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6th THAILAND-JAPAN

International Academic Conference 2013

6th Thailand-Japan International Academic Conference 2013

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Osaka university, Osaka, Japan

Welcome to the 6th Thailand-Japan International Academic Conference 2013

Learn-Share-Inspire

The Thailand-Japan International Academic Conference (TJIA) is an annual conference that provides a platform for students, academicians and researchers from various disciplines to present their research results and development activities. This conference not only provides opportunities for the delegates to exchange new ideas and application experiences face-to-face, but also promotes research collaboration among people from all countries regardless of their specialization and nationality which we hope will lead to technology transfer in the future. The TJIA is organized by the Thai Students' Association in Japan under the Royal Patronage (TSAJ). The conference began as the Thai-Japanese Students' Academic Exchange Meeting (TJSE) conference held in 2006 and 2007 at Osaka University. Following the success of TJSE, the conference continued being held every year and its scale was extended to be equivalent to the international symposium under the name "Thailand-Japan International Academic Conference (TJIA)," which started from 2008, when it was held at the Tokyo Institute of Technology.

This year, the TJIA 2013 returns to Osaka, the Japan's third largest city and second most important economic center. The conference is conducted in the following spirit: "Learn-share-inspire". On this occasion, selected papers and posters in a wide range of topics in the field of Science, Technology, and Sociology will be presented. In addition we also have interesting talks from 2 keynotes and 5 invited speakers. This year's participants are from Thailand, Japan, Philippines and Australia. We believe that participants will enjoy sharing knowledge and having discussions with each other in many areas of study. Alongside the conference program, we hope that everyone can take this opportunity to enjoy sightseeing in Osaka.

We would like to express our gratitude to the kind support from the Royal Thai Embassy, Tokyo (Japan). This conference is also kindly sponsored by a number of organizations and businesses and we are extremely grateful to them. Finally, we also would like to thank all researchers and staff from institutes and universities in both Thailand and Japan for their kind contribution to this project.

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Keynote Speakers:

Insight ASEAN+3: The Convergent of Asian Societies

Asst. Prof. Kritika Kongsompong

Sasin Graduate Institute of Business Administration of Chulalongkorn University

Abstract-- Since the process began in 1997, ASEAN Plus Three (APT) cooperation has been dynamic. This is because such participation tackles the important issues covering financial collaboration, trade facilitation, food and energy security, disaster management, rural development, and poverty alleviation. The future looks bright for businesses across the member nations since the community embraces a significant size of world population. Benefits of this integration include various free flows: products, services, human resources, investments, and capitals. The original 10 ASEAN members have followed the objectives of this integration to build a stronger community quite successfully. Undeniable obstacles, however, tend to focus on the issues of cultural and societal understandings. Each member nation is drastically different from each other regardless of geographic and economic distance. The nuances of societal behaviour remain the topic of discussions among the academics and practitioners on agreeing whether the ASEAN society is converging. Furthermore, one can easily observe that the interactions of different cultures can be both peaceful and conflicting, and one must make the attempt to understand one's own and others' cultures in order to live harmoniously in these powerful integrated societies: The ASEAN Societies.

Two Directions of Thailand: Modernization of the State or Wellness of Society

Prof. Suehiro Akira

Department of Comparative Contemporary Societies, Institute of Social Science, University of Tokyo

Abstract-- "Under the strong pressures of globalization, economic liberalization, IT progress and individualization, Thailand has experienced a lot of socio-economic problems such as slow-down of growth (middle-income trap),Low level innovation, ageing society with smaller number of children, incomplete system of social security and mismatch between higher education and labor market.

In order to tackle these problems, Thai governments and peoples have attempted to introduce two different ways of reforms. One is the promotion of modernization of the state (Thaksin's reform) , and the other is the enhancement of Thai-ness and wellness of a society (Seatthakit Phophian of the King, sangkhom khemkheng of Mo. Prawet Wasi etc).

The presentation aims to introduce and compare these two approaches as possible scenarios for structural reforms in the future."

Invited Talks:

Outputs from Collaborative Research with ASEAN Biotechnology Network

Prof. Kuzuhito Fujiyama

Applied Microbiology Laboratory, International Center for Biotechnology (ICBiotech), Osaka University

Since early 1970, we have been running collaborative projects and educational programs on biotechnology with Thai universities and institutes. The collaborative projects have been supported by JSPS and JST and designed for researchers and academic staffs at Thai universities and institutes. As for the educational programs, students or young researchers joined the programs supported by UNESCO and MEXT, Japan, to study basic techniques and advanced knowledge during their one-year stay in Japan. The number of Thai participants is 78 of 459 from Asian countries.

I believe these activities for more than 40 years contributed to development of science/technology and human resources in biotechnology field of Thailand. In addition, now we have wonderful and strong “KIZUNA” network among Thai and Japanese scientists. This is invisible, but very important outcome from the activities.

Tsunami disasters and countermeasures in Japan

Assoc. Prof. Anawat Suppasri

International Research Institute of Disaster Science, Tohoku University

Abstract-- "This presentation introduces historical and recent tsunami disasters in all regions in Japan. Chronology of tsunami countermeasures that adapted based on lessons from great tsunami events is also summarized. Mechanisms and characteristics of the 2011 Great East Japan Earthquake and Tsunami are to be discussed and ended up by the recent evaluated future tsunami hazard in the Nankai Trough region by the cabinet office, government of Japan.”

Protective effects of Thai red curry paste on oxidative stress and blood glucose levels in type II diabetic rats

Assist. Prof. Aikkarach Kettawan

Food Chemistry Laboratory, Institute of Nutrition, Mahidol University, Thailand

Abstract-- Patients with type 2 diabetes (T2DM) account for up to 95% of all diabetic patients worldwide. High level of blood glucose (hyperglycemia) in diabetic patients can alter several metabolic pathways, especially that of glucose oxidation. This causes a higher production of free radicals, which can overwhelm endogenous antioxidant defenses resulting in a condition known as oxidative stress causing damage to cellular proteins, membrane lipids and nucleic eventually leading to cell death and thereby contributing to the development and progression of diabetes and its complications. Thai red curry paste (TRCP) is one of ingredients used traditional Thai curries. It contains several spices which are generally known to have antioxidants properties. The objective of this study is to evaluate whether daily intake of Thai red curry in an amount equivalent to that consumed in a normal Thai meal could decrease blood glucose and oxidative stress of type 2 diabetes mellitus (T2DM). Six-weeks old male Sprague Dawley rats were fed a high-fat (HF) diet for 2 weeks and T2DM was induced with an injection of streptozotocin (25 mg/kg body weight). Rats then were fed a HF diet supplemented with 0.5% freeze dried Thai red curry paste. After 3 weeks, beneficial effects were seen in the lowering of blood glucose level, liver enzyme activities and hyperinsulinemia. In addition, Thai Red Curry Paste improved moderately antioxidant activity. Our finding suggests that Thai Red Curry Paste intake may ameliorate insulin sensitivity and oxidative stress in T2DM condition. These benefits might be attributed to the numerous bioactive compounds present in Thai Red Curry Paste.

Researches on Carbon Nanomaterials with Thai Researchers and Students

Assoc. Prof. Noriaki Sano

Department of Chemical engineering, Graduate School of Engineering, Kyoto University

Abstract-- I have been working with Thai researchers and students for researches on mainly synthesis of carbon nanomaterials. We have been developing simple and cost-effective methods to synthesize carbon nanotubes and related materials which have high potential for many applications. These materials can be applied to many fields such as energy conversion, electronics, mechanical materials, sensors, and so forth. One of the methods developed by the collaboration is a technique which uses arc discharge submerged in water. The arc discharge can generate about 5000 K temperature, and such high temperature zone placed adjacent to a cold-temperature liquid can generate extremely sharp temperature-drop to realize the production of unique structures of the products. So far, carbon nanotube, carbon nanhorns, metal-dispersed carbon nanohorns, and other types of nanomaterials have been synthesized. In the presentation, in addition to the explanation about the synthesis method developed, the application study lately carried out for sustainable energy issue will be explained.

Future Outlook of the Thai Economy: Where Is It Headed?

Prof. Yoko UEDA

Faculty of Economics, Doshisha University,

Abstract-- Thailand is one of the world's most successful countries in terms of economic growth and industrialization. The Thai economy moved from an agricultural base towards a manufacturing base in the 1980's. Since then, Thailand has accepted huge investment from foreign countries such as Japan, and facilitated industrialization. In today's Thailand, automobile industry and electronics industry are the driving force of the economy.

However, Thailand at present seems to stand at a crucial turning point in seeking for further economic development. Thailand is no longer a cheap-labor country. The government is concerned about Thai manufacturing's future after the establishment of AEC (ASEAN Economic Community) in 2015. It intends to shift gradually to a knowledge and technology intensive economy. High value-added and high-tech industries are seen as important and strategic sectors by the government. The points about how Thailand should prepare for the new stage of economy will be presented. The contribution to the Thai economy made by Japanese companies is also explained.

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Regular Paper

(Oral Presentation)

Session 1

Integrated Science:

Investigation of *In-vitro* Antioxidant Potential of Thai Medicinal Plant Extracts

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ABSTRACT

Methanolic extracts of 27 Thai medicinal plants, traditionally used in different ailments, were evaluated for antioxidant potential using 2,2-diphenyl-1-picrylhydrazyl (DPPH) assay and oxygen radical absorbance capacity assay (ORAC). In comparison with controls, in the DPPH assay, six extracts (6CD, 22ST, 20SG, 21SpC, 23SV and 14OI) showed higher activities than ascorbic acid (SC_{50} = 6.07 µg/ml), In the ORAC assay, all species also show good antioxidant capacity (>2 µmole of TE / µg sample). The ORAC values were seem to be correlated with the DPPH values which the six extracts revealed high levels of antioxidant activity according to both methods, and thus could be potential rich sources of natural antioxidants.

KEYWORDS
Antioxidant, DPPH, ORAC, Thai medicinal plants

INTRODUCTION

Free radicals, particularly reactive oxygen species (ROS) are produced in cells by cellular metabolism and by exogenous agents. During metabolism, ROS such as superoxide ($O_2^{\bullet -}$), hydroxyl (OH•), peroxyl (ROO•), and hydrogen peroxide (H_2O_2) can arise normally. They may cause damage to cell membranes and DNA, which is implicated in mutagenesis, carcinogenesis, degenerative diseases, and aging[1-3]. Antioxidants are substances which inhibit or delay the oxidation process by blocking the initiation or propagation of oxidizing chain reactions. Therefore, antioxidants with free radical scavenging activities may be relevant in the prevention and therapeutics of diseases where free radicals are implicated [4,5]. In recent years, the use of natural antioxidants present in Thai's medicinal plants have attracted considerable interest due to their presumed safely, nutritional and therapeutic value [6,7]. Therefore, antioxidant capacity analysis of Thai's medicinal plant extracts may be the most relevant investigation.

A basic classification of antioxidant assays may be broadly classified as electron transfer (ET) and hydrogen atom transfer (HAT) based assays. Assays that are based on ET-based assays measure the capacity of an antioxidant in the reduction of an oxidant, which changes color when reduced. In contrast, HAT mechanisms measure competitive kinetics and are composed of a synthetic peroxyl radical generator, oxidisable molecular probe and an antioxidant compound [8-10]. This study, we aimed to evaluate the antioxidant activity of Thai's medicinal plants which are recognized to possess many medicinal properties. The methanolic extracts of twenty seven Thai's medicinal plants were measured *in vitro* using two mechanisms of antioxidant capacity assays, ET-based assays (DPPH) and HAT-based assays (oxygen radical absorbance capacity, ORAC).

MATERIALS AND METHODS

CHEMICALS AND CRUDE EXTRATS

2,2-diphenyl-1-picrylhydrazyl (DPPH), 6-hydroxy-2,5,7,8-tetramethylchromane-2-carboxylic acid (Trolox™), sodium fluorescein and 2,2′-Azobis(2-methylpropionamidine) dihydrochloride (AAPH) were purchased from Sigma-Aldrich Co. (USA). The crude dry powder extracts were prepared by maceration of plant materials in methanol.

SCAVENGING OF DPPH RADICALS

The measurement of the DPPH radical scavenging activity was performed according to methodology described by Brand-Williams *et al*. [11] with some modifications. Briefly, Five microliters of different concentrations of each sample or methanol (as a negative control) or ascorbic acid (as a positive control) were allowed to react with 195 µl of 100 µM DPPH methanolic solution in a 96-well microplate. The plate was then incubated at 37 °C for 30 min. When DPPH reacts with an antioxidant compound, the changes in color from deep violet to light yellow was measured at 515 nm (Beckman Coulter AD 200 UV/VIS Plate Reader). The DPPH radical reducing activity of the test sample was calculated using the following equation: *Scavenging effect (%)*: $[(A_0 - A_1) / A_0] \times 100$, where A_0 is the absorbance of the control reaction and A_1 is the absorbance in the presence of the sample of the tested compounds. The SC_{50} (the concentration of the compound required to scavenge 50% of the DPPH) was calculated graphically using a calibration curve in the linear range by plotting the compound concentration versus the corresponding scavenging effect.

OXYGEN RADICAL ABSORBANCE CAPACITY (ORAC)

Samples were assayed using previously described methods with some minor modifications [12]. The assay was carried out in black-walled 96-well plates. Each well had a final volume of 200 µl. the reaction mixture containing 160 µl of 10 nM fluorescein solution in 10 mM phosphate buffer (pH 7.4) was added to 20 µl of either sample or 20 µl of 50% DMSO (as a blank) and pre-incubated at 37 °C for 10 min. To start the reaction, 20 µl of 240 mM AAPH, a peroxyl radical generator, was added to the pre-incubated mixture. A change in intensity of the fluorescent probe caused by free radicals was then monitored at 37 °C every 90 sec for 90 min by using the fluorescent microplate reader (Beckman Coulter DTX880 Multimode Detector) at the excitation and emission wavelengths of 485 and 530 nm, respectively. In parallel, 50, 25, 12.5, 6.25 µM of Trolox™, a water soluble vitamin E analogue, was used as a standard. The areas under the fluorescence decay curves (AUC) was analyzed by the GraphPad Prism software and subtracted by the AUC of the blank to obtain the net AUC. Graph of the net AUC and Trolox™ standard concentrations were plotted and then Trolox™ equivalents antioxidant capacity were calculated and expressed as µmole Trolox equivalent / µg sample (µmole TE/ µg sample).

RESULTS AND DISCUSSIONS

In the present study, antioxidant activities of twenty seven medicinal plants were evaluated using two mechanisms of antioxidant capacity assays, ET-based assays and HAT-based assays.

The bleaching of DPPH is one of the ET-based assays used to evaluate the antioxidant properties of plant extracts. Antioxidant reacts with DPPH, which is a nitrogen-centered radical with a characteristic absorption at 515 nm and convert it to reduced form, due to its hydrogen donating ability at a very rapid rate. The degree of discoloration indicates the scavenging potentials of the antioxidant which expressed as SC_{50} value. The lower SC_{50} value represents the higher free radical scavenging ability. The SC_{50} values of twenty seven medicinal plant extracts are shown in Table 1. The highest antioxidant activities were determined for the extracts of the three species of the family *Fabaceae* (subfamily *Caesalpinioideae*), e.g., *Caesalpinia digyna* (6CD), *Senna timoriensis* (22ST) and *Senna garrettiana* (20SG) with SC_{50} value of about 3-4 µg/ml while the SC_{50} value of the reference standard ascorbic acid was 6.07 ± 0.71 µg/ml.

One standardized method for determining the HAT-based assays is the oxygen radical absorbance capacity (ORAC) assay. The ORAC assay is based upon the inhibition of the peroxyl radical-induced oxidation initiated by thermal decomposition of azo compounds (AAPH). The assay measures the loss of fluorescein fluorescence over time due to peroxyl radical formation. The subsequent addition of an antioxidant produces a more stable fluorescence signal, with signal stability depending on the antioxidant's capacity. Simply explained, a high ORAC value indicates a high antioxidant capacity. The results revealed that most of the medicinal plant extracts showed significant activity against the peroxyl radicals (Table 1). The three species of the family *Caesalpiniaceae* (6CD, 22ST, 20SG,) and five species of plants (21SpC, 23SV, 14OI, 16PA and 18SC) also showed higher antioxidant potential with ORAC values above 5 µmole TE / µg sample while ORAC values obtained for ascorbic acid was 0.53 µmole Trolox / µg ascorbic. Moreover, the ORAC values from this study seem to be correlated with DPPH values (R^2 = 0.72). The correlation between ORAC assay and DPPH assay has been reported previously in the antioxidant capacity of *Sorghum bicolor* [13].

Based on the SC_{50} and ORAC values obtained from twenty seven Thai medicinal plant extracts, results of the antioxidant activities were classified in three categories; 1) Medicinal plant extracts possessing extremely high antioxidant activity (SC_{50} <10 µg/ml and ORAC value > 5 µmole TE/ µg sample). 2) Medicinal plant extracts possessing high antioxidant activity (10 µg/ml < SC_{50} <100 µg/ml and 3 µmole TE/ µg sample < ORAC value < 5 µmole TE/ µg sample). 3) Medicinal plant extracts showed moderate antioxidant activity (SC_{50} >100 µg/ml and ORAC value < 3 µmole TE/ µg sample).

We can suggest that methanolic extracts of the six medicinal plants, e.g., 6CD, 22ST, 20SG, 21SpC, 23SV and 14OI are considered to have high antioxidant potential. In fact, the root extract of *Caesalpinia digyna* (6CD) is used for a Thai traditional medicine which has been used for curing ulcers, inflammatory diseases and serves as a menstrual stimulant. It has been reported that root extract of *Caesalpinia digyna* exhibited strong scavenging effect on DPPH [14]. The phytochemical studies carried out on root extract of *Caesalpinia digyna* reveal the presence of flavonoids such as bergenin, 11-O-galloylbergenin and 7,8 – dihydroxy – 3 - (4'-methoxybenzyl) chroman-4-one which exhibit free radical scavenging effect against DPPH [15]. *Senna timoriensis* (22ST) and *Senna garrettiana* (20SG), these names are synonyms of *Cassia timoriensis* and *Cassia garrettiana* respectively. They are also used for a Thai traditional medicine. Laxative property has been reported for *Senna garrettiana* while *Senna timoriensis* is used as vermifuge. Phytochemicals are found in *Senna garrettiana* such as cassialoin, piceatannol, chrysophanol, oxyresveratrol and aloe-emodin [16,17] in *Senna timoriensis* such as barakol [18]. *Salacia verrucosa* (23SV) is a traditional Thai medicinal plant of which its wood has been used as an analgesic for back pain, as a treatment for anemia and as a tonic for the kidney and liver. Triterpenoids isolated form stems of *Salacia verrucosa* were found strongly cytotoxic against cancer cell lines [19]. There is no report on phytochemical analysis or biological activity of *Spirolobium cambodianum* (21SpC). Biflavonoids and flavonoid glycosides have been found in leaves and twigs of *Ochna integerrima* (14OI) which the flavonoid glycosides showed anti-HIV-1 activities [20]. However, very little is known about relationship between antioxidant activities and contents of active ingredients of these plants. Therefore, these can be exploited for further phytochemical studies in the future.

TABLE I. Antioxidant activities of methanol extracts of Thai medicinal plants as determined by the DPPH and ORAC assays.

Extract Code No.	Scientific Names of Plants	Family names	Part of plants	DPPH assay†	ORAC assay†
				SC_{50} (µg/ml)	Trolox equivalents (µmole TE / µg sample)
6CD	*Caesalpinia digyna*	*Fabaceae*	Stem	3.05 ± 0.67	5.81 ± 0.05
22ST	*Senna timoriensis*	*Fabaceae*	Stem	3.47 ± 0.45	6.10 ± 0.02
20SG	*Senna garrettiana*	*Fabaceae*	Heartwood	4.06 ± 0.63	5.73 ± 0.06
21SpC	*Spirolobium cambodianum*	*Apocynaceae*	Stem	4.48 ± 0.38	5.54 ± 0.08
23SV	*Salacia verrucosa*	*Celastraceae*	Stem	5.34 ± 0.95	5.71 ± 0.09
14OI	*Ochna integerrima*	*Ochnaceae*	Stem	5.95 ± 1.33	5.26 ± 0.07
16PA	*Pterygota alata*	*Sterculiaceae*	Stem	6.75 ± 0.72	5.33 ± 0.05
18SC	*Salacia chinensis*	*Celastraceae*	Stem	7.91 ± 0.22	5.61 ± 0.01
5BM	*Butea monosperma*	*Fabaceae*	Stem	9.86 ± 0.82	4.83 ± 0.05
15OM	*Oleandra musifolia*	*Oleandraceae*	Stem	11.42 ± 1.59	4.02 ± 0.07
8DE	*Derris elliptica*	*Papillionaceae*	Stem	12.61 ± 1.64	4.95 ± 0.31
19SD	*Scoparia dulcis*	*Scrophulariaceae*	Stem	12.93 ± 0.72	4.72 ± 0.11
1BA	*Balanophora abbreviata*	*Balanophoraceae*	Aerial parts	13.69 ± 0.90	4.16 ± 0.88
11MC	*Maclura cochinchinensis*	*Moraceae*	Stem	14.83 ± 0.72	4.95 ± 0.12
2BMon	*Bacopa monnieri*	*Plantaginaceae*	Aerial	16.87 ± 0.44	3.56 ± 0.33
9DM	*Diospyros mollis*	*Ebenaceae*	Stem	20.53 ± 2.48	3.80 ± 0.09
25TH	*Tarenna hoaensis*	*Rubiaceae*	Stem	45.26 ± 3.94	3.35 ± 0.09
24TF	*Tarenna fragrans*	*Rubiaceae*	Leaves	46.57 ± 3.21	3.55 ± 0.21
27ZL	*Zanthoxylum limonella*	*Rutaceae*	Stem	50.79 ± 4.24	4.98 ± 0.05
4BMa	*Bauhinia malabarica*	*Fabaceae*	Leaves	54.94 ± 6.00	2.30 ± 0.11
17RH	*Randia horrida*	*Rubiaceae*	Root	57.54 ± 3.66	2.58 ± 0.15
3BC	*Barleria cristata*	*Acanthaceae*	Root	74.36 ± 1.09	2.04 ± 0.61
10LH	*Leersia hexandra*	*Poaceae*	Stem	78.39 ± 7.15	2.65 ± 0.21
12MF	*Myristica fragrans*	*Myristicaceae*	Aerial parts	85.62 ± 3.72	2.78 ± 0.02
13MM	*Micromelum minutum*	*Rutaceae*	Stem	97.69 ± 7.91	4.03 ± 0.31
7CR	*Crotalaria retusa*	*Fabaceae*	Root	117.51 ± 9.06	2.59 ± 0.61
26TM	*Telosma minor*	*Asclepiadaceae*	Stem	212.03 ± 3.88	3.84 ± 0.04

† Data shown are mean ± SD, and are derived from at least three independent replicates.

CONCLUSION

The results of this study showed that the antioxidant activities were exhibited in all species of the Thai medicinal plants. Among plant extract, the highest antioxidant activities were found in three species of which belong to family *Fabaceae*, subfamily *Caesalpinioideae*. Usually, these plants are used for a Thai traditional medicine. The values above indicate the antioxidants of the plants can be considered as cosmetics, nutraceutical and pharmaceutical applications. However, cell based antioxidant assay, cytotoxicity and other bioactivities should be investigated.

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