further investigation in the future.

S1-4

FT-IR Microspectroscopy Analysis of Beta-Glucan Structure from Spent Yeast *Saccharomyces cerevisiae* TISTR 5339

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Keywords: beta-glucan, *Saccharomyces cerevisiae*, ATR FT-IR

Beta-glucans are linear chain of glucose residues polymerized through β -1,3 β-1,4 or β-1,6 glycosidic linkages. Difference structures of beta-glucans found depend on source of beta-glucans. Yeast biomass remaining in the reactor after bioethanol fermentation process is an important source of beta-1,3/1,6-glucan which has several benefits on biological response, especially its function as immunostimulants to protect cells against infectious disease is from beta-1,3-glucan. In this study, Saccharomyces cerevisiae TISTR 5339 biomass was disrupted with three different methods: autolysis, sonication, and liquid nitrogen. Moreover, extracted yeast beta-glucans were subjected to the Fourier-transform infrared (FTIR) spectroscopy for composition analysis. The result showed that the polysaccharide content from three disruption methods were 64.9%, 60.1%, 52.5% from autolysis, sonication, and liquid nitrogen, respectively. FTIR spectrum indicated that the sample derived from autolysis disruption method provided the highest content of beta-1,3-glucan of total polysaccharide. Therefore, autolysis is the recommended method for spent yeast cells disruption to obtain highest beta-1,3-glucan after extraction process.

S1-5

Properties of Cellulose Extracted from Banana (Kluai Namwa) Peel

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Keywords: banana peel, Kluai Namwa, cellulose extraction, waste utilization

Banana is one of the largest fruit industries in the world that courses large amount of banana waste left behind. By biorefinery process, banana peel cellulose can be extracted and used as biotechnological products in various applications. In this study, cellulose from banana (Kluai Namwa) peel was extracted using the two steps of alkaline extraction followed by bleaching process. The alkaline extraction using 1M NaOH eliminated non-cellulosic substances which were hemicellulose, pectin as well as lignin. The bleaching process with 2% H_2O_2 oxidized dark brown color of chromophore groups in lignin to a milky color treated sample. The cellulose yields of these series extraction process were 19.2%, 11.7% and 9.8% from 1st alkaline, bleaching, and 2nd alkaline treatment steps, respectively. The cellulose content determination by detergent fiber analysis was increased from 62% of raw peel to 81% of finished product, while lignin content was undetectable after challenged with 2nd alkaline treatment. Fourier-transform infra-red (FTIR) spectroscopy was used for ensuring that lignin and hemicellulose were discarded during treatments due to peaks of lignin and hemicelluloses were diminished. As a result of the higher purity extracted cellulose, the water holding capacity (WHC) was significantly increased which was 15.53 g/g whereas raw bran was 6.32 g/g. According to the high cellulose content and its water holding capacity, the extracted banana peel cellulose is high potent to apply as dietary fiber in various functional food products. Furthermore, the characterization and food application of cellulose extracted from banana (Kluai Namwa) peel are under current study.

S2-1

Putative Identification of Cytotoxic Compounds from an Isolate of a Philippine Endemic Plant against Human Colon Carcinoma Cells (HCT-116) Using High-Resolution Mass Spectrometry

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Keywords: cancer, MTT assay, LC-MS, GNPS

Cancer has been a persistent issue in healthcare for many years. Colorectal cancer ranks third among the most common cancers in the Philippines. Natural products provide a reservoir for potentially new and safer compounds for cancer treatment, as current chemotherapeutic drugs are often accompanied by side effects. In this study, MTT assay-guided fractionation of a Philippine endemic plant against human colon carcinoma cells (HCT-116) produced a semi-pure isolate with an inhibitory concentration for 50% of the cell population of 6.801 ± 2.093 µg/mL. Putative identification of the compounds present from the isolate was performed using LC-MS and utilized freely available MS/MS databases uploaded via The Global Natural Product Social Molecular Networking (GNPS). Future directions of this study include determining the cytotoxicity of each compound against HCT-116 cells, and the mode and molecular mechanism involved in cancer cell death caused by such compounds.

S2-2

Antioxidant Activities from *Syzygium gratum* (Wight) S.N. Mitra var. gratum Young Leaf Extracts

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Keywords: *Syzygium gratum* (Wight) S.N. Mitra var. gratum, DPPH radical scavenging activity, ferrous ion-chelating activity, ferric reducing antioxidant power, total phenolic contents

Syzygium gratum (Wight) S.N. Mitra var. gratum belongs to the family Myrtaceae. Young leaves were collected from Ban Ang-Ed Official Community Forest Project, Chantaburi province. They were extracted in ethanol and then successively partitioned into hexane, ethyl acetate and water. *S. gratum* extracts were qualitatively investigated by colorimetric assay and also determined the antioxidant activities using DPPH radical scavenging assay, ferrous ion-chelating activity assay, ferric reducing antioxidant power assay and total phenolic content. As results suggested that all four fractions had polyphenols, particularly in ethyl acetate fraction, it was found flavonoid with γ-benzopyrone group. Moreover, ethyl acetate fraction was presented the highest total phenolic contents with 151.458 mg GAE/g extract. For antioxidant capacity, it could inhibit DPPH radical (EC50 was 0.071±0.002 mg/mL) followed by ethanol, water and hexane fractions. In addition, ethyl acetate fraction at 0.05 mg/mL also expressed the highest ferrous ion-chelating activity by 30.43% and showed the FRAP value by 910.081±0.001 mg TE/g extract. From those results indicate that *S. gratum* showed good antioxidant activity that can be applied in nutritional and dietary supplemented applications with their antioxidant activities and total phenolic contents.

S2-3

Bioactivity Studies for Cosmetics Application of Koon (*Cassia fistula*) Extract

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Keywords: Koon, *Cassia fistula*, cosmetic application, bioactivity

Koon (*Cassia fistula*), Thai traditional herbal medicinal plant which is used for the treatment of several diseases and symptom such as diabetes, laxative and anti-inflammatory. In this study, the effects of the extracts from various parts of Koon such as wood, bark, leaves, flowers and pods were investigated for antioxidation and tyrosinase inhibition activities by methanol Soxhlet extraction for 1 hour, Pods extract showed the highest antioxidation activity by DPPH assay with the SC_{50} of 0.01±0.00 mg/ml which was 2.0 fold of vitamin C. Leave extract showed the highest antioxidation by lipid peroxidation assay with the LPC_{50} of 0.02±0.00 mg/ml which was 3.5 fold of vitamin C. For the tyrosinase inhibition activity test between Pods and Leave, Pods extract showed the higher activity than leave extract with 4.76±0.32mg/ml, 16.71±0.047 mg/ml which were 0.09 and 0.025 fold of kojic acid respectively. This studies demonstrated that pods extract of Koon can be further applied as a whitening and anti-aging agent in cosmetics.

S2-4

Antioxidant and Tyrosinase Inhibition Activities of Laurel Clock Vine (*Thunbergia laurifolia* Lindl) Extracts

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Keywords: *Thunbergia laurifolia* Lindl

Laurel clock vine (*Thunbergia laurifolia Lindl*), the Thai medicinal plans which is well know and widely used for detoxification the plans was extracted by cold water (CW), hot water (HW), cold methanol (CM) and hot methanol (HM). The percentage yield of each extraction system, CW, HW, CM and HM were 11.46, 11.15, 5.33, 14.86 respectively. All extracts were tested for antioxidative and tyrosinase inhibition activities. HM extract showed the highest antioxidative activity by DPPH assay with the IC_{50} of 0.26±0.01 which was 0.11 fold of vitamin C. CW extract showed the highest Tyrosinase inhibition activity with the IC_{50} of 0.03±0.00 mg/ml which was 0.53 fold of kojic acid. The tyrosinase inhibition activity of (CW) which was comparable to kojic acid can be further applied as a whitening agent in cosmetics.

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S2-5

AKT Upregulation by Morin Hydrate Suppresses *E. coli* (Clinical Isolate 3347) Induced Sepsis via Caspase-1 in Male Wistar Rats

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Keywords: AKT, morin hydrate, *E.coli*, sepsis, caspase-1

Current study was designed by using ESBL-*Escherichia coli* (Accession: KBN10P03347), a clinical isolate recovered from the blood of a sepsis patient from a city hospital Daegu during 2016. Here, the protective effect of Morin hydrate (MH), a natural flavonoid from *Maclura pomifera* against the clinical isolate was elucidated. To this aim, ESBL (LD_{50} :1.6 x 10^8 CFU/mL) were administered by intraperitoneal (IP) injection in male wistar rats. MH (40 mg/kg) was able to overwhelm the morphological changes that take place in the initial three hours after infection with *E. coli*. The results were confirmed with H&E performed against liver, kidney and lung tissues. MH ($p<0.001$) subdue the increased pathogenicity as measured with the levels of AST, ALT, ALP, BUN, and CREA in the serum samples drawn from the ESBL infected rats. MH pre-treatment regulated the expression of MyD88, resulting in the activation of the downstream NF-κB to control the excess inflammatory cytokines and increased survival by AKT *in vivo* in lung, kidney and liver tissues. The results observed in this study reinforce the protective role of MH to control inflammatory response, in particular, IL-1β, by activating caspase-1 mediated pyroptotic cell death to protect against ESBL induced sepsis.

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S3-1

Irritant Reaction of Sahastara Remedy Ethanolic Extract on the Skin of Healthy Volunteers

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Keywords: Sahastara remedy, irritant reaction, anti-inflammatory

The Sahastara (SHT) remedy is a Thai traditional medicine which has long been use as oral medicine for muscle and joint pain. There are reports show that SHT remedy ethanolic extract has good anti-inflammatory activity and efficacy for osteoarthritis. However, abdominal pain is a most common adverse event of oral SHT remedy because of spicy ingredients in this remedy. The topical SHT remedy was developed for relieve adverse events and specific to local pain area. Thus, this study the SHT extract was investigated the irritant reaction on skin of SHT remedy ethanolic extract in healthy volunteers. The closed path test was performed in 13 healthy volunteers for 48 hours. 4 descending concentration of SHT remedy ethanolic extract including 5, 3, 1 and 0.5 percent in white petrolatum (vehicle and negative control) were tested. The irritant reaction was evaluated at 48 and 96 hours according to The International Contact Dermatits Research Group by 3 dermatologists. The results show that SHT remedy ethanolic extract at 0.5 and 1% concentration were safe. SHT remedy ethanolic extract at 3% concentration showed safety but mild degree irritation in few volunteers and 5% concentration showed marked irritation. In conclusion, SHT remedy ethanolic extract was safe to use as topical medicine in human with 0.5 to 1 % concentrations.

S3-2

Total Phenolic, Flavonoids Content and Cytotoxic Activity of *Hibiscus sabdariffa* Leaves Extracts against Human Liver and Intrahepatic Bile Duct Cancer Cell Lines

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Keywords: *Hibiscus sabdariffa*, total phenolic content, total flavonoids content, cytotoxic activity, liver cancer, intrahepatic bile duct cancer cells

In Thailand, liver and intrahepatic bile duct cancer are the most commonly diagnosed cancers. *Hibiscus sabdariffa* is well known in Asia and Africa and is extensively used to make jams and beverages. This plant is rich in polyphenol, anthocyanin, and flavone. *H. sabdariffa* leaves are also used to be healthy sour soup for prevention of chronic diseases in the central part of Thailand. In addition, its dry calyxes showed good activity against liver cancer cells but its leaves had no report. Thus, the objectives of this research were to investigate total phenolic, flavonoids content and cytotoxic activity of *H. sabdariffa* leaves extracts from different extraction method. Fresh and dry *H. sabdariffa* leaves were extracted by various methods such as maceration with 50% and 95% ethanol, decoction, and squeeze. All extracts were determined total phenolic and flavonoids content by the Folin-Ciocalteu colorimetric method and aluminium chloride ($AlCl_3$) colorimetric method, respectively. The cytotoxic activity of all extracts was investigated via the sulforhodamine B (SRB) assay against two types of liver and intrahepatic bile duct cancer cell lines (HEPG2 and KKU-M156). The 95% ethanolic extracts of *Hibiscus sabdariffa* dried leaves (HSDE95) showed the highest cytotoxicity against liver and Intrahepatic bile duct cancer cell lines with IC_{50} values 41.58 ± 3.37 and 6.32 ± 0.42 µg/ml, respectively. For total phenolic and flavonoids content, HSDE95 contained the highest phenolic content (57.00 ± 3.73 mgGAE/g), but it showed lower total flavonoids content than HSDE50. Therefore, HSDE95 showed potent *in vitro* cytotoxic activity against all human liver and intrahepatic bile duct cancer cells. It should be further investigated for the active compounds against the human liver and intrahepatic bile duct cancer cells.

S3-3

Safety of Sahastara Remedy Extract Capsule in Treating Primary Osteoarthritis of the Knee Compared with Diclofenac (Clinical Trial Phase II)

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Keywords: Sahastara, osteoarthritis, safety, clinical trial

The Sahastara (SHT) remedy is a Thai traditional medicine and is in the Thai National List of Essential Medicine for release muscles pain. Dosage forms for using in the previously report was the SHT powder capsules but there is no report for SHT ethanolic extract which showed high anti-inflammatory activity. The purpose of this study was to investigate the clinical safety of SHT extract remedy for treating primary osteoarthritis (OA) of the knee compared with diclofenac. A phase 2, double-blind, randomized, and controlled trial study was used to determine the clinical safety of SHT in comparison with diclofenac for the treatment of knee osteoarthritis. 60 patients, ages between 40 and 70 years of age, were randomly allocated into 2 groups. The SHT group received 100 mg of SHT extract capsules 3 times per day, orally before meals, while another group received 25 mg of diclofenac sodium capsules 3 times a day, orally after meals for 28 days. All patients were followed up at 14 and 28. For safety issue, clinical signs and symptoms, complete physical examination, and renal and liver function were evaluated. There were 32 and 31 patients in SHT and diclofenac groups, respectively, who had completed the study. The blood chemistry of both group showed no toxicity on renal and/or liver functions after taking SHT for 28 days but the patients who took diclofenac showed significant increases in their AST, ALT, and ALP. Systolic and diastolic blood pressure slightly increased in the diclofenac group but the SHT group did not effect on blood pressure. The SHT remedy showed similarly safety when compared with diclofenac in all evaluating symptoms of OA knee. However, the SHT remedy had no toxicity in renal and liver functions.

S3-4

Safety of Prasaprohyai Ethanolic Extract Capsules in Healthy Volunteers (Clinical Trial Phase I)

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Keywords: Prasaprohyai, Thai traditional remedy, anti-allergic drug, clinical trial phase I

Prasaprohyai remedy (PSPR), which is in the Thai National List of Essential Medicines, has been used to treat common cold and fever. Previous clinical research showed that PSPR crude powder at high dose of 3,000 mg/day can relieve allergic rhinitis symptoms as well as Loratadine, which is an anti-allergic drug. However, the PSPR powder drug was used in high dose, so the development of extract product was necessary. Many previous studies report that the ethanolic extract form showed anti-allergic activity in both *in vitro* and *in vivo* studies. Thus, the objective of this study was to investigate PSPR ethanolic extract capsules in a phase I clinical trial study in healthy volunteers at Thammasat University, Thailand. Twelve volunteers were divided into 2 groups. One took PSPR ethanolic extract capsules by oral administration at a dose of 100 mg three times a day before meals and the other took PSPR at a dose of 200 mg 3 times a day before meals for six weeks. After that, a washout period of 2 weeks began. All volunteers were followed up in the third week, sixth week and eighth week to evaluate the safety of the medicines. Safety was evaluated by liver function test, renal function test, lipid profile, blood sugar and complete blood count. Both healthy volunteer groups were safe. There were reports of PSPR adverse events such as abdominal pain, eructate. However, there were no severe symptoms recorded after taking PSPR for six weeks. PSPR was safe at both dosages and warrants further clinical trial testing of the approach for safety and efficacy in patients.

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The Beginning of Asian Wave

Poster presentations

P1-1

Seasonal Variation of Ginsenoside Contents in The Leaves of *Panax ginseng*

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Keywords: analysis, ginsenosides, leaf, UHPLC, biosynthesis

Seasonal variation of ginsenoside contents were investigated from the field-grown ginseng (*Panax ginseng*) leaves throughout the year 2017. Eight major ginsenosides, including Rg1, Re, Rg2, F3, Rb1, Rc, Rb2 and Rd, of the five-year-old ginseng leaves that collected in Bonghwa, Korea, were analyzed by ultra-high performance liquid chromatography (UHPLC). The most abundant ginsenoside was Re, which was always more than the second most abundant Rd. The ginsenoside contents varied significantly as ginseng grew, and gradually increased until the leaves fell. The lowest content of total ginsenosides was observed in February (29.23 ± 2.74 mg/g) when the leaves started to form, and the highest content of total ginsenosides were identified in the middle of August with a value of 105.45 ± 2.88 mg/g. However, there was a quick increase of total ginsenoside at the end of April (91.42 ± 2.78 mg/g). The ratios of panaxadiol and panaxatriol ginsenosides in the leaves (0.6 ~ 0.8) were much lower than those of roots (~ 2.5) throughout the year.[1] Based on the seasonal variation and relative distribution of ginsenosides, possible biosynthesis of ginsenosides in the leaves was discussed.

Reference 1. Kim *et. al*., *Molecules* **2018**, *23*, E1824.

P1-2

In Vitro, Inhibitory Effect on Nitric Oxide Production of Thai Traditional Benjakul and Mahapikud Soros Benjakul Remedies Used to be Adaptogenic Drug

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Keywords: Mahaphikud Soros Benjakul, Benjakul, nitric oxide, anti-inflammation

Inflammation is cause of many chronic diseases. Nitric oxide is released in inflammatory process in body and it is cause of tissue injury Thai traditional medicine used adaptogenic drug for helping to adjust the elements in body Benjakul and Mahapikud Soros Benjakul are Thai traditional formulas that are used to balance the body. Thus, the objective of this research was to comparison inhibitory effect on NO production induced by LPS in Raw 264.7 cell line of Benjakul with different formula of MSBJK. BJK and 5 formulas of MSBJK composed with 5 plants but the different ratio. They are fruit of *Piper retrofractum* Linn. (PR), root of *Piper sarmentosum* Roxb. (PS), stem of *Piper interruptum* Opiz. (PI), root of *Plumbaga indica* Linn. (PL), and rhizome of *Zingibber officinale* Rosc. (ZO). They were extracted by macerated in 95% ethanol, decoction and hydrolysis methods. The ethanolic extract and the hydrolysis of MSBJK4 showed the highest inhibitory activity of NO release with IC_{50} 3.47± 0.95µg/ml, and 4.27 ± 2.56µg/ml, following by the hydrolysis and the ethanolic extracts of MSPJK5 with IC_{50} of 4.64 ± 1.75 µg/ml, and 5.55 ± 1.63µg/ml, respectively. However, both of the extraction method of these remedies exhibited inhibitory effect on NO release less than the positive control (Prednisterone) with IC_{50} of 0.168 ± 0.014 µg/ml. These results are concluded that the different formulas had effect on antiinflammation. The best formula or MSBJK4 had *Plumbago indica* as the component in the highest ratio, the second formula had *Zingiber officinale* as a principle ingredient. However, MSBJK 4 and MSBJK5 showed higher inhibitory activity on NO release than BJK. ethanolic extract should be selected for drug development. Thus, selection the formula on MSBJK for treatment inflammation should be used two these formulas.

P1-3

Inhibition of Monoamine Oxidase A and B by *Rhinacanthus nasutus*

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Keywords: monoamine oxidase A, monoamine oxidase B, inhibition, *Rhinacanthus nasutus*

Cigarette smoking is a major risk factor of premature death and illness in smokers, including respiratory diseases and lung cancer. In cigarette, nicotine is an important compound that plays a major role in smoking addiction. Once smoking, nicotine will enter blood circulation and act on nicotinic acetylcholine receptor to stimulate dopamine release, resulting in pleasure and cigarette addiction, a similar mechanism as other drugs. Monoamine oxidase (MAO) is an outer membrane mitochondrial enzyme that degrades biogenic amines substrate, like dopamine. Upon metabolized by brain-specific MAO, the dopamine level decreases and leads to drugs addition. *Rhinacanthus nasutus* is the medicinal plant used for traditional medicine such as anti-viral, hepatoprotective. Recently, *R. nasutus* has been reported for their efficiency to be used for smoking cessation by inhibit cytochrome P450 2A6 and 2A13. This research investigates to inhibitory effect of MAO-A and B by *R. nasutus*. The crude (ethanol) extract of *R. nasutus* could inhibit MAO-B better than MAO-A with IC_{50} value 32.46 ± 3.54 µg/mL and 77.85 ± 2.56 µg/mL, respectively. The crude extract was partitioned with hexane, ethyl acetate, and water. Hexane fraction has the better efficiency of inhibition with IC_{50} value 32.67 ± 3.76 µg/mL for Mao-A and 13.28 ± 3.35 µg/mL for MAO-B, while ethyl acetate fraction has IC_{50} value 43.44 ± 1.68 µg/mL and 26.01 ± 3.09 µg/mL for MAO-A and B, respectively. The candidate compounds and their kinetic parameter as well as inhibition properties will be performed.

P1-4

Alpha-Mangostin, an Active Compound in Garcinia mangostana, Increases Anoikis-Resistance in Human Hepatocellular Carcinoma Cells

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Keywords: alpha-mangostin, liver cancer, anoikis-resistance, epithelial-mesenchymal transition, cancer progression, metastasis

Anoikis resistance is a critical step in cancer progression, especially, metastasis. In carcinogenesis, the cancer cell phenotype alteration causes survival in detachment condition, drug resistance, epithelial-mesenchymal transition (EMT), which support the progression of hepatocellular carcinoma. Alpha-mangostin has been reported its cell death induction, chemosensitizing and anti-metastatic properties in many cancer cell types. We therefore investigated whether alpha-mangostin exhibited anoikis-sensitizing effects in human hepatocellular carcinoma, HepG2 cells. The established anoikis-resistant HepG2 showed more aggressive malignant behaviors, including rapid proliferation, doxorubicin resistance, increased level of anti-apoptotic proteins, c-FLIP and Mcl-1, and EMT phenotype. Alpha-mangostin significantly sensitizing anoikis-resistant hepatocellular carcinoma cells through inhibition of cell survival by induced caspase-9, caspase-8 and caspase 3 activities, increased pro-apoptotic proteins, and decreased the anti-apoptotic proteins levels. Alpha-mangostin significantly reduced migration and matrix metalloproteinases-2 (MMP-2), MMP-9 secretions from the cells. Consistent with these results, EMT-involved protein expressions (αV, β1 integrins, E/N cadherin ratio, and vimentin) were obviously decreased. Besides, AKT and ERK pathways were dramatically suppressed by alpha-mangostin. These results indicated that alpha-mangostin negatively regulated anoikis resistance via the inhibition of AKT and ERK pathways in HepG2 cells. These findings support the anti-cancer drug development and use of alpha-mangostin to sensitize anoikis-resistance in liver cancer treatment.

P1-5

Caspase-Independent Apoptosis of *Dioscorea membranacea* Rhizome Extract in Human Non-Small-Cell Lung Cancer NCI-H226 Cells and Its Phytochemical Constituents

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Keywords: *Dioscorea membranacea*, caspase-independent apoptosis

The ethanolic rhizome extract of *Dioscorea membranacea* Pierre (DM) has been reported to exert potent cytotoxic effects against particular types of cancer (1, 2). As about 80% to 85% of lung cancers are non-small cell lung cancer (NSCLC), the present study aimed to investigate the specific cytotoxicity of DM against the human lung squamous cell carcinoma cell line NCI-H226, and to examine further apoptosis underlying its cytotoxic effect. The cytotoxicity of DM was determined by the SRB assay. Apoptotic cells in the sub-G1 phase as well as early and late apoptotic cells were stained with different fluorescent dyes and then analyzed by flow cytometry. Western blot analysis was used to detect the expression of apoptosis-related proteins. DNA fragmentation was detected by gel electrophoresis. Phytochemical constituents of DM were investigated by liquid chromatography with an electrospray ionization quadrupole time-of-flight mass spectrometer (LC-ESI-QTOF-MS/MS). DM exerted strong, selective antiproliferative activity in NCI-H226 cells with IC_{50}, TGI, and LC_{50} values of 28.65, 62.16, and 83.51 μg/ml, in comparison to human lung fibroblast MRC-5 cells. In addition, 0.5 mg/ml DM induced 6.43-36.97% apoptotic cells in *sub-*G_1 phase as well as 30-80% early and late apoptotic cells combined in a time-dependent manner. Pretreatment with the general caspase inhibitor z-VAD-fmk failed to completely abolish DM-induced sub-G1 phase, and no changes in caspase 3 activity were detected in DM-treated NCI-H226 cells with increased times, indicating no involvement of the caspase cascade in the apoptotic action of DM. Remarkably, Western blot analysis showed that DM induced a gradual translocation of Endo G, a caspase-independent apoptosis marker, from the mitochondria to cytosol and further to the nucleus with increased times. The DNA fragmentation was clearly observed in only DM-treated cells. LC-ESI-QTOFMS/ MS analysis revealed the presence of 26 structurally characterized compounds in DM, which can be categorized into 2 groups: spirostane-type saponins and non-steroidal saponins. This study revealed for the first time that DM exerted its cytotoxicity via apoptosis-inducing effect by triggering the mitochondria caspase-independent apoptotic pathway in NCI-H226 cells.

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P1-6

Effects of Seed Rhizomes Sizes and Shading on Rhizome Yield and Dioscorealide B Content of *Dioscorea membranacea* Pierre ex Prain & Burkill

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Keywords: *Dioscorea membranacea*, rhizome size, shading, yield, bioactive compound

Dioscorea membranacea Pierre ex Prain & Burkil is a medicinal plant which Thai folk doctors typically collect its rhizomes from forest and use them for cancer treatments. Dioscorealide B (DB), bioactive compound, was isolated from its rhizome showing high cytotoxic against breast, colon and lung cancer cell lines but low cytotoxic against normal cell line. However, DB accumulation and cultural practices for rhizome production are still limited. Therefore, the objectives of this study were to investigate the effects of seed rhizome sizes and shading on rhizome yield and DB content of *D. membranacea*. The small, medium and large sizes of 9.4 ± 3.8, 15.9 ±1.0 and 19.9 ± 2.8 cm in length of seed rhizomes, respectively, were grown in plastic pots under non-shading and the rhizomes were harvested at 24 months after planting (MAP). The medium size resulted in the highest rhizome weight, 3.7 ± 0.3 Kg plant^{-1} followed by large size, 3.5 ± 0.6 Kg plant^{-1} and the small size exhibited the lowest rhizome weight as 2.8 ± 0.3 Kg plant^{-1}. DB contents ranged from 4.5 ± 0.5 to 5.2 ± 0.6 % w/w which were not significantly different among the seed rhizomes size treatments. For shading experiment, 13-17 cm in length of seed rhizomes were cultivated in plastic pots under 0%, 50% and 70% shading. Rhizome yield at 24 MAP was not statically different among shading treatments as 2.5 ± 0.8, 2.3 ± 1.6 and 3.5 ± 0.4 Kg plant^{-1} were obtained from 0%, 50% and 70% shading, respectively. DB content was low as 2.1 ± 0.8 % w/w under 50% shading while its contents were greater under 0% and 70% shading as 4.6 ± 0.4 and 4.8 ± 1.1 % w/w, respectively. Based on these results, medium seed rhizome size of *D. membranacea* should be used for cultivation either under open field or shading areas.

P1-7

Antibacterial activity of the ethanolic extract of *Cassia garrettiana* heartwood

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Keywords: *Cassia garrettiana*, antibacterial activity

Cassia garrettiana Craib also called Samae-sarn by Thai name is a Thai medicinal plant in Leguminosae. It is used in Thai medicinal remedies as anti-cancer drug, emmenagogue and blood tonic for woman. However, it has been no report on antibacterial activity. Thus, the objective of this study was to investigate the antibacterial activity of the ethanolic extract of *C. garrettiana* heart wood. The antibacterial activity was performed by disc diffusion method and microtiter-plate based method against *Staphylococcus aureus* ATCC 25923, *Bacillus subtilis* ATCC 6633, *Pseudomonas aeruginosa* ATCC 9027 and *Escherichia coli* ATCC 25922. The ethanolic extract of *C. garrettiana* heartwood showed good activity against *S. aureus* and *B. subtilis* with MIC value of 312.5 μg/ml. Moreover, it also showed moderate activity against *E. coli* and *P. aeruginosa* with MIC value of 1.25 and 2.5 μg/ml. These results showed that the ethanolic extract of *C. garrettiana* heartwood have good effect against gram positive bacteria. However, antibacterial effect on anti-biotic resistance species should be performed to produce antibacterial drug from plant.

P1-8

Effects of Phenylalanine Concentrations on Antioxidant Contents of *Smilax corbularia* Kunth Shoots under Aseptic Conditions

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Keywords: *Smilax corbularia* Kunth, antioxidant, phenylalanine, flavonoids

Smilax corbularia Kunth. is a medicinal plant which its rhizomes used to treat cancers and AIDS. Plant tissue culture for propagation of *S. corbularia* has been studied but there is no report on the effect of precursor feeding on its antioxidant contents. Therefore, the objective of this study was to investigate the effects of phenylalanine (Phe), a precursor, concentrations on antioxidant contents of *S. corbularia* shoots grown under aseptic conditions. Single node explants were culture on the medium supplemented with 0, 25, 50 and 100 mg/l Phe for 4 weeks. The results indicated that all concentrations of Phe did not enhance total phenolic contents, however, 100 mg/l Phe treated shoots contained total flavonoid content of 59.51±6.13 mg CE/g dry extract which were 1.34 times higher than the control treatment (44.26±0.98 mg CE/g dry extract). DPPH radical scavenging activity (EC_{50}=108.15±4.35 µg/ml) of 100 mg/l Phe shoots was also greater than that of the control treatment (EC_{50}=148.48±8.67 µg/ml).

P1-9

Anti-Tyrosinase Activity of Four Plant Extracts and Kinetic Study of *Alpinia galanga* Rhizomes Extract

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Keywords: tyrosinase, *Alpinia galanga*, *Vitis vinifera*, *Moringa oleifera,* non-competitive inhibitor

Tyrosinase (EC 1.14.18.1) is a multifunctional copper-containing protein and considered as key enzyme of biological pigment synthesis (melanin). Tyrosinase inhibitors play a vital role in pharmaceutical and cosmetic field to prevent melanin synthesis. Four different plants which were *Panax ginseng* (rhizomes and leaves), *Alpinia galanga* (rhizomes and leaves), *Vitis vinifera* (seeds) and *Moringa oleifera* (leaves) were used to investigate tyrosinase inhibitory activity and estimate their 50% inhibitory concentration (IC_{50}). Plant parts were dried, powdered and extracted with 95% ethanol for *Alpinia galanga* and 70% ethanol for *Panax ginseng, Vitis vinifera* and *Moringa oleifera* and then evaporated by rotary evaporator. Anti-tyrosinase activity of each extract concentration in range 25-400µg/ml was determined by using L-DOPA as substrate. The results showed that IC_{50} of *Alpinia galanga* rhizomes, *Vitis vinifera* seeds and *Moringa oleifera* leaves extracts were 62.24, 59.62, and 71.20µg/ml, respectively. Kinetic inhibition of *Alpinia galanga* rhizomes extract on tyrosinase activity was also determined. The result showed that this extract inhibited tyrosinase activity as non-competitive inhibitor. The non-competitive property of *Alpinia galanga* rhizomes extract is interesting to determine the purified compound in this extract.

P1-10

Immunostimulatory Effects of *Alstonia scholaris* (Apocynaceae) Ehanolic Leaf Extract in Experimental Immunosuppressed Balb/C Mice

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Keywords: immunostimulation, *Alstonia scholaris*, Balb/C mice, immunosuppression, ethanolic extract

Most of the immunomodulatory drugs available commercially inflict deleterious effects that destroy not only targeted cells, but also the normal cells. In order to deal with this problem, interest in exploring the immunomodulatory properties of different plant extracts has increased. The present study evaluated the immunostimulating properties of *Alstonia scholaris* (L.) R.Br. ethanolic leaf extract in immunosuppressed mice by measuring peritonial macrophage phagocytic activity, plasma lysozyme levels, proliferation of splenic lymphocytes, and reactive oxygen species (ROS) production of murine macrophages. Three groups of Balb/C mice used included: (1) negative control group gavaged with phosphate buffered saline (PBS) daily from days 1 to 7 at 50 mL/kgBW; (2) positive control group gavaged on days 1, 3, 5 and 7, at 300 mg/kgBW with cyclophosphamide; and (3) mice gavaged with 2.5 mg/kgBW of plant extract from days 1 to 7, with a follow up of cyclophosphamide after an hour at days 1, 3, 5 and 7. Results showed significant enhancement of macrophage phagocytic activity and ROS production in extract treated mice. Moreover, the extract induced higher proliferation of splenic lymphocytes compared with immunosuppressed mice. However, no significant difference was detected in plasma lysozyme levels among the three mice groups. In general, the study showed that the *A. scholaris* leaf extract was able to alleviate the effects of cyclophosphamide and therefore has the capacity to enhance the immune system.

P1-11

Inhibition of Human Monoamine Oxidases (MAOs) by *Atractylodes lancea* (Thunb.) DC. Medicinal Plant Extracts

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Keywords: human monoamine oxidase (MAO), inhibition, *Atractylodes lancea* (Thunb.) DC., medicinal plant extracts

Nowadays, the medicinal plants are widely use to treatment many diseases. The rhizome of *Atractylodes lancea* (Thunb.) DC. is extensively used in Chinese, Thai, and Japanese as traditional medicines. Various pharmacological activities of *A. lancea* and its major constituents have been demonstrated *in vitro*, *ex vivo*, and in animal models. The purpose of this study was to investigate the effect of fraction of *A. lancea* extract to inhibit with monoamine oxidases (MAOs). MAOs have been reported as an important therapeutic target of these neurological diseases. MAO has two isoforms; MAO-A and MAO-B; which are different in their substrate preference. The decreased level of serotonin and dopamine neurotransmitters, by excess MAO-A and MAO-B activities, results in neuro deficiency development. In this study, we isolated different polarity fractions, including hexane, ethyl acetate, and water fractions of *A. lancea*. Upon using kynuramine as a substrate and measuring the change in rate of 4-hydroxyquinoline product generating by fluorescence spectrophotometry, the results showed that crude extract of *A. lancea* could inhibit human MAO-A with an IC_{50} value of 23.01 µg/ml and MAO-B with an IC_{50} value of 7.574 µg/ml. While fraction hexane and ethyl acetate of *A. lancea* could inhibit human MAO-A with an IC_{50} value of 54.97, 15.49 µg/ml and MAO-B with an IC_{50} value of 151.7, 30.1 µg/ml respectively.

P1-12

Inhibition of Monoamine Oxidase A and B by *Pluchea indica*

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Keywords: inhibition, monoamine oxidases (MAO), *Pluchea indica*

Monoamine oxidase (MAO) is a mitochondrial enzyme that has two isoforms of MAO-A and MAO-B. MAO-A and MAO-B have been report to be associated with metabolism of neurotransmitter serotonin and dopamine, respectively. Thus, the inhibitors of MAO-A were used as antidepressant drug, while inhibitors of MAO-B were used for the treatment of neurological disorder, such as Parkinson's and Alzheimer's diseases. It has been proposed that the constituents form medicinal plants could be a potential source for safe inhibitor for MAOs. In this study, the inhibition of *Pluchea indica* (*P. indica*) against MAOs was determined. The result showed that ethanol and hexane fraction of *P. indica* inhibited MAO-B better than MAO-A with IC_{50} value of ethanol fraction 42.01 ± 2.48 μg/ml for MAO-B and 69.84 ± 2.56 μg/ml for MAO-A, while IC_{50} value of hexane fraction was 20.56 ± 01.08 μg/ml for MAO-B and 34.32 ± 0.97 μg/ml for MAO-A. However, inhibition of ethyl acetate fraction on MAO-A (IC_{50} is 19.74 ± 2.67 μg/ml) was similar to MAO-B (IC_{50} is 19.11 ± 1.21 μg/ml). Water fraction showed poor inhibitory effect on both enzymes. It appeared that the inhibition by *P. indica* was reversible, because the activities of MAOs were similar upon pre-incubation and co-incubation of extracts.

P1-13

The Effect of Lunasin from Soybean Extract to Decrease Expression of COX-2 in Mice Colon Induced Dextran Sodium Sulfate

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Keywords: lunasin, inflammation, colon cancer, COX-2

Inflammatory bowel disease (IBD) is a condition describing chronic gastrointestinal inflammation. Chronic inflammation that occurs in the colon can develop into colon cancer. Lunasin has been known to resist inflammatory reactions induced by lipopolysaccharide. The role of lunasin as a preventive to colon cancer through inflammatory pathways in *in vivo* is not widely known. In this study we analyzed the effect of lunasin from soybean to decrease the risk of inflammation-associated colon cancer by analyzing the expression of COX-2. 30 Mice are divided into 6 groups. Normal group was not induced by DSS. The other groups were induced by 2% DSS through drinking water for 9 days. After 9 days, negative control group did not receive any treatment, beside the other groups received treatment given lunasin dose 20mg/kgBB and 40mg/kgBB, commercial lunasin and positive control given aspirin. Treatment was performed for 5 weeks. Inflammatory colon histopathologic examination and immunohistochemical score of COX-2 proteins were analyzed using statistical tests. Lunasin dose 20mg/kgBW and 40mg/kgBB were able to significantly reduce inflammation ($p<0.05$) with an average score of 2.52 and 2.16. COX-2 expression decreased significantly ($p<0.05$) with an average score of 43.674 and 33.349. Therefore, lunasin dose 20mg/kgBW and 40mg/kgBB were able to reduce the risk of colon cancer in DSS-induced mice by inhibiting inflammation and decreasing the expression of COX-2.

P1-14

Protective Effect Against Oxidative Stress-Induced Cytotoxicity and *in vitro* Antioxidant Activity of Thai Kam Muang Purple Rice

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Keywords: antioxidant, oxidative stress, Thai pigmented rice, rice bran extract, cellular protection

Overloads of free radicals and metal ions in cells are the important factors of oxidative stress, which cause damage to cell membranes and biomolecules leading to cell death. To date, research evidence has shown that oxidative stress has been implicated in many degenerative diseases. Consumers are thus increasingly interested in food supplements, especially ones with natural antioxidants to lower their oxidative stress. Bran, a by-product of the rice milling process, of pigmented rice varieties is an alternative choice. A number of studies have demonstrated strong antioxidant activities of pigmented rice bran extracts. However, very few studies have been very explicit about cytoprotective effects of these bran extracts against oxidative stress through their antioxidant activities. This study aimed to investigate the antioxidant activity and the protective effect of bran extract of Thai purple rice named Kam Muang (KM) extracted with 40/60 (v/v) ethanol-water solution. Different mechanisms of the antioxidant activity of the KM bran extract were measured with various *in vitro* assays, including radical scavenging assay, metal chelating assay, and anti-lipid peroxidation assay. In addition, the cytoprotective effect of the KM bran extract against oxidative stress was investigated in the normal liver cell line BNL CL.2 induced by tert-butyl hydroperoxide (tBHP), an exogenous inducer of oxidative stress, by measuring cell viability through propidium iodide staining and flow cytometry. The result showed that the KM bran extract possessed strong an antioxidant activity by scavenging DPPH radicals, chelating ferrous ions, and inhibiting lipid peroxidation with EC_{50} values of 10.85±2.72 μg/mL, 0.30±0.05 mg/mL, and 12.67±0.30 μg/mL, respectively. Exposure of tBHP-induced BNL CL.2 cells to the KM bran extract significantly increased cell viability in a dose-dependent manner, thus indicating a cytoprotective effect of KM bran extract against oxidative stress. The KM bran extract exerted a protective effect against oxidative stress-induced cytotoxicity in normal liver cells, potentially through its scavenging, chelating, and anti-lipid peroxidation properties. These findings indicate that Kam Muang bran extract has the potential for being developed into dietary supplements that make Thai pigmented rice bran more valuable.

P1-15

Protective Effect against Nitrosative Stress-Induced Cytotoxicity and *in vitro* Nitric Oxide Scavenging Activity of Hua-Khao-Yen Extract

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Keywords: *Dioscorea birmanica* Prain and Burkill (DB), nitric oxide (NO), sodium nitroprusside (SNP), NO scavenging activity

Nitrosative stress caused by continued overproduction of nitric oxide (NO) and its metabolites can lead to chronic inflammation involved in multiple chronic inflammatory diseases. Therefore, finding NO scavengers can help lower such stress and might be beneficial for the treatment of these diseases. In Thailand, Dioscorea birmanica Prain and Burkill (DB), one of Hua-Khoa-Yen plants, has long been used in folk medicine to reduce inflammation. However, no scientific findings provide insight into the biological effects of DB, especially its cytoprotective effect on nitrosative stress and NO scavenging activity. This study aimed to investigate the cytoprotective effect against nitrosative stress- induced BNL CL.2 cells (a murine normal liver cell line) and the in vitro NO scavenging activity of the rhizome extract of DB, and to determine the phenolic content contained in the extract. The rhizome extract of DB was obtained by maceration with 95% ethanol. The protective effect of DB against nitrosative stress was assayed in BNL CL.2 cells induced by the NO donor sodium nitroprusside (SNP), by measuring cell viability through propidium iodide (PI) staining and flow cytometry. The in vitro NO scavenging activity of the DB extract was measured by the Griess reagent. The total phenolic content was determined by the Folin-ciocalteau colorimetric method. The results revealed that exposing BNL CL.2 cells to SNP reduced cell viability. In contrast, the presence of different concentrations of the DB extract in these SNP-induced cells significantly enhanced cell viability in a dose-dependent manner, thus indicating that DB protected BNL CL.2 cells from SNP-induced cytotoxicity. The DB extract also exhibited a strong and specific NO scavenging activity in vitro with an EC50 value of 26.93±4.79 μg/mL, and contained high phenolic content (up to 170.85±3.02 mg gallic acid equivalent/g extract). These results indicated that the DB extract exerted a cytoprotective effect against nitrosative stress in normal liver cells potentially through its direct NO scavenging activity. Furthermore, phenolic compounds may be the main active ingredients in the DB extract. Therefore, DB is a promising antioxidant source used in medicine.

P1-16

Study on the Safety of *Garcinia mangostana* Linn. (Mangosteen) and Thai Medicinal Formula (Ha-Rak) Ethanolic Extracts in Thai Healthy Volunteers and Anti-Acne Inducing Bacteria Activity

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Keywords: *Garcinia mangostana* Linn., Ha-Rak, anti-acne, closed patch test

Garcinia mangostana Linn. (GM), simply known as mangosteen, has long been used by Thai traditional medicine for treatment skin infection. Ha-Rak formula (HR), a Thai medicinal formula, is also used for skin rash and it has ever been reported on anti-bacterial, anti-inflammatory and anti-allergic activities. However, there is no report on the safety of GM extract in human skin and anti-acne activity of HR extract. The aims of this study were to investigate anti-acne inducing bacteria activity of GM and HR ethanolic extract by determination of minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) values. The allergic contact dermatitis and irritation contact dermatitis of GM and HR ethanolic extracts were also studied in Thai healthy volunteers by using closed patch test. The test samples which included (a) 0.25% to 10% w/w of GM and HR ethanolic extracts and (b) white petrolatum (as a negative control) were applied to the upper back of 10 Thai healthy volunteers for 48 hours. The results of anti-acne activity demonstrated that GM extract was higher effective against *Propionibacterium acnes*, *Staphylococcus epidermidis* and *Staphylococcus aureus* than HR extract with MIC value of GM extract as 4 μg/ml, 3.125 μg/ml and 6.25 μg/ml respectively. The safety of GM and HR ethanolic extract showed that only 4 of 10 volunteers had no reaction, whereas 6 volunteers had positive patch test. Four of 6 volunteers who applied GM extract had angry back syndrome at 48 hours, and the other 2 volunteers had positive reaction at 48 hours while three volunteers who applied HR extract had angry back syndrome and the other three had positive reaction at 48 hours. However, all of them who applied GM and HR completely disappeared of erythema at 96 hours. Both of GM and HR ethanolic extracts at concentration up to 0.25% has potential to produce the irritant contact dermatitis in human skin. Therefore, it is recommended that both extracts should be developed to be topical anti-acne dosage form which can reduce irritation.

P1-17

Cytotoxicity of Three Edible Plants in Piperaceae against Breast and Ovarian Cancer Cells

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Keywords: Piperaceae, sulphorhodamine B (SRB) assay, cervical cancer, breast cancer

Many plants in Piperaceae family are widely used in Thai traditional medicine, such as *Piper nigrum, Piper retrofractum* and *Piper sarmentosum*. They are the most well-known species in this pepper family. They are also used to be edible spicy food in Thailand. These spices are commonly used to be flatulence and are also consist of many remedies in Thai traditional medicine for cancer prevention. Thus, the objective of this study was to investigate cytotoxicity against breast (MCF-7, T47D) and ovarian (SKOV-3) cancer cells. The method of extraction was similarly to practice by Thai traditional doctors as maceration in 95% ethanol and boiling in water. These extracts were tested for cytotoxic activity against three cancer cell lines [breast (MCF-7, T47D) and ovarian (SKOV-3) cancer cells] and one normal cell line [keratinocyte human cell lines (HaCaT)] by sulphorhodamine B (SRB) assay. The result showed that 95% ethanolic extract of *P. nigrum* exhibit the highest activity against all cells; breast (T47D, MCF-7) and ovarian (SKOV-3) cancer cells, with IC_{50} values of 12.70 ± 0.05, 24.19 ± 1.34 and 36.64 ± 1.76 µg/ml respectively.and the selective index when compared with normal cell as 2.84,1.49 and 0.99 respectively. Followed by 95% ethanolic extract of *P. sarmentosum* showed the second highest activity in those cells with IC_{50} values of 19.44 ± 1.86, 24.84 ± 2.03 and 39.62 ± 1.45 µg/ml respectively. The selective index of this extract were 2.08, 1.63 and 1.02 respectively. Lastly, 95% ethanolic extract of *P. retrofractum* showed moderate cytotoxicity to breast (T47D and MCF-7) cancer cells with IC_{50} values of 27.72 ± 2.38 and 27.22 ± 0.39 µg/ml respectively and selective index as 2.64 and 2.68 respectively. However, *P. retrofractum* had no cytotoxic activity against SKOV-3. In contrast, the water extract of these three herbs in Piperaceae family had no cytotoxic activity against breast and ovarian cancer cells. Inclusion, *P. nigrum, P. retrofractum* and *P. sarmentosum* showed cytotoxicity on breast cancer cells, but they showed less toxic on keratinocyte cells. Thus, *P. nigrum* showed the highest cytotoxic activity against cancer cell, especially breast cancer cell depending on hormone but less active against normal cell. These results can be used to promote this plant to be spicy food for cancer treatment and prevention and also support using in Thai traditional medicine.

P1-18

Antibacterial and Cytotoxic Activities against Woman Cancer Cells of *Asparagus racemosus* Extract

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Keywords: *Asparagus racemosus* Willd. antibacterial, cytotoxic, sulphorhodamine B

Asparagus racemosus Willd is commonly known as Shatavari. It is a member of Asparagaceae, the underground part of this plant have long been used to treat women diseases in Thai traditional medicine but there is no scientific report. Thus, the objective of this research was to investigate antibacterial and cytotoxic activities against woman cancer cells of underground parts of this plant extract such as whole root, root peel, inner root and rhizome. The method of extract was maceration in 95% ethanol. Cytotoxic activities against two types of woman cancer cells [cervical cancer cells (HELA) and ovarian cancer cells (SKOV3)] was determined by Sulforhodamine B (SRB) assay and antimicrobial activity by Minimal Inhibitory Concentration (MIC). The results found that the ethanolic extract of root peel (AR.PE) showed the highest cytotoxic activity against cervical cancer cells (20.61 ± 1.61 µg/ml) and ovarian cancer cells (40.78 ± 0.65 µg/ml). The rhizome extract (AR.RE) showed the highest antimicrobial against *Staphyllococus aureus* (2.5 mg/ml) and *Escherichia coli* (5 mg/ml). In the conclusion, root peel of this plant was evaluated as the best part for woman cancer treatment and its rhizome is the best for antimicrobial.

P1-19

Development of Dietary Supplement Products in Spherical Beads Form Containing Herbs

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Keywords: dietary supplement, herbs, spherical beads

Dietary supplement containing herbs is very attractive to healthy concern people because it produces from natural products which tend to be safer than synthesis products. However, the form of the dietary supplement found in the general market is very similar to drug products such as tablet, capsule or powder forms. Spherical bead formation is an innovation and gets more attention from consumers. To promote not only the attractive form of dietary supplement but also to increase value added of Thai herbs, the spherical beads containing herb extracts were developed by spherification process. The extracts of *Phyllanthusemblica* L., *Solanum trilobatum* L. and *Glycyrrhiza glabra* L. were loaded using calcium solution to assist in the bead forming and coated with various molecular weight ranges of natural polysaccharide. To optimize the formulation, the physical properties such as size, spherical shape, hardness, and flexibility of spherical beads were evaluated. Then, the optimum formulation was developed as final products in various forms such as spherical beads in liquid, in agar and in soft jelly. The stability study and safety as Notification of the Ministry of Public Health of Thailand of final products were determined. The results demonstrated that the more calcium used the more hardness of the beads were obtained without affecting their size and shape. Moreover, the coating with a specific natural polysaccharide can protect the penetration of the solution content from inside to outside of the beads. In addition, natural polysaccharide-coated spherical beads containing herbs packed in soft jelly form were the most physically stable and no pathogenic microbial contamination throughout the stability study period. In conclusion, dietary supplement products containing herbs in spherical beads form is the new form of dietary supplement products that can be an alternative choice for health-concern consumers. This innovative product can enhance the health-concern consumer demand and also increase value added to Thai herbs.

P1-20

Potential of *Lactobacillus plantarum* TISTR 1465 and *Lactobacillus plantarum* 5C2-14 for Synbiotic Production with Jerusalem Artichoke Powder

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Keywords: synbiotic, probiotic, prebiotic, Jerusalem artichoke

Synbiotic supplementary food is a synergistic combination of probiotics and prebiotics which can improve benefits on humans' health over the uses of either probiotics or prebiotics alone. The aim of this study was to compare the growth and the survival after freeze-drying process of probiotic strains *Lactobacillus plantarum* 5C2-14 and *Lactobacillus plantarum* TISTR 1465 in order to produce synbiotic product using probiotic strain with prebiotics from Jerusalem artichoke powder. The concentrations of Jerusalem artichoke powder at 2, 4, 6 and 8 % by weight were optimized to improve the growth and the survival of the probiotic strains after freeze-drying process. The results showed that the optimum concentration of Jerusalem artichoke powder was 6 % by weight. The maximum cell concentrations of *L. plantarum* 5C2-14 and *L. plantarum* TISTR 1465 of 5.06×10^9 and 1.14×10^9 cfu/ml, respectively, were obtained when incubated at 37 °C for 24-48 hours under anaerobic condition. After freeze drying, the survived cells of *L. plantarum* 5C2-14 (6.43×10^9 cfu/g) were higher than those of *L. plantarum* TISTR 1465 (5.20×10^9 cfu/g), suggesting that *L. plantarum* 5C2-14 is suitable to be used as probiotic for the production of synbiotic product.

P1-21

Antioxidant and Anti-Inflammatory Effects of Thai Traditional Hemorrhoids-Treatment Recipe

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Keywords: hemorrhoids, recipe, antioxidation, anti-inflammation

A hemorrhoids treatment recipe used in this study was derived from Mr. Kitti Nakun, who is a folk healer in Ubon Ratchathani Province, Thailand. This recipe is a decoction of 7 herbs including S*alacia chinensis* L., *Curcuma comosa* Roxb, *Plumeria alba* L., *Suregada multiflora* (A. Juss) Baill., *Cissus quadrangularis* L., *Salacia verrucosa* Wight. and *Sansevieria cylindrica* Bojer. This study aims to investigate antioxidation using DPPH assay and anti-inflammatory effect via the expression of cyclooxygenase-2 (COX-2), interleukin-1β (IL-1β), inducible nitric oxide synthase (iNOS) and tumer necrosis factor-α (TNF-α) in macrophage cells by using semi-quantitative-reverse transcription-polymerase chain reaction (RT-PCR) technique. This recipe was extracted with water and then dried by using lyophilization. The antioxidant activity of the extract showed half inhibitory concentration (IC_{50}) at 0.55±0.03 mg/mL. For the viability test on RAW264.7 macrophage cells, this recipe exhibited low toxicity on this cell with IC_{50} more than 2 mg/mL after 12 hr of incubation. In addition, the results exhibited that at 25-100 μg/mL concentrations of the extract inhibited the expression of COX-2, IL-1β, iNOS and TNF-α genes in the dose-dependent manner. The results confirm the traditional use of these plants for treatment of pain and inflammation associated with hemorrhoids.

P1-22

Tetrahydrocurcumin Attenuates High-Fat Diet-Induced Kidney Injury through Suppression Intrarenal ACE and AT1R Expression in Mice

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Keywords: tetrahydrocurcumin, high-fat diet, kidney injury, intrarenal ACE and AT1R

In diabetes, activation of intra-renal renin angiotensin system (RAS) is related to the pathogenesis of diabetic nephropathy (DN) and hypertension. We aimed to investigate the effect of tetrahydrocurcumin (THC), an antioxidant hydrogenated from curcumin on intra-renal RAS expression, kidney injury and systolic blood pressure (SBP). Eight-week-old C57Bl/6j mice were fed with normal diet (ND) or high-fat diet (HFD) for 12 weeks, and THC (50 or 100 mg/kg/day) was intragastrically administered along with HFD initiation. During experimental period, physiologic and metabolic changes of those mice were monitored. At the end, sample analyses were conducted. HFD-fed mice exhibited hyperglycemia, insulin resistance and hyperlipidemia. Kidney injury was also found in those mice as the evidence of increasing albumin to creatinine ratio (ACR), glomerular hypertrophy, with renal upregulation of angiotensin converting enzyme (ACE), angiotensin type 1 receptor (AT1R), and NADPH oxidase-4 (NOX4). SBP monitoring for 12 weeks in conscious mice revealed that HFD gradually elevated SBP accompanied with vascular remodeling which was observed in this study. Moreover, vascular AT1R expression was upregulated in HFD-fed mice. THC effectively suppressed intra-renal RAS activation, enhanced insulin sensitivity, and prevented vascular remodeling and high SBP, thereby preventing kidney injury. Taken together, our results suggest that supplementation with THC particular at 100 mg/kg/day may have beneficial effects for preventing kidney injury and high SBP through modulation of intra-renal RAS activation in HFD-fed mice.

P1-23

Characterization of Alkaline Protease Producing Bacteria and Its Application as a Laundry Detergent Additive

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Keywords: alkaline protease, detergent, *Bacillus*

Proteases are a group of enzyme which hydrolyzes peptide bounds of protein into small molecules of polypeptides or free amino acids. Alkaline proteases are outstandingly and widely used in many industrial applications such as laundry detergent industries. *Bacillus pseudofirmus* 1S9-2, a high alkaline protease producing bacteria was selected from Ubon Ratchathani Zoo, resources protection area under Plant Genetic Conservation Project under The Royal Initiative of Her Royal Highness Princess Maha Chakri Sirindhorn. The bacterial was cultured on BMSM broth pH 11.0 supplemented with 1% skimmed milk shaking incubator 150 rpm at 37°C. The highest alkaline protease activity was found 428.72 units/mL, within 72 hours of cultivation. The optimum temperature and pH of enzyme activities were 45°C and pH 11.5, respectively. The temperature and pH stability of this enzyme were 37°C to 45°C for 1 hour and pH range 7.0 to 11.5 for 1 hour at room temperature. The cleaning power of enzyme from *B. pseudofirmus* 1S9-2 was improved. The enzyme could remove blood stains and more brightening when compare with 0.05 M glycine-NaOH buffer as a control. For the properties of alkaline protease from *B. pseudofirmus* 1S9-2 which stable over a wide range of pH and temperature and the ability of blood stains removal, it will be used as an additive in detergent that makes this enzyme potentially useful for various industrial applications.

P1-24

Effects of 6-Week Oral Administration of *Kaempferia parviflora* Rhizome Dichloromethane Extract Formula on Body Fat and Vascular Function in Middle-Aged Male Rats

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Keywords: *Kaempferia parviflora*; blood vessel; glucose; visceral fat; hydrogen sulfide

Rhizomes of *Kaempferia parviflora* (KP) have been used for treating hypertension and for promoting longevity. We previously found that dichloromethane extract of the rhizomes of the KP (KPD) caused an increase in vascular nitric oxide to attenuate vasoconstriction to phenylephrine and enhance vasodilator to acetylcholine with a decrease in body fat accumulation of middle-aged male rats after having oral administration for 6 weeks. However, the KPD is water insoluble. Thus, in the present study we prepared KPD solid dispersions using 50 % Kollicoat® IR (by weight) as a polymeric matrix (KPD formula) and tested the product activities in middle-aged male rats. KPD formula was dissolved in distilled water and orally gavaged to middle-aged male rats (100 mg/kg, twice a day) for 6 weeks, and the same volume of distilled water was gavaged to the control group (n=6 for each group). Basal blood pressure and heart rate were measured in anesthetized rats with a Polygraph. Fasting blood sugar and lipid profile were measured by enzymatic methods. The vascular functions of isolated thoracic aorta were studied using pharmacological techniques. In comparison to the control group, KPD formula consumption did not affect body weight, internal organ weight, basal blood pressure or heart rate. However, it caused decreased visceral fat accumulation and fasting blood sugar level. KPD formula treatment caused a decrease in vascular contractile response to phenylephrine in endothelium-intact thoracic aortic rings. The effect persisted in the present of L-nitro-L-arginine (L-NA), but disappeared after removal of the vascular endothelium. KPD formula treatment also caused increased dilatation to acetylcholine of the aortic ring pre-constricted with phenylephrine. But this effect disappeared in the presence of DL-propargylglycine, a H_2S inhibitor. In conclusion, KPD formula treatment caused decreases in visceral fat accumulation and fasting blood sugar and might increase endothelial H_2S production to attenuate vasoconstriction to phenylephrine and enhance vasodilatation to acetylcholine – effects which are beneficial factors that would attenuate the development of risk of cardiovascular disease. However, further investigation to measure the blood vessel cystathionine-γ-lyase enzyme expression, the key enzyme to convert the amino acid L-cysteine to H_2S, to confirm the increase in H_2S production is necessa.

P1-25

Effects of 6 Weeks Oral Administration of Palm Oil on Lipid Profile and Vascular Function in Young Male Rats

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Keywords: palm oil, blood vessel, visceral fat, lymphocyte, hydrogen sulfide

In the last 30 years, palm oil (PO) has been introduced in Thailand and become more popular than lard oil because of the notion that plant oil consumption would be better than animal fat for cardiovascular health. However, scientific information to support this notion is still controversial. In addition, metabolic syndrome and cardiovascular diseases are also increasing in the Thai people in the same trend as that in the global population.[1,2,3] The present study aimed to investigate the effects of chronic oral administration of PO on lipid profiles, blood chemistry and vascular functions in rats. The study was performed in young adult male rats (3 month old). PO or distilled water (control) at a dosage of 3 ml/kg (which is comparable to the amount of LO that would be used for preparation of 3 dishes of Thai fast food, e.g., a dish of fried rice, stirred fried vegetable and an omelette) were orally gavaged once a day for 6 weeks (n=6 for each group). Basal blood pressure and heart rate were measured in anesthetized rats with a Polygraph. Fasting blood sugar and lipid profile were measured by enzymatic methods. Liver cell lipid accumulation was measured by oil red O staining method on cryostat-thin sections of liver tissue. The vascular functions of isolated thoracic aorta were studied using pharmacological techniques. In comparison to the control group, PO consumption (3 ml/kg, 6 weeks) did not affect body weight, internal organ weight, blood chemistry or basal blood pressure and heart rate. However, it caused increased visceral fat accumulation and number of fasting blood lymphocyte. PO treatment had no effects on vascular contractile response to phenylephrine or dilatation to acetylcholine or glyceryltrinitrate whether or not endothelium and/or N-nitro-L-arginine (L-NA) were present. DL-propargylglycine, an H_2S inhibitor, caused increased baseline tension of the endothelium-denuded aortic ring that had been pre-incubated with L-NA and that resulted in an increase in the contractile response to phenylephrine of the PO treated compared to that of the distilled water control group. In conclusion, consumption of PO at the dosage 3 ml/kg, caused an increase in visceral fat accumulation and increased lymphocyte numbers, which are risk factors for the development of cardiovascular disease. The finding of increased H_2S production by the thoracic aortic rings of PO-treated rats might be a beneficial factor that would attenuate the development of risk of cardiovascular disease. However, further investigation to measure the blood vessel cystathionine-γ-lyase enzyme expression, the key enzyme to convert the amino acid L-cysteine to H_2S to confirm the increase in H_2S production is necessary.

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P1-26

Anti-Metastatic Effect of Rice Bran Hydrolysates on Cholangiocarcinoma Cells through Suppression of FAK/PI3K/Akt Pathway

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Keywords: anti-metastasis, rice bran hydrolysates, cholangiocarcinoma, focal adhesion kinase

Cholangiocarcinoma (CCA), cancer of the bile duct, is one of major health concern in Southeast Asian countries and Southern China. The locally advanced and metastatic tumors are causally related to their very poor prognosis. The current chemotherapy is still inefficient. Drugs or dietary supplements have been advocated as chemoprevention of cancer by preventing the seeding and proliferation of tumor cells. Rice bran hydrolysates (RBH) have been shown to possess anti-inflammatory, antioxidant and insulin sensitizing effects. This study aimed to explore effect of RBH on cell migration and invasion of CCA cells. RBH from Tubtim Chumpae rice (RD69) at concentrations of 200-1600 µg/mL strongly suppressed migration of three CCA cell types, evaluated by wound healing assay and cell invasion by TranswellO chamber assay in KKU-156 cells. The effects were associated with suppression of activation of FAK, and PI3K-Akt protein expression. It is concluded that RBH show the anti-migration and anti-invasion in cancer cells in association with inhibition of activation of FAK/PI3K-Akt pathway. Consumption of rice bran may provide health benefit on prevention of cancer.

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P1-27

Effects of Pepsin-educed Soy Protein Hydrolysates on Degranulation in IgE-Antigen Complex-Stimulated RBL-2H3 Cells

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Keywords: soy protein, soy protein hydrolysates, RBL-2H3 cells, β-hexosaminidase release, anti-allergy

Due to increasing use of soy protein isolate (SPI) in foods for its excellent functional properties, and allergy concerns associated with it, the anti-allergic activity of pepsin-educed soy protein hydrolysates (SPHs) were investigated in this study. SPI was enzymatically hydrolyzed with pepsin, while evaluating its reaction conditions which included E/S (enzyme to substrate ratio) of 0.5%, 1% and 1.5%; and time (0 min, 30 min, 1h, 2h, 4h and 8h). Afterwards, rat basophilic leukemia (RBL)-2H3 cells activated by the IgE-antigen complex were used to assess mast cell degranulation inhibitory activity of the SPHs by the release of β-hexosaminidase. RBL-2H3 cells were sensitized with monoclonal anti-dinitrophenol (DNP) specific IgE and challenged with the antigen DNP-bovine serum albumin in the presence or absence of SPHs. It was observed that the SPHs produced at 0.5% E/S and in the front 4h significantly ($P < 0.05$) inhibited β-hexosaminidase release in IgE-antigen complex-stimulated RBL-2H3 cells as compared to those produced at 1.0% and 1.5% E/S and other time intervals; while the anti-allergic activity was taken at equal concentration of 0.1 mg. The result suggests prospective applications of SPH as a low cost hypo-allergic protein in foods and nutria-pharmaceutical industries.

P1-28

Sung Yod Rice Bran Hydrolysates Reduce Blood Pressure and Oxidative Stress in Nitric Oxide Deficient Hypertensive Rats

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Keywords: hypertension, L-NAME, nitric oxide, oxidative stress, Sung Yod rice bran hydrolysates

Hypertension is one of the most common chronic diseases and a major risk factor for cardiovascular disease (CVD). Increased oxidative stress and reduced nitric oxide (NO) bioavailability in the vascular system are involved in development of hypertension. Consumption of dietary antioxidants has shown their beneficial role in prevention and treatment of hypertension. Rice bran hydrolysates contain highly nutritional proteins and antioxidant compounds which show benefits against hypertension. However, the effect of rice bran hydrolysates extracted from Sung Yod rice, a red-violet pigmented rice, has not been investigated. The present study aimed to investigate the antihypertensive effect of Sung Yod rice bran hydrolysates (SRH) in NO-deficient hypertensive rats. Hypertension was induced in male Sprague-Dawley rats (200-230 g) by administration of Nω-nitro-L-arginine methyl ester (L-NAME), a NO synthase inhibitor, at dose of 50 mg/kg/day in their drinking water for 3 weeks. Simultaneously, SRH were orally administered daily at dose of 250 or 500 mg/kg/day. Rats received tap water as drinking water and orally administered with deionized water were served as normotensive controls. After 3 weeks of treatment, SRH in a dose-dependent manner significantly reduced arterial blood pressure and decreased oxidative stress by decreasing superoxide production in the vascular tissues, reducing plasma malondialdehyde and protein carbonyl, increasing plasma nitrate/nitrite and up-regulating eNOS expression ($p<0.05$). Results of this study suggest the antihypertensive action of SRH might be involved with the improvement of NO bioavailability and a reduction in oxidative stress.

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P1-29

Antihypertensive and Antioxidative Effects of Asiatic Acid in Rats Chronically Exposed to Lead

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Keywords: asiatic acid, antioxidant, hypertension, lead, oxidative stress

Several epidemiologic studies have linked lead (Pb) exposure to hypertension. Pb may contribute to cardiovascular disease by increasing oxidative stress and causing endothelial dysfunction and downregulation of nitric oxide (NO) production. Asiatic acid (AA), a pentacyclic triterpene found in *Centella asiatica*, has shown biological effect of antioxidant, anti-inflammatory and antihypertensive activities. This study aimed to investigate whether AA could alleviate hypertension, endothelial dysfunction and oxidative stress in rats chronically exposed to low level of Pb. Male Sprague-Dawley rats received lead acetate (100 mg/L) in their drinking water for 16 weeks. AA (15 or 30 mg/kg) was intragastrically administered once daily for the last 4 weeks of Pb exposure. Pb significantly elevated arterial blood pressure, attenuated vasodilator response to acetylcholine, decreased NO production and increased oxidative stress ($p<0.05$). AA in a dose dependent manner alleviated these detrimental effects of Pb ($p<0.05$). Results suggest that AA may be promising in the treatment of Pb intoxications.

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P1-30

Plant Proliferation and Callus Induction of a Medicinal Plant *Celosia argentea*

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Keywords: betalains, callus induction, *Celosia argentea*, 2,4-dichlorophenoxyacetic acid, 6-benzylaminopurine

Celosia argentea, commonly known as cockscomb, is a widely cultivated ornamental plant belonging to the family Amaranthaceae with the inflorescence color variation from yellow to various shades of red and violet. The colors of the inflorescence are due to the presence of betalain pigments, which possess important medicinal properties such as hepatoprotection, anti-tumor, anti-diarrhea, anti-diabetic, antioxidant, anti-hypertension, and eye disease treatment. The aims of this study were to propagate the seedlings and to establish callus cultures of *C. argentea in vitro*. Seeds of *C. argentea* were cultured on a modified Murashige and Skoog (MS) medium. It was demonstrated that seeds of *C. argentea* germinated on day 7 after sowing with 100% germination rate without contamination. Red seedlings were selected and maintained on MS medium, and the subculture was carried out every 20 days. Callus cultures were established from stem and leaf explants on the modified MS medium supplemented with various combinations of auxin and cytokinin. The result showed that compact and friable calli were induced using modified MS medium supplemented with 1.0 mg/L of 2,4-dichlorophenoxyacetic acid (2,4-D) and 0.1 mg/L of 6-Benzylaminopurine (BAP after 17 days of culture with 80% callus induction. Therefore, micropropagation and callus formation of *C. argentea* has been successfully established, and the *in vitro* callus cultures of *C. argentea* obtained from this study can be potentially used as a source of betalain production for pharmaceutical, cosmetic, nutraceutical and food industries.

P1-31

Selection of β-glucosidase producing lactic acid bacteria to use as starter culture for soy yogurt production

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Keywords: lactic acid bacteria, *Lactobacillus plantarum*, β-glucosidase, soy yogurt

β-Glucosidase activities of lactic acid bacteria (LAB) play an important role in the fermented soymilk production (soy yogurt). This enzyme hydrolyzes isoflavone glycosides containing in soybean and releases free isoflavone in soy yogurt products. This study aims to select *β*-glucosidase producing lactic acid bacteria and use as a starter culture for soy yogurt production. *β*-Glucosidase production from six strains of lactic acid bacteria (LAB) (*Lactobacillus plantarum* SNK5, *L. plantarum* NBK5, *L. plantarum* SKKP5, *L. plantarum* SSNH28, *Pediococcus pentosaceus* SFM1 and *Weisella cibraia* SFM2) were evaluated in De Man, Rogosa (MRS) medium. The results showed that *L. plantarum* SNK5 and *L. plantarum* SSNH28 exhibited high *β*-glucosidase activity. These two LAB strains were selected to determine the optimum conditions for enzyme production. The inoculum size, temperature and pH optimum of both strains were 10^7 CFU/mL, 30°C and 7.0, respectively. Under optimum condition, *L. plantarum* SNK5 and *L. plantarum* SSNH28 displayed the *β*-glucosidase activity of 96.58 and 54.28 U/mL, respectively at 24 h. Soy yogurt produced by using *L. plantarum* SNK5 as the starter culture under optimum condition exhibited β-glucosidase activity of 4.66 U/mL at 24 h. *β*-Glucosidase production during fermentation could be related to isoflavone glycosides hydrolysis. The increasing of free isoflavone content in soy yogurt will be further analyzed.

P1-32

Glucosyloxybenzyl *R*-2-Benzylmalate Derivatives from *Arundina graminifolia* (D.Don) Hochr.

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Keywords: *Arundina graminifolia*, Orchidaceae, glucosyloxybenzyl 2*R*-benzylmalate derivatives, arundinoside

Arundina graminifolia (bamboo orchid) is a terrestrial growing orchid native to tropical Asian countries of Thailand, Vietnam, Malaysia, Singapore and Indonesia. A rapid RP-HPLC-DAD-HRMS screening of the ethyl acetate extract from *A. graminifolia* suggested the presence of glycosidic compounds due to their high molecular weight, their UV spectrum as well as their MS fragmentation patterns [1-2]. An extensive chemical investigation of the extract using various chromatographic methods lead to the isolation of 15 undescribed benzyl malic glucosides derivatives named arundinoside A-O. Their structures were elucidated by means of extensive spectroscopic experiments. This particular class of orchid glycosides is reported in this well-studied orchid for the first time. Their neuroprotective properties were evaluated on their ability to reduce the beta-amyloid damages on a PC12 cell model.

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P1-33

Production of Hybrid Catfish Patties with *Aloe vera*

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Keywords: patties, hybrid catfish, *Aloe vera*, cooking loss, juiciness

Patties are varieties of seasoned ground meat and usually are consumed as in burgers. Generally, pork or beef or a mixture of both is used as a main raw material. Nowadays, with health concern, patties are widely produced from low fat meat. However, grounded low fat meat is usually hard with rough textures. The purpose of this research is to replace the meat with fish meat as of catfish. In Thailand, the hybrid catfish is one of the freshwater fishes that has high economical values, however, due to its dark color, the fish meat is not so appealing to consumers. And to value-added-product, minced hybrid catfish were mixed with *Aloe vera* gel, which contains hydrocolloid characteristic with water holding properties. Moreover, *A. vera* gel also contains a number of antioxidants. To obtain the optimum concentration of *A. vera* gel, the weight ratio of *A. vera* gel to water were varied at four levels: 0:100 (control), 50:50, 75:25 and 100:0, respectively. The results showed that the patties with 50% *A. vera* gel was somewhat better in % cooking loss, % juiciness and cohesiveness from the control. However, sensory scores in taste, juiciness and overall liking did not significantly difference from that of the control ($p > 0.05$). Additionally, the catfish patties obtained from this study is considered a healthier choice with lower fat content than that of the original patties from low fat pork or beef, and the fish patties are also gentler to touch.

P1-34

Formulation and Process Development of Crispy Rice Coated with Riceberry Sweet Solution

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Keywords: crispy rice, hardness, mulberry, riceberry bran, riceberry powder

The objective of this research was to formulate and develop process of crispy rice coated with riceberry sweet solution. The compositions of prototype coating solution contained riceberry powder, mulberry juice, coconut oil, sweetened condensed cream, honey and glucose syrup. Hardness values of prototype sample, original formula product and two commercial products were determined. The result showed that hardness value of prototype sample was comparable with both commercial products whereas the original formula product had the highest hardness value. Riceberry bran was by product from rice processing, in this study it was used as an ingredient of crispy rice coating solution in order to be natural dye and reduce cost of raw material. Riceberry powder was a key component added in all solution formulations. Four sweet coating solution formulas were studied including mulberry juice and coconut oil (MC), riceberry bran extract and coconut oil (RC), mulberry juice and butter (MB) and riceberry bran extract and butter (RB). It was found that moisture content, water activity (aw) and hardness values of all solutions coated crispy rice were in the range of 7.64-7.91%wb, 0.40-0.45 and 22.45-31.86 kgf, respectively. RB formula coated crispy rice got the highest sensorial score of liking color and had the lowest cost. Three ratios of coating solution to crispy rice (1:1, 1:1.3 and 1:2) were investigated. The result showed that the coating solution and crispy rice at the ratio of 1:1.3 was suitable due to providing a smooth surface covering and producing acceptable texture. The optimum drying condition was 70°C for 3 hours.

P1-35

Etlingera pavieana Extract Inhibits TNF-a-Induced Vascular Adhesion Molecule Expression and ROS Production in Human Endothelial Cells through JNK and Akt Pathways

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Keywords: *Etlingera pavieana*, oxidative stress, cell adhesion molecule, endothelial cell

Chronic vascular inflammation and oxidative stress lead to endothelial dysfunction which plays a key role in the initial step of pathogenesis of atherosclerosis. The aim of this study was to determine whether *Etlingera pavieana*, as herb and spice in the East of Thailand, inhibits the expression of intercellular adhesion molecule-1 (ICAM-1) and vascular cell adhesion molecule-1 (VCAM-1) in TNF-α-stimulated human vascular endothelial cells (EA.hy 926 cell line). We found that the rhizome ethanol extract from *Etlingera pavieana* (EPE) significantly reduced ICAM-1 and VCAM-1 expression in a dose-dependent manner. It also suppressed reactive oxygen species (ROS) generation in TNF-α-induced endothelial cells. Moreover, EPE significantly inhibited the phosphorylation of JNK but not ERK and p38 mitogen-activated protein kinase (MAPKs) pathway. In addition, phosphorylation of Akt and c-Jun, a major component of AP-1, were inhibited by EPE. Taken together, our data indicated that EPE exerts protective effect against vascular inflammation and oxidative stress in endothelial cells. Therefore, *E. pavieana* might have a useful for preventing an early step of atherosclerosis.

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P1-36

Compounds from Black Rice Bran Extract Reduce Prostatic Tumor Progression by Inhibiting the Cells Proliferation and Altering the Cytoskeletal Organization

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Keywords: black rice bran extract, PC_3 cell line, tumor progression, cytoskeletal reorganization

Black rice bran extract (BRB) contains a great mixture of phytochemicals known to be essential nutrients to human health. This study was aimed to investigate the beneficial effects BRB on prevention of prostatic cancer progression in an *in vitro* model using biological, bio-chemical, and immunofluorescence microscopic assessments. BRB treatment exhibited a time and concentration dependent effect on human PC3 cells' viability and a potential inhibitory effect on the cells' migration. Western blot analysis revealed significant inhibitory effect of BRB on metalloproteinase enzyme (MMP-9) activity that was likely potentiated by NF-kB expression level. Strikingly, BRB induced microtubules redistribution in the treated cells leading to an alteration of their movement capability. These data suggest that phytochemicals in the BRB can inhibit prostate cancer cell progression via reducing cell proliferation, motility and invasiveness.

P1-37

Effects of Patawee Apo Wayo Extract on Cognitive Impairment in Streptozotocin-Induced Diabetic Rats

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Keywords: Patawee Apo Wayo, diabetic rats, memory impairment, novel object recognition

The Thai traditional medicine formula named Patawee Apo Wayo (PAW) has long been used for the treatment of diabetes mellitus. The formula is a combination of twenty two plant ingredients and has never been reported its study on nervous system, especially the memory enhancing effect. The aim of the study was to investigate the effect of the extract from PAW on the cognitive performance in streptozotocin (STZ)-induced diabetic rats. Adult male Sprague Dawley rats were divided into five groups (n = 8): normal control, diabetic and three diabetic groups fed with the PAW extract (125, 250 and 500 mg/kg BW) daily for 2 weeks. Cognitive performance was investigated by novel object recognition test. An administration of PAW extract at doses of 125 and 250 mg/kg BW significantly increased the preferential exploration of new objects on short-term duration (5 min). Interestingly, PAW extract at 125 mg/kg BW tended to increase the ability to distinguish new objects in the diabetic rats. However, all dosages of the PAW extract could not relieve the memory deficit on long-term duration (24 h). These results suggest that PAW extract may be useful for improving recognition memory impairment in STZ-induced diabetic rats.

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P1-38

Effects of Patavee Apo Wayo Extract on Body Weight and Blood Glucose in Streptozotocin-Induced Rats

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Keywords: body weight, blood glucose, Patavee Apo Wayo, streptozotocin

Patawee Apo Wayo formula (PAW) containing twenty-two herbal ingredients has long been traditionally used for the treatment of diabetes. The purpose of the study was to investigate the effects of PAW extracts on body weight and blood glucose in normal and streptozotocin (STZ)-diabetic rats. STZ- diabetic rats were daily and orally administered PAW extract (125, 250, 500 mg/kg BW) or a standard drug, glibenclamide (GBN) 0.5 mg/kg BW for 2 weeks. Non-diabetic control rats were administered sterile water. Blood glucose and body weight were monitored daily over the 2-week period. The results showed that the body weight of STZ-induced diabetic rats decreased continuously. Giving PAW extract or the GBN delayed the decrease in body weight of diabetic rats. STZ-induction significantly increased the rat blood glucose, suggesting the diabetic condition of the tested animals. PAW extract decreased the blood glucose of the diabetic rats in a dose-dependent manner. Especially, PAW at the highest tested dose (500mg/kg BW) declined the blood glucose to the normal level, which is better than those effects of GBN. The hypoglycemic effect of PAW extract in these STZ-induced diabetic rats supports its traditional uses in human.

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P1-39

Carissa carandas Extract for Green Synthesis of Gold Nanoparticles

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Keywords: *Carissa carandas*, gold nanoparticle (GNP), green synthesis, antioxidant

Gold nanoparticles (GNPs) are the most studied nanomaterials. Because of unique electrical, optical, and bioconjugate-forming properties, GNPs are widely applied in varieties of medical applications including cancer diagnosis and drug delivery. Phytochemicals can reduce gold ion (Au^{3+}) to zerovalent gold (Au^{0}), which is called green synthesis due to non-toxic and mild reaction. *Carissa carandas* is used in Thai traditional medicine because of its biological activities due to high active phytochemicals. This study is aimed to synthesize GNPs using *C carandas* aqueous extract. The synthesized GNPs were characterized and determined their biological activities including antioxidant property. The results showed that *C carandas* extract had total phenolic content of 1.07 ± 0.004 mg GAE/g fresh wt. and total flavonoid content of 0.45 ± 0.017 mg QE/g fresh wt. This extract, when mixed with $HAuCl_4$, the color of the reaction changed from yellow to red wine color. The formation of GNPs was confirmed by UV-visible spectrum at 546 nm. Fourier transform infrared (FTIR) spectra confirmed the presence of hydroxyl and carboxylic groups of phenolic compounds which responded to synthesize and stabilize on the surface of GNPs. Dynamic light scattering (DLS) indicated the GNPs size dispersion, approximately 50 nm. The synthesized GNPs possessed antioxidant activities, assessed by ferric reducing antioxidant power (FRAP) assay and radical scavenging assay. In conclusion, *C carandas* extract has potential for green synthesis of GNPs and the phenolic compounds may help stabilizing GNPs. The antibacterial and anticancer activities of this GNPs should be further investigated for application in medicine.

P1-40

Phytochemistry and Cytotoxicity of Marine Macroalgae *Sargassum polycystum* Against Cervical HeLa and Breast MCF-7 Cancer Cells

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Keywords: *Sargassum polycystum*, phytochemsitry, cytotoxicity, cervical HeLa, breast MCF-7 cells

Seaweed macroalgae is one of marine resources which showed a potent anticancer activity. This research aims to develop Indonesia marine resource which is focused on phytochemical analysis and further exploration of seaweed macroalgae *Sargassum polycystum* as future anti-cervical and anti-breast cancer agents. Macroalgae *Sargassum polycystum* originated from Lengkuas beach, Tanjung Pandan, Bangka-Belitung Province, Indonesia, were extracted into four different organic solvents of *n*-hexane, ethyl acetate, chloroform and ethanol, respectively. These four extracts were then used for phytochemistry test, analysis by thin layer chromatography (TLC), as well as for cytotoxicity evaluation against cervical HeLa and breast MCF-7 by MTT assay. Phytochemistry test of *S. polycystum* extracts are positive for metabolites of triterpenoid, steroid, alkaloid, tannin and glycoside. Whereas, TLC analysis revealed that *S. polycystum* extracts containing four phytochemical components. Compared to positive control of cisplatin, four concentrated extracts of *S. polycystum* demonstrated a stronger cytotoxicity against cervical HeLa and breast |MCF-7 cells. The strongest cytotoxicity showed by ethanol extract with IC_{50} of 0.29 µg/mL on HeLa cells and 3.58 µg/mL on MCF-7 cells. Thus, our results clearly indicate that extracts of *S. polycystum* are promising anti-cervical and anti-breast cancer agents.

P1-41

Differential Scanning Calorimeter Profiling for Determination of Nanoparticle Extract of Clove *Syzygium aromaticum* L. Toward MCF-7 Human Breast Cancer Cell lines

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Keywords: MCF-7, clove (*Syzygium aromaticum L)*, MTT assay, DSC, nanoparticle

Clove is one of the major vegetal sources of phenolic compounds, such as flavonoids, hydroxybenzoic acids, hydroxycinnamic acids and hydroxyphenyl propane. Clove (*Syzygium aromaticum*) is one of the most commonly used spice in Indian and south-east asia kitchens. It has shown to be a potent chemopreventive agent. This study aims to evaluate in-vitro assay of nanoparticles cloves extract toward MCF-7 human breast cancer cell lines. In this research, we have synthesized bud clove extract nanoparticles and analysed with differential scanning calorimetry. The cytotoxic activity of extract, nanoparticles and its bioactive component was investigated with MTT assay and analysed by Elisa reader. Result of the in vitro test showed that the IC_{50} values of the extract and the nanoparticles were 20.13 µg/mL and 7.6 µg/mL, respectively. Nanoparticles of *Syzygium aromaticum* L. extract are very potential as antibreast cancer.

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P1-42

Antibacterial Against *Bacillus subtilis* and *Staphylococcus aureus* and Antioxidant Activities of Fractions from *Garcinia latissima* Miq. Stem Bark Methanol Extract

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Keywords: *Garcinia latissima* Miq., stem bark methanol fractions, *Bacillus subtilis*, *Staphylococcus aureus*, DPPH, FRAP

This study aimed to get completed information about the antioxidant and antibacterial against *B. subtilis* and *Staphylococccus aureus* activities of the fractions from *G. latissima* Miq. stem bark methanol extract. Fractionation was performed by column chromatography. The antibacterial activities of the fractions from *Garcinia latissima* Miq. stem bark were assayed by inhibition zone technique, bioautography, and minimum inhibition concentration. The antioxidant activity was evaluated using DPPH (2,2-diphenyl-1picrylhydrazyl) and FRAP (Ferric Reducing Antioxidant Power) methods. Stem bark methanol extract had higher antioxidant activity (% inhibition = 95.68%) than ethyl acetate extract and n-hexane stem bark extract of *G. latissima* Miq. The stem bark methanol extract obtained 10 fractions. The greatest of inhibition zone diameter against *B. subtilis* (ATCC (the American Type Culture Collection) 6633) and *S. aureus* (ATCC 25923) was fraction G (7.83 ± 0.46 mm and 7.43 ± 0.15 mm). The highest antioxidant activity fraction by DPPH method and FRAP method was fraction G. Phytochemical screening showed that fraction G contained flavonoid and tannin. The results obtained reveal that the fraction G of stem bark of *G. latissima* Miq. methanol extract possessed antibacterial activity against *B. subtilis* and *S. aureus* and antioxidant activity.

P1-43

Arginase Inhibition and Antioxidant Activity of *Sterculia stipulata* Korth. Leaves Extract

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Keywords: arginase, antioxidant, flavonoids, phenols, *Sterculia stipulata* Korth.

The main secondary metabolite in genus *Sterculia* was flavonoid. This compound may have arginase inhibitory activity. The aim this study was to investigate the activity of arginase inhibitor, antioxidant activity from *Sterculia stipulata* Korth. leaves extract. Sample was extracted gradually using n-hexane, ethyl acetate, and methanol solvents, subsequently. The n-hexane, ethyl acetate, and methanol extract were determined for their arginase inhibitory activity. The most active extract was methanol extract. This extract was determined for its arginase inhibitory, antioxidant activity, identification of chemical compound and determined the content of total phenols and total flavonoids. The most active extract was methanol extract with IC_{50} 348,484 µg/mL for arginase inhibitory activity and IC_{50} 19,276 µg/mL for DPPH scavenging activity. The secondary metabolite of methanol extract presence compound of alkaloids, flavonoids, tannins, terpenes, and glycosides. The total phenols 141,62 mg GAE/gr, total flavonoids content 41,45 mg QE/gr extract. The methanol extract of *Sterculia stipulata* Korth. showed activity as arginase inhibitor and antioxidant.

P1-44

Potency of *Rubus fraxinifolius* Berry as Anti-Elastase and Anti-Oxidant

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Keywords: *Rubus fraxinifolius,* raspberry, anti-elastase, anti-oxidant, antiaging, herbal cosmetic

Rubus fraxinifolius is one of wild raspberries found growing in West Java and potentially act as an antioxidant and antielastase. Both activities can be used as a preliminary test for antiaging ingredient. The objective of this research was to examine the antioxidant and anti-elastase activity of *R. fraxinifolius.* The berries were extracted using Soxhlet apparatus with n-hexane, ethyl acetate, and methanol. The antioxidant activity was determined using DPPH reagent. *In vitro* anti-elastase activity was determined using porcine pancreatic elastase (PPE) which based on the formation of p-nitroaniline and can be measured using microplate reader. Total phenolic content was measured by the Folin-Ciocalteu method. IC_{50} of DPPH scavenging activity of n-hexane, ethyl acetate and methanol extracts were >200; 186.84; and 19.74 ppm, respectively. The ability of inhibition elastase of *n*-hexane, ethyl acetate and methanol extracts were 6.84±0.9%; 52.23±7.1%; and 57.81±5.5% while gallic acid used as control positive gave activity 65.93±1.3%. Methanol extract gave the best activities in both test. Total phenolic content of methanolic extract were 202.21±4.3 mg GAE/g extract. Methanol extracts showed a significant optimum trapping capability of free radicals and gave potential anti-elastase. This investigation gave the promising effect to emphasize the importance of *R. fraxinifolius* berry and it can be developed as herbal cosmetics.

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P1-45

Anti-Collagenase and Anti-Elastase Activity Test of Seagrass (*Thalassia hemprichii*) Cosmetic Cream

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Keywords: *Thalassia hemprichii*, anti-collagenase, anti-elastase, cream

Cosmetic active ingredients must be able to penetrate the skin to be effective. Therefore, research and development for cosmetics include not only the skin's interactive source, structure and mechanism, but also its effectiveness on targeted skin components. The study was performed to test anti-collagenase and anti-elastase activity from dry extract of *Thalassia hemprichii* cream. *T. hemprichii* dry extract was made to 1.5% cream with oil in water type (O/W). Collagenase inhibitory activity was measured using collagenase enzyme from *Clostridium hystolyticum* (ChC) type IA and *N*-(3-[2-Furil]-asriloil)-Leu-Gly-Pro-Ala (FALGPA) as the substrate, while the elastase inhibitory activity was measured through the result of an enzymatic human leucocyte elastase (HLE) type I reaction using *N*-succinyl- (Ala) 3-*p*-nitroanilide (SANA) as the substrate. The IC_{50} of collagenase inhibition and The IC_{50} of elastase inhibition of 1.5% *T. hemprichii* dry extract cream was 20.799 µg/mL and 466.844 µg/mL respectively. The cream showed good physical stability for 12 weeks, good mechanical tests and can be penetrated.

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P1-46

Jambolan Plum (*Syzygium cumini* (L.) Skeels) Juice Exerts Healthy Anti-Oxidant Status and Extends Lifespan in *Drosophila melanogaster*

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Keywords: Jambolan plum, *Syzygium cumini* (L.) Skeels, longevity, lifespan, antioxidation, *Drosophila melanogaster*

One of the most effective methods for the anti-aging agents is to investigate their ability to increase lifespan as well as anti-oxidant status in model organism like *Drosophila melanogaster* (DM). Jambolan plum is an evergreen tropical tree that contains rich sources of antioxidants and vitamins. In this study, the effect of jambolan plum juice on the lifespan and anti-oxidant status of DM were investigated. Results demonstrated that 10% jambolan plum juice containing diet could extend DM lifespan for 12.5 days longer than control group. The antioxidant enzyme activity including superoxide dismutase, glutathione peroxidase and catalase were also significantly increases in jambolan plum juice treated group. This was relevant to a significant reduction in malondialdehyde (MDA) and 8-oxodG levels. In addition, 10% jambolan plum juice treatment could also promote significant survival time of the DM after treating with paraquat and H_2O_2 when compared with those fed with basal diet. This can be concluded that jambolan plum juice could un-regulating of anti-oxidant enzymes which might be playing positive role in the DM's lifespan improvement. Based on the conservation of major longevity pathways in different species, we therefore purpose that supplement with jambolan plum juice could be also extended to humans. Jambolan plum juice may be used for further development of anti-aging agent in the future.

P1-47

Effect of Variety, UV-light, and pH on Phytochemical and Bioactive Compounds Synthesis of Sunflower Sprouts

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Keywords: sunflower sprouts, phytochemicals, germinated condition, GABA

This research aims to study the optimum condition on induction of phytochemical and bioactive compounds synthesis of 3 sunflower sprouts, including Chiangmai 1, Arduel, and Pacific jumbo 77. The studied immersive conditions were with DI water, 1 M PBS pH 4, 7 and 10 and germinated conditions were with and without UV irradiation. The sunflower sprouts were collected at 4-7 consecutive day. The collected samples were then dried out, grind into powder and extracted with 80% ethanol. The extracts were used for studying 3 phytochemical compounds including g-aminobutyric acid (GABA), phenolic and flavonoid by using spectrophotometry. The anti-oxidant activity was studied by using DPPH assay. The results showed that Chiangmai 1, aged 4 days which was immersed with 1M PBS pH 10, showed the optimum condition on GABA and phenolic induction at the concentration of 11.7 and 2.22 mg/kg dry matter, respectively. The optimum condition on flavonoid induction was Arduel, aged 6 days that was immersed with DI water and was irradiated with UV at the flavonoid content of 79.62 g/kg dry matter. Chiangmai 1, aged 4 days which was immersed with DI water, showed the optimum condition on anti-oxidant activity induction at the activity of 2.36 mg/g Vitamin C. The results from this study can be used for further development of nutraceutical foods.

P1-48

Herb-Drug Pharmacokinetic Interaction of a Traditional Chinese Medicine with Lamivudine in Rats

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Keywords: *Schisandra chinensis*, pharmacokinetic, herb-drug interaction, traditional Chinese medicine, lamivudine

Schisandra chinensis has been used as an important component in various prescriptions in traditional Chinese medicine and more recently in western-based medicine for its anti-hepatotoxic effect. Lamivudine is an antiretroviral drug used worldwide for the treatment of hepatitis B virus infection. The aim of this study is to investigate the herb-drug interactions of *Schisandra chinensis* on the pharmacokinetics of lamivudine in rats. Rats were divided into three parallel groups, one of which was treated with lamivudine (10 mg/kg, i.v.) alone, and the remaining two groups were pretreated with a different dose of *S. chinensis* (3 or 10 g/kg/day for 5 consecutive days) followed by a combination with lamivudine. The pharmacokinetic results demonstrated that pretreated with *S. chinensis* extract for five consecutive days did not significant alter the pharmacokinetics of lamivudine in rats. In conclusion, these studies provide constructive information to interpret the herb-drug interactions between lamivudine and Chinese herbal formulation.

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P1-49

Bisphenol A-Metabolizing Enzymatic Activity in an Endophytic Ascomycete Isolated from the Mayana Plant

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Keywords: BPA, ascomycete, degradation, fungal, endophyte, enzyme

Bisphenol A (BPA) is a major component in plastics that has leached into the environment and has become a persistent contaminant. It is an endocrine disruptor which affects estrogen signaling and contributes to hormone-related diseases, including cancers. Several strategies have been explored to reduce BPA from the environment. Here, we identified an endophytic Ascomycete isolated from the Mayana plant, *Plectranthus scutellarioides* (L.) R.Br. that has potential bioremediation properties against BPA. Crude enzyme extracts from the fungal isolate showed BPA but not phenol metabolism within 24 hours of incubation, suggesting specificity of the secreted enzyme for BPA. Crude enzyme was detected to be active from 4-75°C and pH 2.14-11.64 with its optimum activity at 37°C and pH 4.60. Overall, this suggests that the fungal isolate from the Mayana plant secretes an enzyme which may be used for BPA bioremediatio

P1-50

Cirsimaritin: Validation of Flavonoids from *Cirsium japonicum* var. *maackii* by HPLC/UV

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Keywords: cirsimaritin, linearity, LOD, LOQ, precision, accuracy

Plants contain numerous secondary metabolites that fulfills many functions in the plant system. They act as part of plant defense, stress response or pigments to give coloration. *Cirsium japonicum* (CJ) is a perennial herb from the Asteraceae family. They are found across East Asia. Traditionally used as a folk medicine to prevent hemorrhage and high blood pressure. In China, it is used as a uretic agent. Cirsimaritin is a major flavonoid in CJ that have been shown to exert pharmacological activities. The analytical method used in this study was also validated in terms of linearity, limit of detection, limit of quantification, precision, and accuracy.

P2-51

Carbon Dioxide Supercritical Fluid Extraction of Panaxynol and Panaxydol from *Panax Ginseng*

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Keywords: *Panax ginseng*, polyacetylenes, panaxynol, panaxydol, supercritical fluid extraction

Polyacetylene compounds, such as panaxydol and panaxynol, are known to be responsible for the pharmacological activities of ginseng, root of *Panax ginseng* Meyer. Although these compounds are the major components of the ginseng essential oils, conventional extraction of ginseng by means of toxic organic solvents tends to have limited usage for food grade application, regardless of high extraction yield. Therefore, carbon dioxide supercritical fluid extraction, SFE, was performed to take advantage of the lower toxicity and easy separation of the product. SFE was conducted with 100 g of 4-year-old *P. ginseng* roots and the composition was analyzed by UHPLC. Besides, celite and glass beads were added as additives in a ratio of 1:1 (w/w) in the extraction process to increase the extraction yield. Addition of celite slightly increased the extraction yield. In comparison with maceration extraction using hexane as solvent, CO_2 SFE demonstrated its high effectiveness of extraction yields. High contents of panaxydol and panaxynol were found from SFE with celite, 0.87 ± 0.01 and 12.36 ± 0.02 mg/g respectively. Therefore, ginseng SFE could be a promising extraction method in terms of food safety and pharmaceutical efficacy.

P2-52

Aldose Reductase Inhibition by *Rosa hybrida* Petals

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Keywords: *Rosa hybrida*, analysis, diabetes, HPLC-UV, polyol pathway

Despite advancements on drug discovery and molecular pharmacology, diabetes mellitus, including its complications, is still a major life-threatening condition worldwide. Diabetes burdens millions of people and this number has been steadily increasing throughout the years. Aldose reductase (AR), a rate-limiting enzyme in the catabolic pathway of glucose, is an attractive target for counteracting diabetes. In this study, *R. hybrida* petals were evaluated for their aldose reductase inhibitory (ARI) activity and used for the bioassay-guided isolation of a known bioactive flavonoid, kaempferol. Kaempferol was isolated from the ethyl acetate fraction of *R. hybrida* and was shown to exhibit strong inhibition against AR (IC_{50} = 0.02 μM). Quantitative analyses of kaempferol in different petal colors of *R. hybrida* and different *Rosa* species were also performed in this study using high-performance liquid chromatography. This study is the first to establish that *R. hybrida* contains kaempferol and that the light pink petal of the edible rose species has the highest content of the naturally occurring AR inhibitor. The results of this study highlighted the potential role of *R. hybrida* in the treatment and management of diabetic complications via inhibiting AR.

P2-53

Peroxyl Radical Scavenging Activity and DNA Damage Protection Effects of Flavonoids from *Flemingia philippinensis*

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Keywords: *Flemingia philippinensis*, antioxidant, DNA damage protection

Reactive oxygen species (ROS) are reactive species with free radical that is able to mainly attack double bonds in biomolecules of living organism. ROS is origin of most of disease. In the course of searching antioxidant components from *Flemingia philippinensis*, we isolated antioxidative polyphenols (**1**-**9**) from the methanol extract of target plant, and their structures were identified as fleminchalcone A (**1**), flemiphilippinone A (**2**), fleminchalcone B (**3**), fleminchalcone C (**4**), khonklonginol H (**5**), lupinifolin (**6**), flemichin D (**7**), eriosematin (**8**) and 6,8-diprenyl-kaempferol (**9**), respectively. All isolated compounds (**1**-**9**) were applied to peroxyl radical scavenging activity which is a better model of antioxidant reactions with ROS in foodstuffs. All isolated compounds (**1**-**9**) displayed potent antioxidant, according to the ORAC assay in the rage 0.3 ~ 4.6 μmol TE/g. ROS have been known to cause DNA damage in many biological macromolecules which may ultimately lead to carcinogenesis. All the identified phenolic compounds (**1**-**9**) were tested for their protective effects on pBR322 plasmid DNA damage. Compounds **1**, **2**, **6**, and **7** showed significant protective effects on DNA damage with over 80% efficacy.

P2-54

X-Ray Structure of Silydianin from the Seeds of *Silybum marianum*, and Tyrosinase Inhibition

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Keywords: *Silybum marianum*, tyrosinase, X-ray structure, silydianin, mixed type I inhibition

Silybum marianum is an annual to biannual plant and belongs to Asteraceae family. This plant known as milk thistle is a popular functional food stuff which has mainly used for liver disease. In this study, we isolated silydianin having five chiral carbons from target plant. Its structure was fully characterized by X-ray crystallograpic and NMR study. Silydianin showed the crystallographic parameters: $C_{25}H_{22}O_{10}$, space group = $P2_12_12_1$, Z = 4, a = 6.9228 (1) Å, b = 13.2423 (1) Å, c = 24.8766 (3) Å, α = 90º, β = 90º, and γ = 90º. In particular, silydianin showed significant tyrosinase inhibition to monophenolase with 2.63 μM of IC_{50} as well as diphenolase with 16.5 μM of IC_{50}. This compound was proved as mixed type I inhibitor against tyrosinase with K_I (2.07 μM) and K_{IS} (2.27 μM), which prefers to bind to active site than others.

P2-55

DPPH Scavenging Activities and Phytochemical Analysis of Some Thai Medicinal Plants

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Keywords: *Bridelia ovate*, *Cryptolepis buchanani*, *Eclipta prostrate*, *Mimusops elengi*, DPPH, total phenolic, total flavonoid, TLC

Five ethanol extracts from the leaves of *Bridelia ovata* Decne., stems of *Cryptolepis buchanani* Roem. & Schult., aerial parts of *Eclipta prostrata* (L.) L., pulps and seeds of *Mimusops elengi* L. were tested for *in vitro* antioxidant activities using DPPH scavenging assay. All selected extracts were also determined for total phenolic and total flavonoid contents using Folin-Ciocalteu and aluminium chloride methods, respectively. The selected plant extracts promoted moderate free radical scavenging effect with EC_{50} values ranged from 89.16 ± 1.31 to 539.50 ± 14.18 mg/ml. Stem extract from *C. buchanani* showed the strongest DPPH scavenging effects among the tested samples. Total phenolic and total flavonoid contents in the extracts ranged from 2.24 ± 0.16 to 15.45 ± 2.04 g% gallic acid equivalent (g% GAE) and 0.05 ± 0.03 to 1.23 ± 0.20 g% quercetin equivalent (g% QE), respectively. *C. buchanani* stem extract and *B. ovata* leaf extracts had the highest total phenolic and total flavonoid contents, respectively. The results suggest the correlation between total phenolic contents and DPPH scavenging activities of plant extracts. Thin layer chromatographic (TLC) analysis of the extracts showed the chromatographic bands corresponded to phenolics and flavonoids after the detection with natural product/polyethylene glycol (NP/PEG) spray reagent.

P2-56

Development of High Performance Liquid Chromatography Method for Determination of Caffeic Acid and Rosmarinic Acid in *Thunbergia laurifolia* Leaf Extract

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Keywords: *Thunbergia laurifolia*, caffeic acid, rosmarinic acid, high-performance liquid chromatography

Thunbergia laurifolia Lindl., known as Rang Chuet, is a medical plant that is popularly used in Thailand. In National Drug list, the indication of Rang Chuet capsules and infusion was assigned for treatment of fever and apthous ulcer. However, a marker compound for the quality control of *T. laurifolia* was not clearly identified. The objective of this study was to develop the high-performance liquid chromatography (HPLC) method for the quantitative analysis of caffeic acid and rosmarinic acid in *T. laurifolia* leaf extract using quantitative analysis of multi-components by single-marker technique. The optimal condition consisted of a C-18 reversed-phase column with the mobile phase of 0.02% ortho-phosphoric acid and acetonitrile using gradient elution. The detection wavelength was 330 nm and the flow rate was 1 ml/min. Quantitative analysis of caffeic acid and rosmarinic acid were conducted using the external standard (ES) method, then rosmarinic acid was selected as the internal constituent to calculate the relative correction factors (RCF) between caffeic acid and rosmarinic acid. The content of the caffeic acid can be directly calculated from the RCF. Comparing caffeic acid contents obtained from ES and quantitative analysis multi-components by single marker (QAMS) method, it was found that there is no significant difference between caffeic acid contents obtained from both methods with p-value higher than 0.05% using paired *t-test* statistical analysis. The results from this study indicated that the developed QAMS method was accurate and reliable which could be applied for quality control of *T. laurifolia* leaf extract in the future.

P2-57

Inhibitory Effects of Major Flavonoids from *Oroxylum indicum* Fruits against Clinical Isolated Bacteria

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Keywords: *Oroxylum indicum*, baicalein, baicalin, chrysin, *Streptococcus suis*, *Pseudomonas aeruginosa*, *Escherichia coli*, broth micro-dilution assay

Oroxylum indicum fruit extracts and their major flavonoids including baicalein, baicalin, and chrysin were tested for *in vitro* antibacterial activities on some clinical isolated bacteria; *Stapylococcus intermedius*, *Streptococcus suis*, *Pseudomonas aeruginosa*, and *β-Escherichia coli* using broth micro-dilution assay. Flavonoids concentrations ranging between 0.0391-5 mg/ml were used in the assays. Antibacterial activities of the compounds were compared with those of antibiotic of choices; amoxicillin (0.1 mg/ml), doxycycline (0.1 mg/ml), and Gentamicin (0.1 mg/ml). Maximum inhibitory activities of baicalein and baicalin to *S. intermedius* were shown at 37.17% and 89.15% respectively while chrysin did not show any effect. Activities of the flavonoids to *S. suis* were 1.97% and 70.24% from baicalein and baicalin. Chrysin, comparable to activities against *S. intermedius*, did not show inhibitory activity to *S. suis*. *P. aerogenosa* showed susceptibility to all of three flavonoids; baicalein, baicalin, and chrysin at maximum inhibitions 80.18%, 95.98%, and 72.94% accordingly. *E. coli* displayed susceptibility at 65.99%, 94.79%, and 38.79% from baicalein, baicalin, and chrysin correspondingly. The half maximal inhibitory activity (IC_{50}) and minimum inhibitory activity (MIC) of baicalein, baicalin, and chrysin against clinical bacterial strains were calculated and displayed. Study is going on with the *O. indicum* extracts in parallel of the main flavonoid components to compare the activities to clinical strains of bacteria with different characteristics.

P2-58

Mechanistic Effects of Rice Bran Constituents on Cadmium-Exposed Human Breast Cancer Cells

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Keywords: black rice bran, MCF-7 cell line, autophagy, cadmium

Cadmium is a toxic heavy metal that harmful to human health and ecosystem. Rice bran is a byproduct from rice that contains various bioactive phytochemicals. This study evaluated the potential benefit effects of a Thai Black rice bran (*Leum Pua* cultivar) extract on cadmium-exposed cancer cell line. Human breast adenocarcinoma cells (MCF-7) were cultured to confluence and then treated with cadmium chloride ($CdCl_2$) (30 μM) alone, Black rice bran extract (BRB) (1 mg/ml) alone, or a combination of $CdCl_2$ and BRB for 24 hours. Percent cell viability and morphological alteration were analyzed. Intracellular ROS production and specific proteins involved in cell survival and cell death were evaluated by ROS assay and western blot analysis. The results showed that $CdCl_2$ treatment alone inhibited cell proliferation and induced autophagy through ROS and DNA damage-dependent activation. BRB treatment alone increased cell survival and reduced intracellular ROS production. The combination treatment of $CdCl_2$ and BRB significantly reduced ROS, induced autophagy, and improved DNA damage from cadmium effects by alteration of phosphorylated-p53 protein controlling cell survival and cell death. The overall results suggest that BRB constituents potentiate autophagy in cadmium-exposed cell and allow the cell to maintain genome integrity leading to longevity and healthy of the breast cancer cells.

P2-59

HPLC Method Validation of Oxyresveratrol in *Artocarpus lakoocha* Roxb. Extract: Application for Skin Permeation Study

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Keywords: *Artocarpus lakoocha* Roxb., oxyresveratrol, HPLC, method validation, skin permeation study

The main constituent, oxyresveratrol, of *Artocapus lakoocha* Roxb. heartwood (AL) exhibits strong tyrosinase enzyme inhibitory and antioxidative effects. In Thailand, there are many cosmetics consisted of AL extract claimed as skin lightening product. However, the skin permeability of the oxyresveratrol has been limited. Therefore, the aims of this study was to develop an analytical method for skin permeation study of oxyresveratrol from AL extract. The analysis of oxyresveratrol in AL extract was performed by high performance liquid chromatographic (HPLC) technique using C_{18} column (150x4.6 mm, 5 μm). The gradient elution of mobile phase consisted of acetonitrile and 0.05% trifluoroacetic acid. All validation parameters were also evaluated. In terms of method validations, the relative error and relative accuracy varied from 1.53-5.75% and 98.79-105.74%, with %RSD of 1.87-5.08%, respectively. Limit of detection (LOD), and limit of quantitation (LOQ) were 3.379 and 10.239 μg/mL, respectively. The method expressed a high correlation coefficient at 0.9994. The extraction of oxyresveratrol from skin was about 88.53±0.71%. The accumulation of oxyresveratrol from AL extract and standard-oxyresveratrol within skin at 12-hour were 202.06±4.68 and 255.38±80.64 μg/mL, respectively. In conclusion, the developed method exhibited suitable validation parameters and could be applied for skin permeation study.

P2-60

New Tetrahydroxyflavanones from the Flowers of *Coreopsis lanceolata* L. and their Antioxidant and Antinflammatory Activities

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Keywords: ABTS, *Coreopsis lanceolata*, DPPH, flower, nitric oxide, ORAC, phagocytosis

Coreopsis genus is one of the most common Asteraceae phanerogams, widely distributed in American continental and Eastern Asia. Typically, *Coreopsis lanceolata* is the most common *Coreopsis* plant in Korea. This plant is reported to have antioxidant, antiallergic, antibacterial, antileukemic, and nematicidal effects. Therefore, it can be expected that *C. lanceolata* contain a variety of antioxidant and anti-inflammatory materials. Despite several reported pharmacological activities of *C. lanceolata*, there is only one paper reported for the isolation of flavonoids from the flowers of *C. lanceolata*. Therefore, the phytochemical study was initiated to isolate antioxidant and antinflammatory compounds from the flowers of *C. lanceolata*. *C. lanceolata* flowers were extracted with aqueous methanol, and the concentrated extract was partitioned into EtOAc, *n*-BuOH, and H_2O fractions. The repeated silica gel and ODS column chromatographies for EtOAc and *n*-BuOH fractions led to isolation of seven tetrahydroxyflavanones, including five new flavanones (**2**, **4**, and **5**－**7**), as well as two known flavanones (**1**, **3**). Six flavanones **2**－**7** were isolated for the first time from *C. lanceolata* flowers in this study. All fractions and isolated compounds were evaluated for DPPH, ORAC, and ABTS radical scavenging activity, but also for phagocytic activity and anti-inflammatory activity in RAW264.7 macrophage cells.

P2-61

Shikimate Metabolites from of *Forsythia koreana* Flowers (Oleaceae) and their Functionality as Pharmacological Agents

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Keywords: anti-diabetes, anti-inflammatory, anti-oxidant, *Forsythia koreana*, koreanaside, whitening agent

Forsythia koreana (Oleaceae), a perennial shrub, is widely distributed in Korea and China. The fruits of this plant, "Yeon-Kyo", have been used as oriental medicine, and have been reported for various secondary metabolites and their activities. However, phytochemical or biological study on the flowers of *F. koreana* is barely carried out. Therefore, the present study focused on the isolation and identification of active materials from the flowers of *F. koreana* and evaluation of pharmacological effect. Dried flowers of *F. koreana* were extracted with aqueous MeOH, and the concentrated extract was partitioned into EtOAc, *n*-BuOH, and H_2O fractions. As a result of repeated SiO_2, ODS, and Sephadex LH-20 column chromatographies on each fractions, twenty phenolic compounds including four new ones were isolated. These compounds were identified based on spectroscopic methods including IR, HR-FAB/MS, and NMR. All these compounds were isolated for the first time from the flowers of *F. koreana* in this study. As well the examination of extracts, fractions, and isolated compounds was carried out for the various functionalities. Some compounds showed significant anti-oxidant, anti-inflammatory, anti-diabetes, and whitening activity without visible toxic effect. Quantitative analysis of active materials in *F. koreana* flowers was also conducted using LC/MS experiments.

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P2-62

Constituents of *Syringa Dilatata* Flowers (Oleaceae)

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Keywords: Nagoya protocol, secoiridoid, *Syringa Dilatata*

With the recent entry into force of the Nagoya protocol, the protection of sovereignty of biological resources has become important. Its objective of this protocol is the fair and equitable sharing of benefits arising from the utilization of genetic resources, thereby contributing to the conservation and sustainable usage of biodiversity. *Syringa* plants, which have good fragrance and beautiful appearance, are cultivated worldwide. Also this plants have been reported for various secondary metabolites. In particular, *Syringa* genus contains a large amount of iridoids that have pharmacological activities. Among them, *S. dilatata* is a Korean native species. Therefore, *S. dilatata* is an important resource in Korea. No study has been reported for components and activities of *S. dilatata* flower. Accordingly, research of phytochemical investigation on this plant is very valuable. Thus the present study focused on the isolation and identification of secoiridoids from *S. dilatata* flowers. Chemical study on the extract resulted in the isolation of seven secoiridoid glycosides (**1**-**7**), including four new compounds (**1**-**4**), and known ones, syringopicroside (**5**), syringalactone (**6**), oleuropein (**7**). The structures were elucidated on the basis of extensive spectroscopic analysis. In this study, all compounds were isolated for the first time from the *S. dilatata* flowers.

P2-63

Unusual β-Sitosterol Derivatives from the Young Shoots of *Nypa fruticans*

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Keywords: β-sitosterol, Hae-Juk-Soon, *Nypa fruticans,* nypasterol A

Nypa fruticans, commonly known as Nipa, is a perennial plant distributed in Malaysia and mainly inhabits in wetlands like Mangroves. Recently in Korea, its young shoots, called 'Hae-Juk-Soon', are taken as tea or other food ingredients and have received much attention as an antioxidant product. In Malaysian traditional medicine, it has been used as a detoxification, treatment for herpes, constipation, and gum inflammation. However, there're only a few phytochemical and biological studies. Therefore, this study focused on the isolation and identification of active compounds from the young shoots of *N. fruticans*. Dried young shoots of *N. fruticans* were extracted with aqueous MeOH, and the concentrated extract was partitioned into EtOAc, *n*-BuOH, and H_2O fractions. The repeated silica gel and ODS column chromatographies for the EtOAc and *n*-BuOH fractions led to isolation of five steroids. From the results of spectroscopic data, they were identified as β-sitosterol (**1**), β-sitosterone (**2**), β-sitosterol 3-*O*-β-D-galactopyranoside (**3**), 3-*O*-(6′-*O*-linoleoyl-β-D-glucosyl)-β-sitosterol (**4**), 7β-hydroxysitosterol (**5**) and 7α-hydroxysitosterol 7-*O*-palmitoleic acid (named nypasterol A) (**6**). Among them compound **6** was revealed to be new compounds, and compounds **1**-**5** were isolated for the first time from the young shoots of *N. fruticans* in this study. Especially, **2**-**5** are rarely found in nature.

P2-64

New Ursane-Type Triterpenoids from the Flowers of *Rosa multiflora*

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Keywords: baby rose, *Rosa multiflora*, ursane-type triterpenoid, rosaflorin

Rosa multiflora (Rosaceae), commonly called as 'baby rose', is a deciduous shrub originated in East Asia. This plant has been commonly used for ornament. *R. multiflora* flowers were also used for antidysenteric, antidiarrhotica, treatment of stomatitis and so on in traditional usage. Those were reported to have antioxidant, anthelminthic, and purgative activities. However, there is few study on chemical constituents of *R. multiflora* flowers. Therefore, the present study was conducted to isolate physiologically active substances from *R. multiflora* flowers. Finally, five ursane-type triterpenoids including three new ones were isolated and identified. *R. multiflora* flowers were extracted with aqueous MeOH, and the concentrated extract was partitioned using EtOAc, *n*-BuOH, and H_2O. The repeated SiO_2 and ODS column chromatographies for the EtOAc fraction led to isolation of four ursane-type and one oleanane-type triterpenoids. From the analysis of spectroscopic data including 1D-NMR (^1H, ^{13}C and DEPT), 2D-NMR (gCOSY, gHSQC and gHMBC), three new types of triterpenoids (**2**, **3** and **4**), as well as known ursane-type (**1**) and oleanane-type (**5**) triterpenoids. Compounds **2**, **3**, and **4** were revealed to be new compounds. And all compounds were isolated for the first time from the *R. multiflora* flowers in this

P2-65

Annona squamosa L. Leaves Inhibits α-MSH-Stimulated Melanogenesis via P38 Pathway in B16F10 Melanoma Cells

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Keywords: *Annona squamosa* L, melanogenesis, p38 MAPK, MITF, tyrosinase

Annona squamosa L., is called custard apple, sugar apple or sweetsop, is growing demand for food supplements, pharmaceuticals, and cosmetics. As various biological activities of *A. squamosa* L. have been reported, non-edible parts are also being investigated for use as a source of valuable materials. In this study, we evaluated the inhibitory effect of *A. squamosa* L. leaves extract (ALE) on melanogenesis and the underlying mechanisms in B16F10 murine melanoma cells. ALE decreased melanin content and intracellular tyrosinase activity in α-melanocyte-stimulating hormone (α-MSH)-stimulated B16F10 cells. ALE abolished the expression of microphthalmia-associated transcription factor (MITF), which in turn decreased expressions of melanogenic enzyme proteins, tyrosinase, tyrosinase related protein 1 (TRP1), and TRP2. The phosphorylation of p38 mitogen-activated protein kinases (MAPK) was stimulated by ALE. Therefore, ALE suppressed melanogenesis through phosphorylation of p38 and subsequent down-regulation of MITF, which is then followed by inhibition of melanogenic enzyme proteins and melanin production. GC-MS analysis of ALE revealed that ent-kaur-16-en-19-ol (19.40 ± 2.98%), 18-oxokauran-17-yl acetate (19.12 ± 4.21%), and β-sitosterol (16.79 ± 1.41%) were the main compounds. To our knowledge, this is the first study on the anti-melanogenic effect of *A. squamosa* L. leaves. These results suggest that the extract of *A. squamosa* L. leaf may be used as a natural decolorizer for skin diseases and cosmetics.

P2-66

Comparison of Total Phenolic Contents and Antioxidant Activities of Methanolic Extracts of Cacao Nibs, Flaxseed, Hempseed, Maca and Maqui Berries

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Keywords: cacao nibs, flaxseed, hempseed, maca, maqui berries

Superfood is a marketing term for food with supposed health benefits as a result of some part of its nutritional analysis or its overall nutrient density. Cacao nibs, flaxseed, hempseed, maca and maqui berries represent valuable resources, rich in bioactive compounds with various biological activities. The objective of this study was to evaluate the total phenolic contents and antioxidant activities of methanolic extracts of five kinds of superfood, cacao nibs, flaxseed, hempseed, maca and maqui berries. Methanolic extracts of cacao nibs showed the highest total polyphenol content (TPC) (20.09±0.13 mg gallic acid equivalent/g dry weight), followed by maqui berries, flaxseed, maca, and heepseed. Also, total flavonoid content (TFC) was the highest in cacao nibs methanolic extract at 11.36±0.32 mg rutin equivalent/g dry weight. The antioxidant activities of methanolic extracts were analyzed using Fe2+ chelating activity, superoxide dismutase (SOD)-like activity, and 2,2-diphenyl-1-picrylhydrazyl (DPPH)-, and 2,2'-azino-bis(3-ethylbenzothiazoline-6-sulphonic acid) (ABTS)- radical scavenging activities. The methanolic extracts of cacao nibs showed significantly higher antioxidant activities than other plant extracts. In addition, TPC and TFC were significantly correlated with the antioxidant activity. Our results suggest that cacao nibs can serve as an excellent object for the development of functional foods in the food industry.

P2-67

Improved Antioxidant Capacity of Gold Kiwifruit by Lactic Acid Bacteria Fermentation

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Keywords: antioxidant, chemical characteristics, fermentation, gold kiwifruit, *Lactobacillus plantarum*

Gold kiwifruit was fermented with *Lactobacillus plantarum* CK10 derived from kimchi and the fermented products were extracted with ethanol at various fermentation time-points. The bacterial cellular density, total titratable acidity, total polyphenol content (TPC), and total flavonoid content (TFC) increased during fermentation, while pH values and total soluble solids decreased. Levels of TPC and TFC were highest after five days, at 1.21±0.13 mg gallic acid equivalent/g dry weight and 0.36±0.04 mg rutin equivalent/g dry weight, respectively. The antioxidant activities of the fermented gold kiwifruit were analyzed using Fe^{2+} chelating activity, superoxide dismutase (SOD)-like activity, and 2,2-diphenyl-1-picrylhydrazyl (DPPH)-, and 2,2'-azino-bis(3-ethylbenzothiazoline- 6-sulphonic acid) (ABTS)-radical scavenging activities. The Fe^{2+} chelating activity of gold kiwifruit peaked after five days of fermentation, while both SOD-like activity and DPPH radical-scavenging activity were highest after seven days of fermentation. On the other hand, the ABTS radical-scavenging activity of fermented gold kiwifruit was similar to that of the non-fermented counterpart. TPC and TFC were significantly correlated with the antioxidant activity. Our results suggest that fermented gold kiwifruit with its increased antioxidant activity could be useful in the development of functional food.

P2-68

HPLC Isolate from *Voacanga* sp. Bark Extract Exhibited Cytotoxicity against Selected Cancer Cell Lines

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Keywords: *Voacanga*, natural products, cytotoxicity, cancer

Cancer continues to be a global predicament with increasing incidence and mortality rates despite recent developments in anticancer therapies. Due to the intrusive nature of commonly available chemotherapeutic regimens, there is a pressing need for the discovery and development of novel compounds with better therapeutic efficiency and fewer side effects. In this study, MTT assay-guided partitioning and fractionation was employed on the methanolic bark extract of a Philippine endemic plant from genus *Voacanga* (Family: Apocynaceae). Vacuum Liquid Chromatography (VLC) fraction 8 of the ethyl acetate partition showed promising cytotoxic activity (IC_{50} less than 30 μg/mL) against human colorectal carcinoma (HCT-116) and human breast adenocarcinoma (MCF7) cell lines. Further purification of fraction 8 yielded an HPLC isolate, fraction 8.9, which also showed moderate levels of cytotoxicity against the two cancer cell lines. Putative identification of the bioactive compounds was then employed using MS-MS analysis. In conclusion, the HPLC isolate from *Voacanga* sp. bark has shown promising in vitro cytotoxic activity against selected cancer cell lines. Isolation and characterization of the bioactive compounds, as well as further studies on their safety and efficacy, must then be pursued to fully evaluate their potential in the development of anticancer therapies.

P2-69

Anti-HIV-1 Activities and Chemical Constituents from Leaves and Twigs of *Santisukia pagetii* (Bignoniaceae)

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Keywords: *Santisukia pagetii*, Bignoniaceae, anti-HIV-1 activities, anti-syncytium assay, anti-HIV-1 reverse transcriptase assay

The first phytochemical investigation of leaves and twigs of *Santisukia pagetii* (Bignoniaceae) by using bioassay-guided fractionation led to the isolation and identification of seventeen known compounds, including four triterpenoids, pomolic acid 3-*β*-acetate (**1**), ursolic acid (**2**), 3-*O*-acetylursolic acid (**3**) and siaresinolic acid (**4**), three iridoid glycosides, specioside (**5**), verminoside (**6**) and ambiguuside (**7**), three flavonoid glycosides, luteolin-7-*O*-neohesperidoside (**8**), apigenin-7-*O*-neohesperidoside (**9**) and isoquercitrin (**10**), two phenolic compounds, *p*-coumaric acid (**11**) and caffeic acid (**12**), one monoterpenoid, (6*S*)-menthiafolic acid (**13**), together with *α*-D-glucose (**14**), *β*-D-maltose (**15**), β-sitosterol 3-*O*-*β*-D-glucopyranoside (**16**), a mixture of β-sitosterol (**17A**) and stigmasterol (**17B**). Compounds **1**-**13** were isolated from *Santisukia* genus for the first time. In addition, compounds **1**-**7**, **9** and **10** were found to be active against HIV-1 in anti-syncytium assay, while only compounds **1** and **3** were found to be very active (84.4% and 87.2% inhibition at 200 μg/mL, with IC_{50} values of 290.96 and 210.34 μM, respectively) against HIV-1 reverse transcriptase. Moreover, anti-HIV-1 activities of compounds **1**, **3**-**8**, and **13** were reported for the first time.

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P2-70

A Metabolomic Study: Effect of *Curcuma comosa* Roxb. in Ovariectomized Rats

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Keywords: *Curcuma comosa*, oxidized phospholipids, phytoestrogen, ovariectomy, metabolomics

Metabolomics is one of the widely distributed omics-techniques which are the comprehensive analysis of large number of metabolites in biological samples. Currently, it has become a powerful new tool to give insight into cellular functions as well as the biological status. In addition, it also allows us to predict the potential biomarkers and metabolic pathway associated with perturbations. Decline of ovarian function in menopause women apparently induces metabolic disorders which increases risk of metabolic diseases. The present study aims to investigate the effects of *Curcuma comosa* Roxb. (*C. comosa*) on the metabolic disturbance in ovariectomized rats (OVX rats). The OVX rats were treated with a phytoestrogen diarylheptanoid (3R)-1,7-diphenyl-(4E,6E)-4,6-heptadien-3-ol (DPHD 50 mg/kgBW) or the *C. comosa* ethanol extract (500 mg/kgBW) for 3 months compared to that received 17β-estradiol (E2, 10 μg/kgBW). By using LC-MS and GC-MS with multivariate data analysis (PCA, PLS-DA, and OPLS-DA) to characterize the global metabolites, the profound metabolic alteration with increases in serum oxidized phosphatidylcholines were the key features found in OVX rats. The changes of the oxidized lipids in the OVX rats may serve as a potential biomarker of this disease model which was restored to control levels by *C. comosa* extract, and DPHD treatments whereas E2 treatment restored the changes partly. This is the first report showing the improvement in the metabolic alterations in the long standing ovariectomy by *C. comosa*.

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P2-71

Bark Extract and Fractions from an Endemic *Aglaia* Species (Meliaceae) Inhibits Proliferation of Selected Human Cancer Cell Lines

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Keywords: antiproliferative, anticancer, MTT assay, *Aglaia*, apoptosis

Natural products, plant extracts or plant-derived chemicals have played a promising role in the treatment and prevention of various diseases exhibiting considerably less toxicity and lack the side effects of other chemotherapeutic agents. The plant genus *Aglaia* (Meliaceae) has demonstrated ethnomedicinal importance and has been revealed to contain a variety of compounds with insecticidal and cytotoxic properties. Bark extract, vacuum liquid chromatography (VLC), and gravity column chromatography (GCC) fractions from an *Aglaia* tree species endemic to the Philippines were evaluated for their antiproliferative activity against HCT116, MCF7 and A549 cancer cell lines using MTT assay. The crude extract, ethyl acetate partition, VLC and GCC fractions demonstrated very high antiproliferative activity against all cell lines tested. The GCC fraction 9.2 demonstrated very low IC50 against HCT116 (0.04±0.01 µg/mL), MCF7 (0.71±0.83 µg/mL) and A549 (0.017±0.04 µg/mL) and showed high selectivity against both HCT116 (Selectivity Index=6.26) and A549 (Selectivity Index=13.77). Morphological examination of the treated cells showed loss of membrane integrity, loss of contact with neighboring cells, condensed cytoplasm and detachment from the plate suggestive of apoptosis. The underlying mechanism of the active fraction that induces cell death will be investigated using flow cytometry. Further purification of the active fraction using RP-HPLC and detailed chemical characterization is our next step to identify potentially chemotherapeutic agents against cancer.

P2-72

Herbal Medicine Use by Cancer Patients: A Cross-Sectional Survey

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Keywords: herbal medicine, cancer patients, survey

Approximately 30,000 cancer patients had been waiting for the "10 capsules of MS herbal recipes" given for free to them every first weekend of the month at Prachin Buri province. Each capsule contained undisclosed herbal components. **This study aimed** to explore 1) demographic and health profile, 2) cancer treatment (conventional and alternative medicine), and 3) symptom distress among these cancer patients. **Cross-sectional survey** was conducted in 1,105 cancer patients who received MS herbal recipes during January to March 2018. Fifteen-minute interview was performed for each patient. Symptom distress of each participant was evaluated using Memorial Symptom Assessment Scale (MSAS). Descriptive statistic was analyzed with SPSS program. **Only** 1,093 cancer patients were eligible for the study. The mean age of participants was 53.21±10.33 years, and 71.36% was female. Two hundred twenty-two patients (20.31%) reported complementary and alternative medicine (CAM) use in the past. Six hundred fifty-one patients (59.56%) disclosed that they were not under the conventional cancer treatment (CCT) with 432 patients (66.36%) had completed CCT, 125 patients (19.20%) were in waiting line for CCT while 94 patients (14.44%) rejected to continue the CCT. The side-effect and benefit of MS herbal recipes were asked only in 480 patients (43.92%) who receiving it more than once (old case). About 227 patients (47.29%) indicated that they feel better in 3 most reported symptoms: appetite, sleep and energy. Side effects (diarrhea and dizziness) were found in 38 patients (7.92%). Five most distress symptoms of patients were pain, weakness, sleeplessness, tingling or numbness in the tip of finger and stomach distension. *This is the first study in Thailand* reveals the need of selected CAM used by cancer patients. This study provided the most distress symptom of cancer patients that need to be minimized. We also identified 125 patients who were in waiting line for CCT that might require a special approach to prevent their loss from the CCT system.

P2-73

Antispasmodic Activity of GCC Sub-Fractions from the Hexane Fraction of *Tabernaemontana pandacaqui* Poir. Leaves in ICR Mice

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Keywords: antispasmodic, *Tabernamontana pandacaqui*, hexane fraction

The overactivity or hypermotility of the intestine may lead to painful spasms which can be counteracted by anti-motility drugs with antispasmodic activities. Nowadays, many clinically useful treatments had been derived from plant materials to treat intestinal hypermotility. *Tabernaemontana pandacaqui* Poir. is a plant species native to the Philippines traditionally used to cure stomach and intestinal ailments as well as menstrual cramps and muscle spasms. However, there are no known scientific reports and studies regarding its antispasmodic activity. In this study, the antispasmodic activity of gravity column chromatography (GCC) sub-fractions from the hexane fraction of *T. pandacaqui* Poir. leaves (TpHex01-08) in ICR mice was assessed against acetylcholine (ACh)-induced contractions in ICR mouse jejunum. Using a PowerLab data acquisition system equipped with an organ bath, the GCC sub-fractions were observed to inhibit spontaneous smooth muscle contractions induced by ACh (0.3uM). TpHex01 had the lowest IC_{50} of 3.00±1.63µg/ml and TpHex08 had the highest with 11.160±1.113µg/ml. Moreover, low concentrations of TpHex05 and TpHex08 first stimulated a much stronger contraction compared to that induced by ACh before inhibiting muscle contractions. The components of TpHex01 were further separated to TpHex01.1 and TpHex01.2. Both exhibited inhibitory activity against ACh-induced smooth muscle contractions with TpHex01.2 having a significantly lower IC_{50} of 0.808 ± 1.361 compared to TpHex01.1 (13.54±1.232) and dicyclomine (1.429±1.165), which is the positive control. The ^{1}H NMR spectrum of TpHex01.2 dissolved in $CDCl_3$ at room temperature shows signals typical of terpenoids which also confirms preliminary phytochemical test results. However, terpenoids are compounds that are rarely investigated in *Tabernaemontana* species studies compared to its characteristic indole alkaloids and are still not explored in *T. pandacaqui*. It is recommended that further purification of TpHex01.2 be done in order to isolate, characterize, and identify the compound with the most effective antispasmodic effects. It is also recommended to further explore the other GCC sub-fractions as all of them exhibited antispasmodic activity.

P2-74

Effect of Rhodomyrtone on *Streptococcus suis* Cell Division Checkpoint

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Keywords: *Streptococcus suis*, rhodomyrtone, bacteria cell division, nucleoid segregation

Rhodomyrtone has been recently demonstrated to possess a novel antibiotic mechanism of action involving multiple targets resulting in interference of several bacterial biological processes including bacterial cell division. The present study further elucidated the effect of rhodomyrtone on nucleoid segregation of *Streptococcus suis*, an important zoonotic swine pathogen. Using live-cell imaging fluorescence, we demonstrated that the compound caused partial interference of nucleoid segregation. Subsequently, it led to the generation of anucleated cells. Transmission electron micrograph confirmed that a functional consequence of rhodomyrtone disturbance on nucleoid segregation along with septum misplacement led to cell morphology alteration such as cell lysis and multi-constriction of septum. This finding demonstrated that the disturbance of the bacterial cell division checkpoint was an important part of antibacterial mechanism of rhodomyrtone.

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P2-75

Chemical Constituents from *Crinum amabile*

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Keywords: Amaryllidaceae, *Crinum amabile*, alkaloids, lignan

Two known alkaloids, pratorimine (**1**) and pratorinine (**2**), *trans*-cinnamic acid (**3**) and one lignan derivative, pinoresinol (**4**), were isolated from the dichloromethane extract of the stems, roots and bulbs of *Crinum amabile*. Their structures were determined by 1D and 2D NMR spectroscopic data and compared with those reported in the literatures. Compounds **1-4** were isolated for the first time from *Crinum amabile*.

P2-76

Chemical Constituents from the Leaves of *Eucalyptus camaldulensis*

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Keywords: Myrtaceae, *Eucalyptus camaldulensis*, acylphoroglucinols, antimicrobial activity

Eucalyptus leaves are a traditional Aboriginal herbal remedy. The essential oil found in the leaves is a powerful antiseptic and is used all over the world for relieving coughs and colds, sore throats and other infections. *Eucalyptus camaldulensis* is an evergreen tree with a short, thick bole and a large, spreading crown which exhibits several bioactivity such as antibacterial, antifungal, and anti-inflammatory activities. In Thailand, *E. camaldulensis* is the most famous *Eucalyptus* species which was cultivated for paper industrial. Moreover, CH_2Cl_2 extracts from the leaves of *E. camaldulensis* which is large amounts of waste in paper making process showed good antibacterial activity against *Staphylococcus aureus* (*S. aureus*) and *Candida albicans* ATCC90028 with MIC 8 and 64 μg/mL, respectively. The phytochemical constituents of CH_2Cl_2 extract from the leaves of *E. camaldulensis* led to the isolation of acylphoroglucinols. The structural identifications of pure compounds were characterized by spectroscopic methods and comparison with those of published compounds. All of pure compounds were evaluated for antimicrobial activity.

P2-77

In vivo Anti-Inflammatory Activity of Ethanolic wood Extract from *Albizia myriophylla*

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Keywords: *Albizia myriophylla*, flavonoid, Fabaceae, anti-inflammatory, natural product

Albizia myriophylla (Fabaceae) has been recorded in Thai folk medicine for treating inflammation-associated disorders such as sore throat, skin infection, toothache, and fever. Previous researches demonstrated both antibacterial and anti-inflammary properties of the plant extract. This study was further conducted to examine the anti-inflammatory activity of ethanolic wood extract from *A. myriophylla* using *in vivo* model of croton oil-induced ear edema. In addition, the extract was characterized for total phenolic contents and later subjected for detailed high-performance thin-layer chromatography (HPTLC) fingerprint analysis. Both the extract (0.2 mg/ear) and the reference drug indomethacin (1 μmol/ear) demonstrated significant inhibitory activity on the ear edema formation at all assessment times. The extract exhibited a marked percentage inhibition up to 80% of inflammation in the ear edema model, comparable to indomethacin. The extract contains a total phenolic content of 54.3 mg gallic acid equivalents/g. Further HPTLC fingerprint analysis of the extract revealed the presence of pharmacologically active anti-inflammatory components including lupeol, and *b*-sitosterol. Regarding a challenging anti-inflammatory potential of the *A. myriophylla* extract, we expect the feasibility of its application for treating inflammation-related diseases. This natural anti-inflammatory agent for pain relief could substitute the use of chemicals in order to avoid serious side effects.

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P2-78

Endotracheal Tube Embedded with Silver Nanoparticles Synthesized Using *Eucalyptus citriodora* Leave Extract Inhibits Bacterial Growth and Biofilm Formation

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Keywords: ventilator-associated pneumonia, endotracheal tube, silver nanoparticle, *Eucalyptus citriodora*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*

Ventilator-associated pneumonia is a serious complication in critically ill patients receiving mechanical ventilation. It is associated with increased hospital stay and significant morbidity and mortality. Bacterial biofilm on endotracheal tube (ETT) surface represents a significant cause of the infections. In this study, silver nanoparticles (AgNPs) synthesized using *Eucalyptus citriodora* ethanolic leaf extract was embedded in polyelectrolyte multilayers on ETT surface. We investigated and compared the preventive effects of the AgNPs-coated, uncoated and commercially-available silver coated ETT using agar inhibition and bacterial adherence method. The inhibition zone generated by AgNPs-coated ETT was 3.05 ± 0.07 and 4.125 ± 0.03 mm for *Staphylococcus aureus* and *Pseudomonas aeruginosa*, respectively. The results are comparable with commercially-available silver coated ETT. In addition, AgNPs-coated ETT significantly reduced *S. aureus* and *P. aeruginosa* adhesion on the ETT surface by 3.46 and 4.13 log CFU/ml, respectively ($P < 0.05$). The results suggest that AgNPs-coated ETT exhibited excellent activity, and it was superior to currently-available silver coated ETT for antibiofilm activity against both Gram-positive and Gram-negative bacteria. Further studies are under investigation to evaluate the activity *in vivo* and in clinical settings and thus can be considered for clinical applications.

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P2-79

Effects of *Eleuterine americana* Bulb on Adhesion and Invasion of *Campylobacter* spp. in Cultured Caco-2 Cells

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Keywords: *Eleutherine americana*, Caco-2, campylobacter, chicken, food additive

Campylobacteriosis is an infection by *Campylobacter* spp., most commonly *C. jejuni*. It is among the most common foodborne illness. Red bulbs of a well-known Asian medicinal herb, *Eleutherine americana* Merr., have been used in cuisine and claimed to exhibit many biological activities including antibacterial activity. In the present study, an attempt was made to evaluate the potential of *E. americana* bulbs as anti-adhesive agent against adhesion and invasion to Caco-2 cells by commonly contaminated *Campylobacter* spp. present in food. Two treatments were investigated: Treatment I: pre-incubation of the ethanolic extract of *E. americana* bulbs with campylobacter before adding to Caco-2 cells. Treatment II: pre-incubation of the organisms with Caco-2 cells before adding the extract. Adhesion and invasion of campylobacter to Caco-2 cells preincubated with *E. americana* bulb extract were completely inhibited within 12 h. Adding *E. americana* extract after campylobacter were mixed with Caco-2 cells resulted in modest effect on reversing adhesion. However, 100% effect on preventing penetration of the bacterial cells was observed. In addition, the extract demonstrated no cytotoxicity towards Caco-2 cells. The results evidenced that *E. americana* bulb extract could be applied as an effective food additive to control campylobacter contamination at initial stage in food chain.

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P2-80

Use of *Eleuterine americana* Bulb Extract as a Biocontrol Agent to Prevent *Campylobacter jejuni* Contamination in Broiler Products

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Keywords: biocontrol, *Campylobacter jejuni*, *Eleutherine americana*, food preservative, poultry

Spices have been employed mainly as flavouring and colouring agents and their additional beneficial role in food safety have been well-documented. The study evaluated the efficacy of bulb extract of a traditional medicinal plant, *Eleutherine americana* Merr. in controlling contamination of a major foodborne pathogen, *Campylobacter jejuni*. In dipping method, the addition of 8 mg/mL of the extract lowered *C. jejuni* ATCC 33560 counts in chicken meat to 2 log on day 6. In mixing method, 2 log decrease in the bacterial counts in chicken meat mixed with *E. americana* extract at 8 mg/mL was observed from day 4 until day 7 ($P < 0.05$). Combined treatment with the extract at 4 and 8 mg/mL and subsequent short-term freezing of chicken meat at -20°C reduced campylobacter counts to approximately 2 log from day 5 and day 3, respectively ($P < 0.05$). Sensory scores demonstrated that addition of the extract did not affect the properties of cooked chicken meat. In addition to being a nutritional agent, the results demonstrated a practical application of *Eleutherine americana* bulb extract as a candidate biocontrol preservative in preventing *Campylobacter jejuni* contamination in poultry processing to attain high quality meat products for human health benefits.

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P2-81

Development and Analysis of Physical and Chemical Properties of Functional Food, Nata de Coco with Gac Fruit Filling

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Keywords: gac fruit, antioxidant activity, nata de coco, lycopene, phenolic compound, ferric reducing antioxidant power

Gac fruit or Spiny Gourd (*Momordica cochinchinensis* (Lour.) Spreng) is typically round or oblong and its fruit becomes a dark orange color upon ripening. The aril of ripe gac fruit contains high contents of beta-carotenoids and lycopene. This study aimed at developing a functional food of gac fruit, and comparing the physical and chemical properties of gac fruit aril from nata de coco with gac fruit filling. The conditions for functional food development were optimized and the color value, the amounts of lycopene, antioxidant activity (DPPH radical scavenging activity, FRAP assay and total antioxidant capacity), total phenolic compound and citric acid were investigated. The results showed that the optimal conditions for preparation of Nata de coco with gac fruit filling were under static condition at room temperature, a 10% (v/v) inoculum, at a pH of 3.5. The color value, amounts of lycopene, total antioxidant capacity, and total phenolic compound, except DPPH radical scavenging activity, FRAP value and the amount of citric acid, of gac fruit aril and nata de coco with gac fruit filling had no significant difference after 14-day storage in the refrigerator (8°C). The physical and chemical properties after long term storage should be further investigated.

P2-82

Biosynthesized Silver Nanoparticles Using Waste Materials from Industry against Foodborne Pathogens

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Keywords: silver nanoparticles, *Eucalyptus camaldulensis*, sericin, foodborne pathogen, industrial waste, antibacterial

Foodborne illnesses caused by foodborne pathogens affect a huge number of populations worldwide. Development of natural alternative as safe antimicrobials is essential in combating serious foodborne pathogens. This study investigated antibacterial properties of silver nanoparticles (AgNPs) as a bio-control agent. *Eucalyptus camaldulensis* waste material obtained from paper industry and sericin, a protein derived from silk industrial wastewater were used for AgNPs synthesis. Surface plasmon resonance bands of AgNPs occurred in the wavelength at 417 nm. AgNPs morphology was spherical and ranged in size from 3-12 nm and zeta potential of AgNPs was -23.85 mV. FT-IR results showed the binding properties of constituents responsible for capping and stabilizing. AgNPs displayed antibacterial activity against foodborne bacteria including *Bacillus cereus*, *Listeria monocytogenes*, *Staphylococcus aureus*, *E. coli* O157:H7, *Salmonella* spp., Shigella spp., *Vibrio* spp. Minimum inhibitory and minimum bactericidal concentration ranged from 0.74-5.92 and 2.96-11.83 μg/mL, respectively, and the nanoparticles exhibit good antioxidant activity. In addition, AgNPs at MBC were not toxic to human red blood cells. We report an eco-friendly, cost-efficient, rapid and easy method for AgNPs synthesis. The results highlighted potential uses of industrial waste materials for AgNPs synthesis to be applied as food preservative and in food packaging against foodborne pathogens.

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P2-83

Safety Assessment of Rhodomyrtone on Human Erythrocytes, Invertebrate, and Vertebrate Animal Models for Industrial Applications

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Keywords: *Galleria mellonella*, human erythrocytes, mouse, rhodomyrtone, toxicity, zebrafish

Rhodomyrtone, a well-known acylphloroglucinol compound isolated from *Rhodomyrtus tomentosa* leaf extract, is currently considered as a novel natural antibacterial agent for the treatment of Gram-positive bacterial infections. This study aimed to investigate toxicity of rhodomyrtone on human erythrocytes and *in vivo* models of *Galleria mellonella*, zebrafish, and murine. Haemolytic assay showed that rhodomyrtone at 256 x minimal inhibitory concentration (MIC=1μg/ml) did not cause haemoglobin release. *In vivo* model of *Galleria mellonella* demonstrated no toxic effects when the larvae were treated with rhodomyrtone at 100 mg/kg body weight for four days. The compound at 16 x MIC demonstrated no toxicity on viability of 24-h post fertilization zebrafish embryo after 24 h treatment up to 5 days. In addition, microinjection of the embryos with 80 x MIC of rhodomyrtone elucidated 70% survival embryos after rhodomyrtone treatment on day 4, similar to dimethyl sulfoxide-injected control group. Oral toxicity testing in mice indicated the absence of systemic toxicity when the animals received rhodomyrtone formulation at 5,000 mg/kg body weight for 15 days. The toxicity profiles of rhodomyrtone on different *in vivo* models assure venues for utilization of rhodomyrtone in food, cosmetics, and pharmaceutical industries.

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P2-84

In vivo Toxicological Evaluation of *Rhodomyrtus tomentosa* Leaf Extract to Assure Potential Applications in Health Care

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Keywords: *Rhodomyrtus tomentosa*, toxicity, safety, functional observational battery, pharmacological

Rhodomyrtus tomentosa Aiton Hassk. is a medicinal plant species belonging to the family Myrtaceae. It is widely exploited in traditional medicine for the treatment of many diseases and disorders such as abscess, diarrhoea, dysentery, gynaecopathy, and haemorrhage. Recently, scientific data demonstrated that the plant possesses a wide range of potent biological activities. However, no toxicological studies have been documented to support its uses. This study was attempted to assess toxicity profile of *R. tomentosa* leaf extract in animal model in order to gain scientific support for industrial applications. Behaviour and functional integrity of mice were assessed by functional observational battery. Toxic effects including both histopathological and ultrastructural changes were visualized. It was evident that *R. tomentosa* leaf extract is safe up to the dosage of 2,000 mg/kg body weight of mice per day which is equivalent to 20,000 mg/day for 70 kg person. According to OECD guidelines, the lethal dose of *R. tomentosa* leaf extract falls under class four with no signs of toxicity at 2,000 mg/kg body weight. The results from this study demonstrated that *R. tomentosa* leaf extract is considered safe and of high value for potential applications in human health, aquaculture, agriculture, and food industry.

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P2-85

Rhodomyrtus tomentosa (Aitton) Hassk. Leaf Extract and Rhodomyrtone: Potential Anti-Virulence Agents against *Streptococcus pneumoniae*

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Keywords: biofilm, phagocytosis, rhodomyrtone, *Rhodomyrtus tomentosa*, *Streptococcus pneumoniae*

Rhodomyrtus tomentosa (Aiton) Hassk. has been used in traditional herbal medicine for treatment of infectious diseases. An ethanol leaf extract of the plant and its purified compound, rhodomyrtone, exhibited excellent antibacterial activity against *Streptococcus pneumoniae* with minimal inhibitory concentration (MIC) ranging from 16–32 μg/ml and 0.125–1 μg/ml, respectively. This study aimed to further determine the effects of the extract and rhodomyrtone on *S. pneumoniae* virulence factors including biofilms, capsule formation, and host cell adhesion and invasion that play an important role in the infection. The ability of the extract and rhodomyrtone to prevent biofilm formation and eradicate mature biofilms was assessed. The extract at 1/8 × MIC and rhodomyrtone at 1/2 ×, 1/4 × and 1/8 × MIC significantly inhibited biofilm formation in all clinical isolates ($P < 0.05$). The viability of 8-day biofilm-grown cells significantly decreased by treatment with 16 × MIC the extract and rhodomyrtone. Approximately 90% phagocytosis of the bacterial cells by macrophage RAW264.1 was observed following treatment with the extract and rhodomyrtone at 1/2 × MIC. Reduction in bacterial adhesion and invasion to human alveolar epithelial A549 was detected after challenging with the extract and rhodomyrtone within 60 min. The results suggested that both the extract and rhodomyrtone inhibited *S. pneumoniae* virulence factors could be used as alternative agents for the treatment of pneumococcal infections.

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Biological Activities of *Eucalyptus camaldulensis* Ethanolic Leaf Extract, an Alternative Potential Bio-Preservative Agent against *Listeria monocytogenes*

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Keywords: antibacterial, anti-virulence, anti-oxidant, *Eucalyptus camaldulensis*, *Listeria monocytogenes*

Consumers' concerns towards chemical preserved foods resulted in increased search for healthy alternative green preservative. In this study, the antibacterial activities of *Eucalyptus camaldulensis* ethanolic leaf extract was evaluated against *Listeria monocytogenes,* a serious foodborne pathogen. The extract showed anti-listerial effects with minimum inhibitory concentration (MIC) of 64 to 128 µg/mL and minimum bactericidal concentration of 256 to 512 µg/mL. Time-kill assay revealed growth inhibitory effects after 4 h treatment of the bacteria with the extract. Approximately 2 to 3-log reduction in CFU/mL against all of the tested food and environmental isolates was observed after challenging the pathogen with the extract at MIC for 6 and 8 h. Sub-MICs of the extract significantly reduced motility up to 80%, and inhibited listeriolysin O production, and biofilm formation ($P < 0.05$). Total phenolic content of the extract was 11.10 mg GAE/mg extract and total flavonoid content was 15.05 mg QE/mg extract. Free radical scavenging activity demonstrated IC_{50} of 57.07 µg/mL for DPPH and 29.01 µg/mL for ABTS assay. FRAP assay further showed a total anti-oxidant power equivalent to 92.93 µM AAE/mg extract. The extract exhibited profound antibacterial activity as well as good radical scavenging abilities, thus might serve as a potential alternative source of bio-preservative agent.

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P2-87

Clinical Evidence on the Efficacy and Safety of Formulation Containing Rhodomyrtone, a Novel Antibacterial Agent Isolated from *Rhodomyrtus tomentosa*: a Randomized, Double-Blind, and Placebo-Controlled Study

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Keywords: anti-acne, clinical trial, natural product, Rhodomyrtone, *Rhodomyrtus tomentosa*

Rhodomyrtus tomentosa (Aiton) Hassk., belonging to Myrtaceae family, is an evergreen shrub native to Southeast Asia. This plant contains a bioactive compound, rhodomyrtone that possessed significant antibacterial activity. Liposomal encapsulated rhodomyrtone formulation has been previously demonstrated in our *in vitro* study as a promising anti-acne topical therapy. This work aims to further study the efficacy of the formulation in clinical trials. In a randomized, double-blind, and placebo-controlled study, 30 volunteers with mild to moderate acne vulgaris in each group were instructed to apply the formulation, clindamycin, or placebo to infected facial areas twice daily. Significant reduction in total numbers of acne lesions were demonstrated during week 2 to week 8 ($P < 0.05$). Volunteers received the formulation showed improvement for inflammatory lesions with reference to baseline within 2 to 14 days, depending on inflammatory severity. In addition to infection control, uses in human volunteers clinically demonstrated good healing activity and skin whitening. All subjects showed no signs of irritation or long-term undesirable side effects. Liposomal encapsulated rhodomyrtone formulation has been demonstrated to be effective and safe for treating acne lesions, especially inflammatory lesions.

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Ginsenosides Rg3 and Rh2 Regulate Lipid Accumulation in 3T3-L1 Adipocytes via Discrete Mechanisms

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Keywords: ginsenosides, Rg3, Rh2, cultured ginseng roots, lipid accumulation

Cultured Ginseng Roots (CGR) are a rich source of ginsenosides that possess plethora of health benefits including anti-proliferative, anti-inflammatory and anti-oxidant activities. However, little is known about the impact of each ginsenoside which enriched in CGR on lipid metabolism. Thus, the aim of this study is to determine the novel functions of ginsenosides in regulating energy metabolisms in the adipocyte. Among 11 ginsenosides, Rg3, Rh2, Re, and Rb1 are rich in CGR and Rg3, and Rh2 are effectively repressed adipogenesis in 3T3-L1 cells in a dose-dependent manner. Rg3 specifically inhibited the early stage of adipocyte differentiation by decreasing TG accumulation and adipogenic protein and gene expressions. The regulation of TG synthesis by Rg3 was involved in the upregulation of fatty acid oxidation and mitochondrial activity in the adipocyte. Rh2 more significantly suppressed the late stage of adipocyte differentiation than early stage, and it is followed by significant suppression of NF-kB activation. Taken together, Rg3 and Rh2 attenuated lipid accumulation in the adipocyte. Rg3 specifically reduced adipogenesis via increasing fatty acid oxidation, while Rh2 inhibited lipogenesis with inhibition of inflammation. These results suggest that Rg3 and Rh2, both enriched in CGR, exert unique lipid-lowering effects in adipocyte via discrete mechanisms.

P2-89

Antioxidant Property of Microencapsulation of Marigold (*Tagetes erecta* L.) Extract

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Keywords: marigold, antioxidant, microencapsulation, polylactic acid

The influence of methnaolic and 50% methanolic extracts of yellow marigold (YM) and orange marigold (OM) in a concentration range 0.1-0.9 mg/ml, were evaluated on 2,2-diphenyl-1-picrylhydrazyl free radical (DPPH). The OM extracts possessed better scavenging and antioxidant activity than YM extracts, while methanolic extracts exhibited lower activities than 50%methanolic extracts. Methanolic-water extracts of YM had the best antioxidant activity, 0.75 mg/ml extracts. This concentration of this extract scavenged 93%, DPPH, had phenolic compound (14.67-47.25 mg/g), and flavonoids (5.24-19.25 mg/g). Marigold extract was microencapsulated with maltodextrin or polylactic acid (PLA) to improve its solubility. PLA proved to be better carrier compared to maltodextrin and showed enhanced dissolution and antioxidant activity of the extract.

P2-90

Antioxidant Properties of Virgin Coconut Oil Microencapsulated by Spray Drying with Supercritical Carbon Dioxide

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Keywords: virgin coconut oil, microencapsulation, supercritical carbon dioxide, antioxidant activity

The virgin coconut oil (VCO) has been shown to have health-promoting effects due to its high medium-chain fatty acid content and antioxidant properties, however, its taste and feeling are not acceptable to many consumers. In this study, VCO was microencapsulated by spray drying with supercritical carbon dioxide (SC-CO2) at pressures from 12 to 16 MPa, temperatures from 40 to 60 °C for an emulsion feed flow rate that was varied from 3 to 5 mL/min. The results showed the encapsulation efficiencies ranged from 54% to 72%, the microcapsules were spherical with diameters that ranged from 25 to 72 μm. The antioxidant activities of the retained microencapsulated oil ranged from 0.34 to 1.14 mmol butylated hydroxytoluene (BHT) equivalent/ml oil and 0.74−1.72 mmol trolox equivalent/ml oil for 2,2- diphenyl-1-picrylhydrazyl (DPPH) assay and 2,2'-azino-bis (ABTS) tests, respectively. The obtained results indicate the SC-CO2 spray drying is an effective method to encapsulate VCO.

P2-91

Dual Effect of Blossoming Energy™ on Anti-Oxidant and Skin Moisturizing

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Keywords: Blossoming Energy™, anti-oxidant, moisturizing

The 'Blossoming Energy™' was developed for enhancing skin health by mimicking plant physiology. It is composed of plant hormone (auxin) and growth nutrients (sucrose and rose hip fruit extract). In this study, we examined the anti-oxidant and moisturizing efficacy of 'Blossoming Energy™'. An antioxidant assessment was conducted to determine whether a 'Blossoming Energy™' had DPPH radical scavenging capability through DPPH assay. As a result, it was found that the 'Blossoming Energy™' showed significant anti-oxidant efficacy. And RT-qPCR was inducted to find out expression level of moisturizing-involved mRNA. As a result, we found that 'Blossoming Energy™' treatment increased expression of RNA levels which are involved in moisturizing (AQP3, aquaporin3: 1.31 times, $p<0.01$ vs. control; CAS14, caspase14: 1.37 times, $p<0.05$ vs. control; ABCA12: 1.70 times, $p<0.01$ vs. control). The 'Blossoming Energy™' also increased expression of ki-67 mRNA level which is known as cell proliferation marker. In conclusion, our data indicated that 'Blossoming Energy™' can be a good candidate for active ingredient on anti-oxidant and moisturizing cosmetics.

P2-92

Catechol Inhibits Epithelial to Mesenchymal Transition and Enhances the Cytotoxic Effects of Gemcitabine in Pancreatic Cancer Cells

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Keywords: catechol, metastasis, pancreatic cancer, synergistic effect

Catechol is a natural phenolic compound derived from fruits and vegetables such as olive oil and apples. Catechol has been shown to have anti-cancer effects on lung and breast cancer, but there has been no report on whether catechol can inhibit the metastasis and proliferation of pancreatic cancer. Here, we found that catechol significantly inhibited proliferation of pancreatic cancer cell and suppressed migration and invasion by suppressing the expressions of snail, vimentin, matrix metalloproteinase (MMP)-2 and MMP-9. Mechanistically, catechol inhibited epithelial to mesenchymal transition (EMT) through a reduction in reactive oxygen species (ROS) levels by upregulating GPx2. Interestingly, our study showed that the combination treatment of catechol and gemcitabine exerted noticeable synergistic effect. In addition, catechol together with gemcitabine treatment significantly increased apoptosis as evidenced by the increase in caspase-3 activity and the degradation of poly(ADP-ribose) polymerase (PARP) protein. Taken together, these data suggest that catechol inhibits the ROS-mediated EMT and it can sensitize gemcitabine-induced cytotoxicity against pancreatic cancer cells.

P2-93

Enhancing Immunomodulatory Function of Red Ginseng through Fermentation Using *Bifidobacterium animalis* subsp. lactis LT 19-2 from Infant Feces

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Keywords: immune modulation, red ginseng, fermentation, ginsenoside Rd

Many aglycone derivatives have been reported to possess superior bioactivity compared to their corresponding glycosides. In order to increase aglycone contents via fermentation, we performed a screening using bacteria isolated from the feces of infants (under 100 days after birth) focusing on β-glucosidase activity. We isolated 565 enterobacterias and selected *Bifidobacterium animalis subsp*. lactis LT 19-2 (LT 19-2), which exhibited the highest β-glucosidase activity. Red ginseng (RG) has been known to display immune-regulatory functions. Hence, we fermented RG using the strain LT 19-2 (F-RG) and investigated whether this could alter the aglycone profile of ginsenosides and improve its immunomodulatory effect. F-RG increased RAW264.7 macrophage activity more potently compared to RG, demonstrated by the higher IL-6 production. More importantly, F-RG treatment was able to stimulate more proliferation of primary mouse splenocytes compared to that of RG, further confirming the enhanced immunomodulatory function after fermentation. Next we analyzed the ginsenoside composition in RG and F-RG. We found a significant increase in the content of ginsenoside Rd, the aglycone skeleton of ginsenoside Rb1, accompanied by a decrease in Rb1, in F-RG compared to RG. Collectively, we propose F-RG as a novel functional food and/or pharmacological material for enhancing immunity.

†These authors contributed equally to this work.

P2-94

Dihydrocapsaicin Inhibits Malignant Cell Transformation through Targeting Amino Acid Signaling and c-Fos Expression

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Keywords: dihydrocapsaicin, chili pepper, c-fos, amino acid signaling, cell transformation

Research results on chili pepper and some of its constituents have raised controversy on whether chili pepper compounds possess cancer-promoting or cancer-preventive effects. While ample studies have been carried out to examine the effect of capsaicin in carcinogenesis, the chemopreventive effect of other major components in chili pepper, for example, dihydrocapsaicin, capsiate, and capsanthin, is relatively unclear. Herein, we investigated the inhibitory effect of chili pepper components on malignant cell transformation. Among the tested chili pepper compounds, dihydrocapsaicin displayed the strongest inhibitory activity against epidermal growth factor (EGF)-induced neoplastic transformation. Dihydrocapsacin specifically suppressed EGF-induced phosphorylations of p70S6K1-S6 pathway and expression of c-fos. Reduction in c-fos levels by dihydrocapsacin led to a concomitant downregulation of AP-1 transactivation. Further analysis of the molecular mechanism responsible for dihydrocapsaicin-mediated decrease in phospho-p70S6K1, revealed that dihydrocapsaicin can block amino acid-dependent mTORC1-p70S6K1-S6 signal activation. Additionally, dihydrocapsaicin selectively augmented amino acid-deprivation induced cell death in mTORC1-hyperactive cells. Collectively, dihydrocapsaicin exerted chemopreventive effects through inhibiting amino acid signaling and c-fos pathways, and thus might be a promising cancer preventive natural agent.

P2-95

Variations of Fatty Acid Composition in 137 Accessions of Korean Rice Core Set

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Keywords: rice, germplasm, fatty acid, phytonutrient

To understand genetic diversity of fatty acid composition, Korean rice core set consisting of 137 accessions representing 25,604 rice germplasm were selected and their brown rice fatty acid compositions were analyzed by using a gas chromatography. Total 9 fatty acids were identified and quantified, among which linoleic, oleic, and palmitic acids were the 3 major ones that showed average composition of 36.9%, 33.8%, and 23.9%, respectively. Additional minor fatty acids were stearic (2.0%), linolenic (1.2%), myristic (1.0%), arachidic (0.5%), behenic (0.4%) and eicosenoic acid (0.4%). Myristic acid exhibited highest genetic diversity (RSD=34.7%) among 137 accessions, compared to other major fatty acids such as linoleic (RSD=6.3%) and oleic (RSD=9.3%) acids. Accessions 'Tchampa', 'Urasan', 'Rathal' showed highest compositions in palmitic (30.2%), oleic (42.4%), and linoleic (43.5%) acid. Ecotype-dependent difference could be observed in that Aus-type rice exhibited higher saturated fatty acid composition, while tropical and temperate japonica type rices contained higher mono-unsaturated and poly-unsaturated fatty acids, respectively. Throughout the whole 137 accessions, oleic acid composition exhibited statistically significant negative correlationships with palmitic ($r=-0.651^{**}$) and linoleic (-0.611^{**}) acids, but positive correlationship with eicosenoic acid ($r=+0.547^{**}$) composition. All these results showed diverse fatty acid composition among 137 Korean rice core set.

Acknowledgement This work was supported by a grant from the Next-Generation BioGreen 21 Program (Plant Molecular Breeding Center No. PJ013280), Rural Development Administration, Republic of Korea.

P2-96

Plant-Based, Multivitamin/Mineral, and Phytonutrient Supplementation Scavenges Reactive Oxygen Species in Healthy Subjects

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Keywords: phytonutrient, antioxidant capacity, ROS scavenging, DNA damage, human intervention study

Phytonutrients as well as vitamins and minerals supplementation has been reported to have antioxidant capacity in human; however, there is still controversy. In our previous study, nutritional dose of multivitamin was effective in prevention of DNA damage without altering endogenous antioxidant capacity. In the current clinical trial, we examined the antioxidant and DNA protection capacity of a plant-based, multi-vitamin/mineral, and phytonutrient (PM) supplementation in healthy adults with habitually low intake of fruits and vegetables. This study was an eight-week, double-blind, randomized, parallel-arm, and placebo-controlled study. PM supplementation for eight-week reduced reactive oxygen species (ROS) and prevent DNA damage without altering endogenous antioxidant system, and plasma vitamins and phytonutrients were significant correlation with ROS scavenging and prevention of DNA damage. In addition, when mRNA expression analysis, no stimulation was also found, while, PM supplementation affected subtle and connected changes in superoxide metabolic processes and negative regulation of DNA damage response in enriched-network analysis. In this study, we proved exposed phytonutrient have significant correlation with ROS scavenging and prevention of DNA damage for the first time in the human intervention study. However, detailed action mechanisms for phytonutrient should be further analyzed.

P2-97

The Yak-Kong Soybean (*Glycine max*) Extract Fermented by a Novel *Pediococcus pentosaceus* Inhibits the Oxidative Stress-Induced Monocyte-Endothelial Cell Adhesion

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Keywords: Yak-Kong, small black soybean, *Pediococcus pentosaceus,* atherosclerosis prevention, monocyte- endothelial cell adhesion

Yak-Kong (YK), a small black soybean (*Glycine max*) in Korea, contained higher concentrations of antioxidants than ordinary black soybean or yellow soybean in our previous study. We have fermented YK extract by a novel lactic acid bacterium, *Pediococcus pentosaceus* AOA2017 isolated from *Eleusine coracana*, and found that the antioxidant ability was enhanced after fermentation. In order to investigate the cause of enhanced antioxidant ability in the fermented YK extract, we conducted a phenolic composition analysis. Results showed that proanthocyanidin decreased and phenolic acid increased with significance after fermentation. Among phenolic acids, p-coumaric acid was newly produced at about 11.7 mg/ 100 g which did not exist before the fermentation. Further, the fermented YK extract with increased p-coumaric acid significantly inhibited the lipopolysaccharides (LPS)-induced THP-1 monocyte-endothelial cell adhesion compared to unfermented YK extract. The fermented YK extract also suppressed the protein expression levels of vascular cell adhesion molecule (VCAM)-1 in human umbilical vein endothelial cells (HUVECs). Together with the previous studies, our results suggest that the YK extract fermented by *P. pentosaceus* AOA2017 has a potential to be a new functional food material with its enhanced bioactive compounds to prevent atherosclerosis caused by oxidative stress.

P2-98

Bioactivity of Metabolites in Ginseng-Based Functional Foods

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Keywords: ginseng, ginsenoside, metabolite, biotransformation, functional food

Ginseng has been recognized to exert various health-beneficial effects including, immunomodulation, anti-cancer, anti-inflammation, anti-skin aging, anti-neurodegeneration and anti-fatigue. Evidence from various research results suggest that ginseng metabolites produced from microbial metabolism or during food processing may possess enhanced bioactivity. Gut microbiome-driven transformation induces removal of sugars from major ginsenosides, yielding alycone derivatives. Heating and drying of ginseng can also generate different ginsenoside profiles which has been proposed to alter the biological efficacy of ginseng. In recent years, this has led to application of biotransformation in developing ginseng-based functional foods. In the current review, we will focus on the health functionality of ginseng metabolites displaying superior bioactivity compared to their parental compounds.

[†]These authors contributed equally to this work.

P2-99

Dual Effect of *Artemisia argyi* Leaf Water on Anti-Inflammation and Skin Moisturizing

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Keywords: *Artemisia argyi* Leaf Water, anti-inflammation, moisturizing

Artemisia argyi is an herbaceous perennial plant with a creeping rhizome. *A. argyi* has been used traditionally for medicine and skin care. 'Artemisia argyi Leaf Water (Ganghwa yakssuck condensate)' is a hydrosol obtained by steam-distillation of *A. argyi* leaf from Ganghwa in Korea. In this study, we examined the anti-inflammatory and moisturizing efficacy of '*Artemisia argyi* Leaf Water'. To evaluate the efficacy of 'Artemisia argyi Leaf Water', we studied alterations of inflammation and moisturizing-involved mRNA expression levels by RT-qPCR. After treatment with IFN-g and '*Artemisia argyi* Leaf Water' simultaneously, data showed inhibited expression of RNA levels which are involved in inflammation (COX2, prostaglandin-endoperoxide synthase: 0.67 times, $p<0.001$ vs. IFN-g-treated control; iNOS, Inducible nitric oxide synthase: 1.01 times, $p<0.05$ vs. IFN-g-treated control). It was also confirmed that 'Artemisia argyi Leaf Water' significantly increased expression of moisturizing-involved RNA, AQP3 (Aquaporin 3: 7.90 times, $p<0.001$ vs. Control). Consequently, '*Artemisia argyi* Leaf Water' has the moisturizing and anti-inflammatory properties in normal human primary keratinocytes. It is expected that '*Artemisia argyi* Leaf Water' can be the useful active ingredient of cosmetics for anti-inflammation and skin moisturizing.

NATPRO 7

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The Beginning of Asian Wave

Appendices

Appendix A. Category of Natural Products

Science

S-1	Chemistry	Organic	Isolation, purification, structure
			Synthesis
		Biochemistry	Biosynthesis
		Analytical	
S-2	Metabolism	Prebiotics	
		Probiotics	
		Pharmacokinetics	bioavailability
S-3	Biology and efficacy	Biological activity	Cancer
			GI disease
			diabetes
			Alzheimer's Disease
			inflammatory
			Chronic
		Clinical study	
		Nutrition	Digestion
			Nutrients
			Supplements
S-4	Non-herbal NP	Marine	Microbioal NPs
		Animal	
		Insects	

Technology

T-1	Biotechnology	Process and Production	
		Biotransformation	Tissue culture
			Microbial
		Formulation	
T-2	Medicine	Traditional herbal	
		Drug discovery	
T-3	Functionalfood	Development	
		Health improvement	Cognitive and learning
			Stress
			Immune
T-4	Cosmetics		
T-5	Diets	Vegetarian and Vegan	
		Halal, Kosher	

Outreach

O-1	Regional NP	Scope and trends of country	
		Screening	
O-2	Regulations and policy	Registration	
		Cultivation and Safety	
		QA/QC	
		Statistics	
O-3	Education	Pedagogy	
		Workshop	

Appendix B. Constitution of The Asian Society of Natural Products

Chapter 1
General Provisions

Article 1 (Name)

The "SOCIETY" shall be known as The ASIAN SOCIETY OF NATURAL PRODUCTS.

Article 2 (Objectives)

The objectives of the SOCIETY shall be to realize the benefit of the members of the SOCIETY by promoting advancement of basic and applied natural products science and encouraging propagation of natural products-related principles and technologies in the region of Asia, thereby contributing to advancement of natural products research.

Article 3 (Location of Office)

Main office of the SOCIETY shall be located in the Seoul metropolitan area of the Republic of Korea and, upon request of the members of the SOCIETY residing in a country other than the Republic of Korea, the Society may form an individual National Chapter with respect to such country as established and governed by Bylaws.

Article 4 (Activities)

To foster the objectives described in Article 2, the SOCIETY shall conduct the following activities:
1. Publication of journals and books.
2. Holding meetings, conferences, workshops, and symposia.
3. Promotion of intra- and international cooperation among academia, industries, and research institutes.
4. Promotion of research activities and prize awarding for significant achievements.
5. Executing other activities that befit the objectives of the SOCIETY described in Article 2.

Article 5 (Benefiter)

Notwithstanding that any benefit provided to benefiter shall not be awarded with monetary compensation while conducting the activities described in Article 4, part or full cost can be collected, if circumstances demand, from the benefiter, only if the decision of the Executive Committee demands.

Chapter 2
Membership

Article 6

The members of the SOCIETY shall be those individuals and entities, who agree with the objectives of the SOCIETY specified in Article 2 and meet the requirements and qualifications as categorized below. Applicants for membership shall be elected upon the submission of formal applications as provided in Bylaws.

1. Regular Members
Individuals who have studied natural products science and are involved in natural products business.
2. Student Members
Individuals who are currently enrolled in Master's or Doctor's program in natural products science.
3. Honorary Members
Former Members who have made significant contributions to the progress and diffusion of natural products science and in the mission of the SOCIETY. The title shall be awarded upon decision by the Board of Directors.
4. Corporate Members
A corporate body involved in the natural products area.
5. Group Members
Educational institutions, libraries, public research institutes, and non-profit scientific societies and organizations admitted by the Board of Directors.

Article 7 (Right and Responsibility)

Members, except Honorary Members, shall claim all the rights specified in the Constitution by paying annual dues as provided in the Bylaws.

Article 8 (Abdication of Membership)

Members shall retain the right to abdicate from membership.

Article 9 (Expulsion of Member)

A member may be expelled from membership by the Board of Directors and or as determined in a General Meeting for grounds as provided below:

1. For conduct which tends to affect adversely the SOCIETY's reputation.
2. For conduct which is destructive of the SOCIETY's objectives.
3. For non-payment of dues.

Chapter 3
Officers

Article 10 (Kinds and Numbers)

The officers of the SOCIETY shall consist of a President, three Vice-Presidents, two Auditors, an Executive Director, elected members of the Board of Directors no less than 10, and more or less than 10 Executive Committee Members.

Article 11 (Term of Office)

Officers shall take office on January 1 and shall hold office for two years. Only a Regular Member of the SOCIETY may serve as an officer.

1. President shall not be reelected.
2. Officers other than President can be reappointed with nomination by the consent of at least half of the Board members.
3. In the event of the inability of any officer to function in his or her office, a pro tem officer may be by-elected at a General Meeting upon nomination by the Board of Directors. In the case of a member of Executive Committee, Board of Director shall by-elect upon recommendation by the Chair of the Committee.

Article 12 (Manner of Election)

1. The President-Elect, the Vice Presidents (subject to Article 12.4), and the Directors shall be elected by the Board of Directors and the election shall be formalized by approval in General Meeting as provided in the Bylaws.
2. Auditors shall be nominated by a Regular Member and elected by a majority vote in General Meeting.
3. The Executive Director and the members of Executive Committee shall be nominated by the President and approved by the Board of Directors.
4. One of the Vice-Presidents shall be nominated by the President and approved in General Meeting.
5. Dismissal of an Officer shall be decided by the Board of Director and reported to General Meeting.

Article 13 (Duty of Officers)

1. The President shall represent the SOCIETY and oversee the general affairs pertaining to the SOCIETY, and chair the General Meeting and the Board of Directors.
2. The Vice-Presidents shall assist the President. The senior Vice-President shall act as the President In the event of the inability of the President to function in his or her office.
3. The members of Board of Directors shall vote on matters pertaining to the SOCIETY and execute such duties as may be commissioned by the President.

Article 14 (Duty of Auditors)

The auditors shall perform the following duty:

1. To oversee the business operation and financial affairs of the SOCIETY.
2. To oversee the operation of Board of Directors.
3. To demand the correction of unlawfully, unfairly executed business as a result of the Article 14.1 and 2.
4. To summon General Meeting or Board of Directors to carry out as provided in the Article 14.3.
5. To report the status and/or results of the assets and properties, operation of Board of Directors, and operation of the SOCIETY.
6. To sign and seal on the minutes of General Meeting and Board of Director.

Chapter 4
General Meeting

Article 15 (Function)

General Meeting shall be held to deliberate and vote over the following matters of the SOCIETY:
1. Results of the operation and settlement of account of the current fiscal year
2. Operation plan and budget of the next fiscal year
3. Approval of election of the President-elect, Vice-Presidents, elected members of Board of Directors, and the Auditors.
4. Amendment to the Constitution and dissolution of the SOCIETY
5. Matters referred by the Board of Directors
6. Other matters deemed to be important or set forth in this Constitution.

Article 16 (Convening)

1. General Meeting shall comprise regularly scheduled annual meetings and special meetings convened by the President or the Board of Directors.
2. President shall notify the agenda no fewer than 14 days before the meeting in a written document which may be in electronic format.
3. General Meeting shall deliberate and vote only on the previously notified agenda as specified in the Article 16.2.

Article 17 (Quorum)

General Meeting shall be held by the Regular Members described in Article 6.1. In any session of General Meeting, 10 percent of the registered Regular Members shall constitute a quorum, and decision shall be made by a majority vote. Chair of the Meeting shall cast the deciding vote in the case of a tie among the Regular Members.

Article 18 (Special Convening)

1. The president shall convene a Meeting within 20 days from the date of demand of convening in the case of the following:
   (1) When the majority of the Board of Directors demand convening of the Meeting with a specific agenda.

(2) When the Auditors demand the Meeting be convened according to the Article 14.4.
(3) When more than 10 percent of the registered Regular Members demand the Meeting be convened with a specific agenda.

2. In the event of the inability of the rightful convener to qualify or function in his or her office or the refusal by the convener, either a majority of Board of Directors or no less than 10% of regular members shall have the power to convene the Meeting.
3. General Meeting held in accordance with the provisions in the Article 18.2 shall be chaired by the most senior of the Board member present at such General Meeting.

Article 19 (Exclusion from Voting) Chairperson or a member shall be excluded from voting in the case of following:

1. The agenda concerns such persons's election to office or dismissal from office.
2. The agenda concerns conflict of interest accompanying monetary transaction with such person.

Chapter 5
Board of Directors

Article 20 (Composition, Function, Operation, and Quorum)

1. Composition and Function
The members of the Board of Directors shall include (i) the President, (ii) Vice-Presidents, (iii) Executive Director, (iv) Directors, (v) the President-elect, and (vi) Chairman and a Vice President of individual National Chapter, and (vii) the Auditors as non-voting member. Duties of the Board shall be the deliberation of and voting for the following business:
(1) Planning of the operation, operation and execution of the business pertaining to the SOCIETY.
(2) Budget planning, account settlement, and procurement, disposal and management of assets.
(3) Affaires concerning the Constitution and By-laws.
(4) Election of the President-elect, Vice-Presidents, and members of Board of Directors.
(5) Approval for nomination of Executive Director.
(6) Expulsion of a member.
(7) Official commendation.
(8) Establishment of a new Committee.
(9) Dissolution of the SOCIETY
(10) Other matters deemed to be important.
2. Convening
(1) Board of Directors shall be convened by the President, and the agenda thereof shall be notified to each Board member at least seven days prior to the date of said meeting.
(2) Board of Directors shall vote only on the agenda as specified in the Article 20.1 (1). However, a new agenda other than the previously notified agenda shall be deliberated and voted only if the new agenda is approved by the unanimous vote of the Board of Directors with full attendance.
3. Quorum

In any session of the Board of Directors, 50% of the voting members shall constitute a quorum, and decision shall be made by a majority vote.

4. Special convening

(1) President shall convene a special meeting of the Board of Directors within 20 days of the date since the special meeting has been demanded under the following conditions:
   a. Majority of the Board members demand the convening with a specific agenda,
   b. Auditors demand the convening in accordance with the Article 14.4.

(2) In the event of the inability of the rightful convener to qualify or function in his or her office or the refusal by the convener, the majority of Board of Directors shall have the power to convene the special meeting of the Board or Directors.

(3) A special meeting of the Board of Directors held in accordance with the provisions in the Article 20.4(2) shall be chaired by the most senior of the Board member present at such meeting.

Article 21 (Executive Committee and Standing Committees)

To effectively execute the business of the SOCIETY, Executive Committee and Standing Committees shall be established, and their organization and operation shall be governed by Bylaws.

Chapter 6
Finances

Article 22 (Finances)

1. Finance of the SOCIETY shall be based upon the following sources of income:
   a. Annual dues paid by members except for Honorary member.
   b. Interest and profit from the management of assets.
   c. Donations and subsidies
   d. Endowment
   e. Other income
2. Contribution from the members and non-members shall be annually open to the public via notification published on or through the SOCIETY's website or social media accounts.

Article 23 (Fiscal Year)

The fiscal year of the SOCIETY shall be from January 1 to December 31, inclusive.

Article 24 (Annual Budget of Revenue and Expenditure)

The operation plan and annual budget of revenues and expenditures shall be set up within 2 months after the beginning of each fiscal year, and the report on the operations of and account settlement for the fiscal year shall be submitted to Board of Directors within 2 months after the end of the fiscal year. The report and current fiscal year's

operation plan and budget shall be approved to be effective by the Board of Directors and General Meeting.

Article 25 (Annual Dues)

Annual dues and the use thereof shall be governed as provided by Bylaws.

Article 26 (Fund)

The SOCIETY shall manage its fund as provided by Bylaws.

Article 27 (Extra-budget Debt)

Payment of debts and abandonment of credit, both not specified in annual budget, shall be approved by General Meeting by a majority vote.

Chapter 7
Supplementary Rules

Article 28 (Dissolution of the SOCIETY)

Dissolution of the SOCIETY shall be effective by over the vote of at least 2/3 of the members of the Board of Directors, and, thereafter, by the vote of at least 2/3 of the registered members at a General Meeting.

Article 29 (Disposal of Asset by Dissolution)

The asset of the dissolved SOCIETY shall be donated to the institution with the same or similar aim as the SOCIETY.

Article 30 (Amendment to the Constitution)

Amendment to this Constitution shall be made by the vote of at least 2/3 of the members of the Board of Directors and the majority vote at a General Meeting thereafter.

Article 31 (Bylaws and Regulations)

Bylaws and Regulations of the SOCIETY to effectively execute the Constitution shall be approved by the Board of Directors.

Article 32 (Notification)

The following acts of the SOCIETY shall be notified to members on the official publication of the SOCIETY.

1. Change of name and location of the office of the SOCIETY,
2. Any act regarding the operation of the SOCIETY as may be determined by the Board of Directors to be so notified.

Provisions

1. (Effective Date)
The present Constitution of the SOCIETY shall be effective on the date when the official identification number for non-profit organization by national Tax Service of Republic of Korea is issued.

2. (Term of Founding Officers)
Term of founding officers shall be until December 31, 2018.

3. (Application of Provisions)
Provisions in the Civil Law of the Republic of Korea shall be applied to the provisions not specified in the present Constitution.

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The Beginning of Asian Wave

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NATPRO 7

The 7th International Conference on Natural Products

October 18(Thu) - 20(Sat), 2018
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The Beginning of Asian Wave

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