

# Japan-ASEAN Science, Technology and Innovation Platform (JASTIP)

## Progress Report of JASTIP-Net Activity

Date: 2017/11/29

1. Research partner	Affiliated Organization		
	Name	Wichan Eiadthong	
	Affiliation	Kasetsart University, Thailand	
	Position	Assistant Professor	
	Address	Department of Forest biology, 5 <sup>th</sup> floor of 60 year Anniversary Building, Fac. Forestry, Kasetsart Univ. Bangkhen campus 50 Paholyothin road, Ladyao, Chattujak, Bangkok (Thailand)	
2. Collaborative research	Collaborative research theme	<p><b>Headquarters</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> To Develop Operational Linkages and Human Resources among Academic Sector, Government Agencies, and Private Sectors in ASEAN countries and Japan.</li> <li><input type="checkbox"/> To Introduce Various STI Collaborations for Effectively and Efficiently into the Society based on the three joint laboratories' activities.</li> </ul> <p><b>Energy &amp; Environment Joint Lab</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Studies on Rural/Community Renewable Energy.</li> <li><input type="checkbox"/> Development of Renewable Energy Technology adapted to the ASEAN region.</li> <li><input type="checkbox"/> Studies on Energy Policy/Security in the ASEAN region.</li> </ul> <p><b>Bioresources &amp; Biodiversity Lab</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Studies on Biodiversity in the ASEAN Region Contributing to the Improvement of Identification, Collection and/or Information.</li> <li>■ Sustainable Utilization of Bioresources for Biorefinery, Bioremediation, Wood Construction, Food or Medicine.</li> <li><input type="checkbox"/> Plant Improvement for Agroforestry Systems and Carbon Sequestration Contributing to the Mitigation of and/or Adaptation to Climate Change.</li> </ul> <p><b>Disaster Prevention Joint Lab</b></p>	

		<input type="checkbox"/> Innovative Ideas on Disaster Prevention, Mitigation and Recovery Technologies and Policies Peculiar to Each ASEAN Country. <input type="checkbox"/> How to Cope with Trans-Boundary Disasters in the ASEAN Region Such as Tsunami, Flood, Drought and Haze. <input type="checkbox"/> Understanding and Quantitative Evaluation of Disaster Risks Peculiar to ASEAN Countries.
	Collaborative research title	Bioprospecting of plant resources in ASEAN countries to produce highly value-added products
	Host core-researchers	Toshiyuki Takano, Hiroshi Kamitakahara



### 3. Members

Name	Wichan Eiadthong		
Affiliation	Kasetsart University	Position	Assistant Professor
Name	Andria Agusta		
Affiliation	LIPI	Position	Principal Investigator
Name	Toshiyuki Takano		
Affiliation	Kyoto University	Position	Professor
Name	Hiroshi Kamitakahara		
Affiliation	Kyoto University	Position	Associate Professor

### 4. Report of activities

#### 4.1 Research Activities and major findings

##### Research field trip to Southern Thailand<sup>1</sup> ( Fig. 1& Fig. 2)

Period: November 18-25, 2016

Member: Wichan Eiadthong; Andria Agusta; Toshiyuki Takano; Hiroshi Kamitakahara

We collected some plant species for lignin analysis, natural rubbers (1,4-*cis*-polyisoprene or 1,4-*trans*-polyisoprene), and Rubiaceae plant species.



Fig. 1 Plant samples inventories and collection in Phang-Nga province, southern Thailand

<sup>1</sup> The cost was covered by JASTIP-Net.



Fig.2 Sample preparation of *Prismatomeris tetrandra*'s root



Fig.3 Latex tapping from rubber tree (left) and gutta-percha (right)

After collected plant samples were pretreated and cleaning in Kasetsart University, Bangkok. Crude materials were sent to LIPI, Cibinong, Indonesia. Agusta group explored antimicrobial activities of crude extractives, and purified active compounds from *Angiopteris* fern species and Rubiaceae plant species.<sup>2</sup> Dewi Wulansari (LIPI) visited Kyoto University to purify crude compounds and analyzed several pure compounds to identify bioactive compounds from Rubiaceae plant species.<sup>3</sup>

### Research in laboratories

In 2016, 4 species of *Angiopteris* fern samples i.e. *Angiopteris evecta*, *A. angustifolia*, *Angiopteris* sp.1 and *Angiopteris* sp. 2 were collected from Bogor botanical garden, Indonesia. Especially for *A. evecta* was also collected from Sumba Island, East Nusa Tenggara, Indonesia. The organic solvent extractive of the plant rhizomes were screened for their antibacterial, alpha-glucosidase inhibitor activity, acetylcholin esterase inhibitor activity based on a TLC bioautography methods. The TLC patterns of acetone extract of the

<sup>2</sup> The cost was covered by JASTIP core project.

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rhizomes shows different patterns between one species to another species. However, all of the extracts showed the same major single chemical constituent. Especially for dried *Angiopteris* fern sample from Sumba Island, we could isolate one additional main compound that under progress for their chemical structure elucidation. Fortunately, the main compound is not responsible chemical constituent for biological activities of *Angiopteris* spp. extract as antibacterial, antioxidant, alpha-glucosidase inhibitor, and acetylcholine esterase inhibitor. The responsible chemical constituents that were responsible for the above activities show different *R<sub>f</sub>* values on TLC plates, and need to be confirmed by further analyses.

In 2015, some anthraquinone derivative compounds were successfully isolated from the plant of *Rennellia* spp. These plant materials were collected from West Kalimantan. In 2017, one compound from its methanol extract was isolated and showed positive result in acetylcholinesterase inhibitor activity on a TLC bioautography method. This compound has been analyzed for its <sup>1</sup>H-NMR and its structure is being elucidated.

In 2017, comparison study on chemical contents of *R. speciosa* root bark extract from Indonesia and Thailand was performed by using TLC and HPLC. It was showed that anthraquinone derivatives 1 is the main chemical constituent of *R. speciosa* root bark extract from Indonesia with value content more than 50% of weight extract. On the other hand, in Thailand species, main anthraquinone content is only close to 10% of weight extract. The chemical constituents of the root extractive sample from Indonesia are different with sample collected from Thailand, and now is being investigated.

### **Chemical modification of natural rubber was carried out in Kyoto University<sup>4</sup>**

The aim of this study is to produce highly value-added products from natural rubber material of low price. There are two kinds of natural rubber: *cis*- and *trans*-1,4-polyisoprenes (Fig.3). The *cis*-1,4-polyisoprene is produced in southeastern Asian countries from rubber tree (*Hevea brasiliensis*). In contrast, the *trans*-1,4-polyisoprene, which obtained from gutta-percha tree (*Palaquium gutta*), is now produced only in Sukabumi, West Java, Indonesia. Nowadays, only one factory of *trans*-1,4-polyisoprene works in the world. Local price of *cis*-1,4-polyisoprene in Thailand is very low: 47baht/Kg (approximately 141yen/Kg). In contrast, price of *trans*-1,4-polyisoprene in Indonesia is relatively high: 250 USD/Kg (approximately 28,500 yen/Kg). To return benefit to local communities in southeastern Asian countries, we tried to modify two kinds of natural rubbers to produce highly value-added products.

In this FY2016, we tried to react cellobiosyl derivative bearing sulfur atom on double bond of polyisoprenes. The reaction proceeded to give polyisoprene grafted with cellobiose derivatives. Its chemical structure was confirmed by means of <sup>1</sup>H-NMR. Further analysis of physical properties of new compounds is under progress.

### **2) Their academic and social implications toward achieving the SDGs**

The used of medicinal plant by ethnics in Indonesian have been through generation by generation since

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<sup>4</sup> The cost was covered by Grant-in-Aid for Scientific Research, JASTIP-Net, and JASTIP core projects.

hundred years ago. Fortunately, the use of these medicinal plants just based on empirical experience without enough scientific explanation about their pharmacological aspect and their biological active chemical constituents, and the most important aspect regarding to their safety for human. Through the JASTIP and JASTIP-Net Project we conduct a study to reveal the pharmacological activities and toxicological studies of some medicinal plants that have been used in ASEAN countries by scientific explanation. In parallel with pharmacological and toxicological studies, we also conduct the biological active chemical constituent identification from the certain medicinal plants. The data obtained from this project can be used to support the use of medicinal plants in ASEAN countries scientifically

5. List of publications: Not yet

6. List of oral presentations:

6.1 **2<sup>nd</sup> JASTIP Bioresources and Biodiversity Lab Workshop “Collaborative Bioresources and Biodiversity Studies for the ASEAN Region” & Humanosphere Asia Research Node Workshop toward Sustainable Utilization of Tropical Bioresources**

6.2 **Chemical Modification of Natural Rubbers Collected in Indonesia and Thailand**

Yuumi Iga<sup>1</sup>, Hiroshi Kamitakahara<sup>1</sup>, Andria Agusta<sup>2</sup>, Wichan Eiadthong<sup>3</sup>, Toshiyuki Takano<sup>1</sup>  
(<sup>1</sup>Graduate School of Agriculture, Kyoto Univ.; <sup>2</sup>Research Center for Biology, LIPI; <sup>3</sup>Faculty of Forestry, Kasetsart Univ.)

6.3 **Conversion of Lignin to Tannin-like Polymer by Demethylation**

Kaori Sawamura<sup>1</sup>, Yuki Tobimatsu<sup>2</sup>, Hiroshi Kamitakahara<sup>1</sup>, Toshiyuki Takano<sup>1</sup> (<sup>1</sup>Graduate School of Agriculture, Kyoto Univ.; <sup>2</sup>Research Institute for Sustainable Humanosphere, Kyoto Univ.)

6.4 **Bioactive Metabolites from *Angiopteris* spp. Collected in Indonesia**

Andria Agusta<sup>1</sup>, Ahmad Fathoni<sup>1</sup>, Praptiwi<sup>1</sup>, Hiroshi Kamitakahara<sup>2</sup>, Toshiyuki Takano<sup>2</sup>  
(<sup>1</sup>Research Center for Biology, LIPI; <sup>2</sup>Graduate School of Agriculture, Kyoto Univ.)

6.5 **Bioactive Metabolites from *Rennellia* and *Prismatomeris* collected in Indonesia and Thailand**

Dewi Wulansari<sup>1</sup>, Marlin Raunsai<sup>1</sup>, Hiroshi Kamitakahara<sup>2</sup>, Wichan Eiadthong<sup>3</sup>, Toshiyuki Takano<sup>2</sup>, Andria Agusta<sup>1</sup> (<sup>1</sup>Research Center for Biology, LIPI; <sup>2</sup>Graduate School of Agriculture, Kyoto Univ.; <sup>3</sup>Faculty of Forestry, Kasetsart Univ.)

6.6 Int. Symposium on Bioeconomics of Natural Resources Utilization (ISBINARU, Bogor 12-14 October 2017: **Acute Oral Toxicity Study of Root bark Extract of Yellow Ginseng (*Rennellia***

***elliptica* Korth.) in Mice**

Praptiwi<sup>1</sup>, Dewi Wulansari<sup>1</sup>, Ahmad Fathoni<sup>1</sup>, Hiroshi Kamitakahara<sup>2</sup>, Toshiyuki Takano<sup>2</sup> and Andria Agusta<sup>1</sup>(<sup>1</sup>Research Center for Biology, LIPI; <sup>2</sup>Graduate School of Agriculture, Kyoto Univ.)