

Training Workshop on Taxonomy of Terrestrial Plants (Monocots)

12 – 16 March 2012
Research Center for Biology,
Indonesian Institute of Sciences - Indonesia

East and Southeast Asia Biodiversity Information Initiative
(ESABII)

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General Discription of Training Workshop on Taxonomy of Terrestrial Plants (Monocots)

Date: 12 – 16 March 2012 (5 days)

Venue: Herbarium Bogoriense, R.C.Biology, CSC-LIPI, Bogor, Indonesia

Introduction / Background

In 2008, at the ninth meeting of the Conference of the Parties to the Convention on Biological Diversity (CBD/COP9), the programme of work with deliverable outcomes was adopted (Decision IX/22). The Programme of Work, as revised, was adopted in CBD/COP10 (COP10/L.34). Hence, parties to the convention were urged to promote/carry-out the programme of work for the Global Taxonomy Initiative (GTI) through coordination of its implementations with existing national, regional, sub-regional, and global initiatives, partnerships and institutions, designation of national GTI focal points, provision of updated information about legal requirements for exchange of genetic/biological specimens, and about current legislation and rules for access and benefit-sharing in terms of the needs for the GTI, and initiatives of setting-up of national and regional networks to aid the Parties in their taxonomic needs in implementing the CBD.

However, the lack of trained human resources and inadequate capacities on taxonomy has been stressed as one of the obstacles in the implementation of CBD commitments, especially in the ASEAN region. ASEAN + 3's dynamic growth in recent years has increased the pressure on its natural resources. Human activities, the driving force behind the regional growth, threaten the biological resources. Lack of scientific information on biodiversity in this region is a crucial issue in the assessment and prediction of biodiversity changes, caused mainly by the lack of taxonomic capacity in data collection and analysis.

It is in this context that the project titled "*Expanded Taxonomic Capacity Building and Governance for Conservation and Sustainable Use of Biodiversity*" proposed by ASEAN Centre for Biodiversity (ACB) was approved by the Japan-ASEAN Integration Fund (JAIF) on 09 December 2011. An Inception Meeting / Workshop were conducted initially in Manila, Philippines on 31 August – 01 September 2010 to provide direction and work out the details of the project. It identified 3 training topics to be conducted. One of these topics was the taxonomy of terrestrial plants. For the taxonomy of terrestrial plants, it was agreed that the training would be conducted on dicots, monocots, and ferns as a series of training courses. A training workshop on dicots was conducted in the fiscal year 2010, and subsequently a training workshop on Monocots was conducted in this fiscal year 2011.

The Ministry of the Environment, Japan (MoE-J) is also involved by providing experts as resource persons in the training. The collaboration between ESABII (East and Southeast Asia Information Initiative) and the ACB JAIF project is evident in this training workshop since this will be a joint activity.

Topics to cover in the Training Workshop

The training workshop would capacitate the taxonomy on Monocots, which is a group of terrestrial plants said to be difficult to identify. Specifically, the training workshop will:

1. Introduce the participants to the taxonomy of terrestrial plants particularly selected families of Monocots
2. Familiarize the participants to the general biology of these plants

3. Upgrade the taxonomic skills of the participants on the following:
 - a. Methods of morphological observation
 - b. Sample collection, processing and managing
 - c. databasing
4. Provide hands-on experience through a field exercise in collection

Expected Outputs

The outputs of the training workshop will be the following:

1. Upgraded the skills of the participants in terrestrial plant taxonomy especially on Monocots
2. Improved knowledge on taxonomic methodologies
3. Provided hands-on experience in collections management, cataloguing and storage

Qualification for the Participants to the Training Workshop

Those who will participate in this Training Workshop will be representatives of the ESABII Member States who have background in botany, plant ecology and related field.

They must be less than 35 years old and who has an academic or government position in the field of terrestrial botany or plant ecology.

Agenda of the Training Workshop

The following are the agenda of the training workshop:

1. General lectures on the following:
 - a. Taxonomy and systematics of Monocots
 - b. Ecology and forest dynamics
 - c. Herbarium specimens collection
 - d. Ecological sampling of Monocots
 - e. Specimen collection methodologies
2. Special lectures on the following monocot families:
 - a. Orchidaceae (Orchids)
 - b. Arecaceae (Palms)
 - c. Pandanaceae (Pandans)
 - d. Zingiberaceae (Zingers)
3. Field trip for hands on field collection and specimen management
4. Report Writing

Trainers for the course were the following:

1. Mr. Ong Poh Teck, Malaysia
2. Dr. Eiji Suzuki, Japan
3. Dr Edwino Fernando, Philippines
4. Dr. Hidenobu Funakoshi, Japan
5. Dr. Ary Prihardhyanto Keim, Indonesia
6. Dr. Rugayah
7. Ms. Wita Wandani, M.Sc.
8. Dr. Himmah Rustiami

With assistance from (1) Mr Arief Hidayat (coordinator), (2) Mr. Ujang Hapid, and Mr. Asep Sadeli

Program of the Training

Day 0: 11 March 2012

Arrival of participants at Sempur Park Hotel, Bogor, Indonesia

Day 1: 12 March 2012

08:00-08:30. Registration of participants

08:30-09:30. Opening Ceremony

Welcome Remarks: Dr. Siti Nuramaliati Prijono, LIPI

Opening Message: Ms. Clarissa Arida, ACB/JAIF

Dr. Masaya Tatara, MoE-J

09:30-10:00. Introduction of participants: Dr. Teguh Triono, RCB-LIPI

Overview of the Training Workshop: Dr. Filiberto Pollisco, Jr., JAIF-ACB project

(Photo opportunity)

10:00-10:30 Break time

10:30-11:00 Introduction of ESABII

Ms. Mari Takehara, MoE-J

11:00-12:00 General Lecture on Monocots Taxonomy & Systematics Dr. Edwino Fernando

12:00-13:00 lunch break

13:00-14:30 Lecture on Ecology of Rattans

Dr. Eizi Suzuki

14:30-16:00 Lecture on Arecaceae

Dr. Edwino Fernando

16:00-16:30 Break

16:30-17:30 Lecture on Orchidaceae - Characters of Selected genera Mr. Ong Poh Teck

Day 2: 13 March 2012

8:00 – 8:30. Registration of participants

8:30 – 10:00 Lecture on Arecaceae (Palms) - Characters of Selected genera and Collecting & preserving Arecaceae (Palms) Dr. Edwino Fernando

10:00 -10:30 Break

10:30-12:00 Lecture on Orchidaceae (Orchid) - Basic morphology Mr. Ong Poh Teck

12:00-13:00 Lunch

13:00-14:30 Lecture on Orchidaceae (Orchid) - Characters of Selected genera Mr. Ong Poh Teck

14:30-16:00 Collecting & preserving Orchidaceae (Orchid) Mr. Ong Poh Teck

16:00-16:30 Break

16:30- 18:00 Lecture on Zingiberaceae (Gingers) - Basic morphology Characters of Selected genera & Collecting Zingiberaceae (Gingers) Dr. Hidenobu Funakoshi

Day 3: 14 March 2012

08:00-08:30 Registration of participants

08:30-10:00 Lecture on Pandanaceae (Pandan) - Basic morphology Dr. Ary P. Keim

10:00-10:30 Break

10:30-12:00 Continuation of Pandanaceae

12:00-13:00 lunch

13:00-14:00 Continuation of Pandanaceae

14:00-16:00 Working with Herbarium Specimens

Ms. Wita Wandani

16:00-16:30 Break

16:30-17:30 working with herbarium specimens

Day 4: 15 March 2012

07:30-12:00 Short excursion to the Bogor Botanical Garden

12:00-13:00 Registration of participants (each group)

Lunch

13:00-16:00 Working with herbarium specimens

16:00-16:30 Break

16:30-17:30 Preparing report and presentation (each group)

Day 5: 16 March 2012

08:00-08:30 Registration of participants

08:30-10:00 Preparing report and presentation (each group)

10:00-10:30 break

10:30-12:00 Preparing report and presentation (each group)

12:00-13:00 lunch

13:00-15:30 Group presentation and discussion

15:03-16:00 Break

15:15-17:30 Feedback from participants Mr. Jofree bin Haji Ali Ahmad (Brunei)

Closing remarks

MOE-Japan

Dr. Masaya Tatara

ACB

Dr. Filiberto Pollisco, Jr.

PROSEA

Prof. Dr. Dedy Darnaedi

Day 6: 17 March 2012

Departure of participants from Sempur Park Hotel, Bogor, Indonesia

List of Participants

No.	Country/ Organization	Name	Institution
1	Brunei Darrusalam	Mr. Joffee Bin Haji Ali Ahmad	Forestry Officer, Brunei National Herbarium, Brunei Forestry Centre
2	Brunei Darrusalam	Mr. Mohd Rozizan bin Mohd Maslin	Junior Forestry Assistant, Forestry Department, Ministry of Industry and Primary Resources
3	Cambodia	Mr. Chak Sokhavicheaboth	Chief of Office, International Convention and Biodiversity Department, Ministry of Environment
4	Cambodia	Mr. Kao Sosatya	Vice Chief, Office of Clearing House Mechanism, International Convention and Biodiversity Department, Ministry of Environment
5	Lao PDR	Mr. Soulivanh Lanorsavanh	Botany Unite, Herbarium Technician, Department of Biology, Faculty of Sciences, National University of Laos (NUOL)
6	Lao PDR	Ms. Khamfa Chantavongsa	Lecturer, Department of Biology, Faculty of Sciences, National University of Laos (NUOL)
7	Malaysia	Ms. Regina Mariah Jong	Assistant Director, Forestry Department of Peninsular Malaysia
8	Malaysia	Mr. Ong Poh Teck	Research Officer, Forest Institute of Malaysia (FRIM)
9	Malaysia	Dr. Ummul Nazrah Binti Rahman	Research Officer, Forest Institute of Malaysia (FRIM)
10	Myanmar	Ms. Kyi Kyi Khing	Research Assistant 3, Forest Research Institute, Forest Department, Ministry of Environmental Conservation and Forestry
11	Myanmar	Ms. Zin Myo Thu	Staff Officer, Forest Research Institute, Forest Department, Ministry of Environmental Conservation and Forestry
12	Philippines	Mr. Lowell Aribal	Assistant Professor I, College of Forestry, Central Mindanao University
13	Philippines	Ms. Pola Geneva Bumanglag	Ecosystems Management Specialist I, Wildlife Resources Division, Protected Areas and Wildlife Bureau, DENR
14	Singapore	Mr. Joey Gan Soon Hock	Senior Conservation Officer, National Parks Board, Bukit Timah Nature Reserve 177 Hindhede Drive Singapore 589333
15	Singapore	Ms. Adelle Wang Shumin	Manager (Nature Parks), National Parks Board
16	Thailand	Ms. Paweena Taraksa	Agricultural research Scientist, Plant Varieties Protection Division, Department of Agriculture, Ministry of Agriculture and Cooperative
17	Thailand	Ms. Sommanussa Saengrit	Forest Officer, The Forest Herbarium, Department of National Park Wildlife and Plant Conservation
18	Viet Nam	Mr. Mai Hong Quan	Senior Specialist, Agency for Biodiversity Conservation, VEA,

			Ministry of Natural Resources and Environment
19	Viet Nam	Ms. Phan Binh Minh	Senior Specialist, Agency for Biodiversity Conservation, VEA, Ministry of Natural Resources and Environment
20	China	Dr. CHEN Bin	Institute of Botany, Chinese Academy of Sciences
21	Mongolia	Dr. Nyambayar Dashzeveg	National University of Mongolia
22	Korea	Ms. LEE SoHee	College of Forest Science, Kookmin University
23	Japan	Ms. Kanako MATSUYAMA	Agricultural Science Program, Graduate school of Integrated Arts and Sciences, Kochi University
24	Japan	Ms. Narumi KAKIMOTO	Faculty of Agriculture, Kochi University
25	Japan	Mr. Yoshimasa KUMEKAWA	Faculty of Agriculture, Kochi University
26	University of the Philippines	Dr. Edwino Fernando	Professor, University of the Philippines Los Banos
27	Kagoshima University	Dr. Eizi Suzuki	Professor of Kagoshima University Graduate School of Science and Engineering
28	Kochi Prefectural Makino Botanical Garden	Dr. Hidenobu Funakoshi	Former curator of the Kochi Prefectural Makino Botanical Garden
29	Ministry of the Environment	Dr. Masaya TATARA	Biodiversity Center of Japan, Ministry of the Environment of Japan
30	Ministry of the Environment	Ms. Mari TAKEHARA	Biodiversity Center of Japan, Ministry of the Environment of Japan
31	Japan Wildlife Research Center	Dr. Sanei ICHIKAWA	Japan Wildlife Research Center
32	LIPI	Dr. Ary Prihardhyanto Keim	Botany Division (Herbarium Bogoriense) Research Centre for Biology-LIPI
33	LIPI	Dr. Rugayah	Botany Division (Herbarium Bogoriense) Research Centre for Biology-LIPI
34	LIPI	Ms. Wita Wardani, M.Sc.	Botany Division (Herbarium Bogoriense) Research Centre for Biology-LIPI
35	LIPI	Dr. Himmah Rustiami	Botany Division (Herbarium Bogoriense) Research Centre for Biology-LIPI
36	LIPI	Ms. Ina Erlinawati	Botany Division (Herbarium Bogoriense) Research Centre for Biology-LIPI
37	LIPI	Ms. Destri	UPT Balai Konservasi Tumbuhan Kebun Raya Cibodas-LIPI
38	LIPI	Dr. Teguh Triono, M.Sc.	Botany Division (Herbarium Bogoriense) Research Centre for Biology-LIPI
39	LIPI	Dr. Dedy Darnaedi,	Director, PROSEA Association
40	LIPI	Mr. Arief Hidayat,	Botany Division (Herbarium Bogoriense) Research Centre for Biology-LIPI
41	LIPI	Mr. Yessi Santika,	Botany Division (Herbarium Bogoriense) Research Centre for Biology-LIPI
42	ACB	Ms. Clarissa Arida	Director, Programme Development and Implementation Unit
43	ACB	Dr. Filiberto Pollisco	Programme Management Specialist
44	ACB	Ms. Rhia Galsim	Capacity Development Officer
45	ACB	Ms. Corazon de Jesus, Jr.	Programme Management Officer
46	ACB	Ms. Ana Maria Tolentino	Programme Management Officer

Member of working Group

Group Pandanaceae

Lecturer: Dr. Ary Prihardhyanto Keim

Assistant: Dr. Rugayah

Trainees: 6

Joey Gan Sook Hock (Singapore)

Phan Binh Minh (Vietnam)

Regina Mariah Jong (Malaysia)

Zin Myo Thu (Myanmar)

Chen Bin (China)

Yoshimasa Kumekawa (Japan)

Group Orchidaceae

Lecturer: Mr. Ong Poh Teck

Assistant: Ms. Wita Wardani

Trainees: 6

Khamfa Chanthavongsa (Lao PDR)

Paweena Taraksa (Thailand)

Pola Geneva Bumanglag (Philippines)

Soulivanh Lanorsavanh (Lao PDR)

Destri (Indonesia)

Narumi Kakimoto (Japan)

Group Arecaceae

Lecturer: Dr. Edwino Fernando

Assistant: Dr. Himmah Rustiami

Trainees: 7

Adelle Wang Shumin (Singapore)

Chak Sokhavicheaboth (Cambodia)

Mai Hong Quan (Vietnam)

Mohd Rozizan bin Mohd Maslin (Brunei Darussalam)

Ummul Nazrah Binti Abdul Rahman (Malaysia)

Lee So-Hee (Korea)

Nambayar D. (Mongolia)

Group Zingiberaceae

Lecturer: Dr. Hidenobu Funakoshi

Assistant: Ms. Wita Wardani

Trainees: 7

Jofree bin Haji Ali Ahmad (Brunei Darussalam)

Kao Sosatya (Cambodia)

Kyi Kyi Khing (Myanmar)

Lowell G. Aribal (Philippines)

Sommanussa Saengrit (Thailand)

Ina Erlinawati (Indonesia)

Kanako Matsuyama (Japan)

The results of studies

Final report and presentation material of each group

Training overview of each group

Group Pandanaceae used the specimens of six species (*F. angustifolia*, *F. sumatrana*, *F. scandens*, *F. imbricata*, *F. Javanica*, *F. insignis*) of *Freycinetia* in *Pandanaceae* distributed over Jawa. They observed and measured the form of specimens, recorded the details of the form, and produced the identification key.

Group Orchidaceae targeted the genus *Grammatophyllum* in *Orchidaceae* distributed over Jawa. They recorded the details of the form and produced the identification key about *G. speciosum* and *G. stapeliiflorum* through the sampling in the Bogor Botanical Gardens and examination of samples in Herbarium Bogoriense. They also practiced how to dissect, measure and take a photograph of collected fresh samples.

Group Arecaceae targeted the genus *Daemonorops* belonged in Calameae in *Arecaceae*. One species proposed as new species was found while the sampling in the Bogor Botanical Gardens. They observed and measured the form of four species including new species (*D. melanochaetes*, *D. rubra*, *Daemonorops* sp. nov., *D. hirsute*), recorded the details of the form, and produced the identification key. They recorded the further details of form about the new species.

Group Zingiberaceae targeted four species (*A. javanica*, *A. malaccensis*, *A. galanga*, *A. scabra*) in the genus *Alpinia* in *Zingiberaceae* distributed over Jawa. They observed and measured the form of specimens, recorded the details of the form, and produced the identification key. They also studied the information about how these four species are used, as well as information of ecology and morphology.

Group Pandanaceae

REPORT ON FREYCINETIA (PANDANACEAE) OF JAVA

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Zin Myo Thu *Staff Officer, Forest Research Institute, Forest Department, Ministry of Environmental Conservation and Forestry, Nay Phyi Taaw, Myanmar.*

ABSTRACT

Six species of *Freycinetia* (*Pandanaceae*) are recorded in Java and are described here. A simple identification key was produced to aid identification in the field. The six species are: *F. angustifolia*, *F. javanica*, *F. imbricata*, *F. insignis*, *F. scandens* and *F. sumatrana*.

Keywords: *Freycinetia*, Java, identification key.

INTRODUCTION

Pandanaceae is one of the 5 largest families in the Monocotyledons and is of exceptional diversity in the Flora Malesiana region, particularly in Indonesia. Despite this, there has not been much in-depth study of *Pandanaceae* in this region. *Freycinetia* is one of four genera in *Pandanaceae* and is the only genus that exhibits a climbing habit, making it even much less studied in Indonesia. This paper will focus on *Freycinetia* that occurs in Java, Indonesia and is based on herbarium specimens from Herbarium Bogoriense. This paper will cover all 6 species that occurs in Java, namely: *F. angustifolia*, *F. javanica*, *F. imbricata*, *F. insignis*, *F. scandens* and *F. sumatrana*.

IDENTIFICATION KEY TO THE SPECIES OF FREYCINETIA IN JAVA

1. a. Leaf linear less than 50 cm, narrow; infructescence raceme..... *F. angustifolia*
b. Leaf elliptical or lanceolate-elongate; infructescence umbellate 2
2. a. Auricle lobed *F. sumatrana*
b. Auricle tapered 3
3. a. Leaf elliptical 4
b. Leaf lanceolate-elongate 5
4. a. Infructescence terminal *F. scandens*

- b. Infructescence lateral *F. imbricata*
5. a. Leaf short, less than 100cm; bracts yellow *F. javanica*
- b. Leaf longer, at least 100cm; bracts purplish white *F. insignis*

SPECIES NOTES

1. FREYCINETIA ANGUSTIFOLIA Blume

Freycinetia angustifolia Blume, Rumphia 1: 157. T.43, f. 1-7. 1835 – Lectotype: Java, G. Seribu, Blume 841 (L, sh 908.164-106)

Freycinetia malaccensis Ridl., Mat. Fl. Malay. Penins. 2: 233. 1907. – Lectotype: Malacca, Derry 406 (SING!, holoecto), designated by B.C. Stone, Gard. Bull. Singapore 25: 197. 1970).

Freycinetia brunoniana Wallich, Number. List: 3660. 1831, nom. Nud. – Voucher: Penang, G.Porter s.n. (K).

Freycinetia debregeasiana Gaudich., Voy. Bonite, Bot.: t. 37, f. 1-11. 1814(-1852). – Type: not stated, probably Malacca or Singapore (Gaudichaud s.n. 1837; P? fragment in Fl. n.v.)

Freycinetia insipida Martelli ex Elmer, Leafl. Philipp. Bot. 3: 1114. 1911. – Type: Capiz Province, Mt Magellanes (Giting-giting), May 1910, Elmer 12426 (Fl, holo n.v.; PNH, lost, EDINB n.v.)

Description: Slender climber up to 10m high. *Stem* slender, hard, 3-5mm diameter; internodes 4-13mm. *Leaf* lanceolate-elongate, narrow, 14-31cm long, 5-8mm wide, no spines on entire margin of leaf for female specimens; male specimens exhibit minute spines on terminal and apical leaf margins; adaxial surface, glabrous without spines; abaxial surface, glabrous without spines; venation, main venation is clear; auricle is slightly hooked with minute spines. *Inflorescence*, male inflorescence terminal, orange in colour 15-20mm long, 2mm wide surrounded by 5 bracts. *Infructescence* terminal, raceme; pedicle 4-12mm long; peduncle, 1.5-5cm long; *Cephalium*, 2-4 cephalium, 10-33mm long, 4-8mm wide, elongated ellipsoidal, light green in colour. *Fruit* 0.5mm long, 0.1mm wide; *Stigmatic remains* 3-4. *Bracts* light green in colour

Distribution: Java (G. Salak, G. Gede), Peninsular Malaysia.

Habitat: Humid tropics from 100m to 1800m altitude, from primary rainforest to secondary forest. Commonly found in older forest. In Java, this species was recorded in Mt Gede, West Java, along a trail in disturbed primary lowland forest. In Bogor (then Buitenzorg), specimens were recorded in forest complex of Nunggoeng in Mount Menapa. Specimens were also recorded at 900m altitude in Mount Salak.

Vernacular name: Unknown

Uses: Unknown

Notes: *F. angustifolia* is moderately occurring and is more commonly found in older forests.

Specimen examined: INDONESIA, Jakarta, Bogor (formerly Buitenzorg), 18 Dec 1940 CCGJ Van Steenis 17345 (BO!); Bogor, 30 Aug 1918 C.A. Backer 25736 (BO!), Bogor, G. Salak, 2 August 1929 CCGJ Van Steenis 3017 (BO); West Java, near Leuwiliang, west of Bogor near tea-estate of Tjianten, 13 Nov 1952 W.Meijer 1324 (BO!).

2. FREYCINTIA SUMATRANA Hemsley

Freycinetia sumatrana Hemsley, J. Linn. Soc. Bot. 30: 167 (1894). Type: *Beccari 211* (holo K; iso Fl), Indonesia, Sumatra, Mount Singalan (presumably Mount Singgalang in West Sumatra), June 1878.

Freycinetia valida Ridley, Mat. Fl. Mal Penins. 2:234 (1907). Lectotype: *Ridley 3937* (SING!), Malaysia, Malay Peninsula.

Freycinetia auriculata Merrill, Philipp. J. Sci., C. Bot. 3: 312 (1908). Type: *Bur. Sci. Foxworthy 876* (holo PNH +; iso A), Philippines, Palawan, Puerto Princesa, May 1906

Freycinetia loheri Martelli, Webbia 3: 15 (1910). Syntypes: *Loher 1577* (K; iso PNH+), Philippines, Luzon, Benquet, 1908-1915; *Loher 1578*; *Loher 5469*, Luzon, Montalban, June 1908-1915.

Freycinetia lucida Martelli, Webbia 3: 168 (1910). Type: *H. Hallier 3188* (holo BO!; iso L), Indonesia, Kalimantan, Amai-Ambit, 1893-1894)

Freycinetia ceramensis Martelli, Webbia 3: 169 (1910). Type: *G.H. de Vriese s.n.* (holo L), Indonesia, Moluccas, Seram, 1857-1861.

Freycinetia amboinensis Martelli, Webbia 3: 170 (1910). Type: *Teysman s.n.* (holo BO! Iso L), Indonesia, Moluccas, Ambon.

Freycinetia sumatrana Hemsley var. *penangiana* B.C. Stone, Gard, Bull, Singapore 25(2): 202 (1970). Type: *Stone 5890* (holo KLU), Malay Peninsula, Selangor, Templer Park, Kanching, June 1965.

Description: Robust climber up to 20m. *Stem* hard, 10-12mm diameter, glabrous; internodes 5-10mm. *Leaf*, lanceolate-elongate, linear, acute, 55-170cm long, 23mm wide, spines present on leaf margins along terminal and basal parts; adaxial surface glabrous without spines; abaxial surface, glabrous with minute spines along underside of midrib; venation, main venation is clear; auricle lobed, bluntly hooked to sharply hooked with spines. *Inflorescence*, male flowers umbellate, 10cm long, 2.5cm wide, flame red when fresh. *Infructescence* terminal, umbellate, 3-4 cephalium, peduncle 30-55mm long; *Cephalium*, 70-90mm long, 15-20mm wide; elongate ellipsoidal, yellowish green. *Fruit*, 1mm long, 0.1mm wide; *Stigmatic remains* 2

Distribution: Andaman Islands, Malay Peninsula, Sumatra, Java, Borneo, the Philippines, and Moluccas (A. P. Keim, *et al*, 2011)

Habitat: in lowland land tropical forest and partly felled open forest up to 93m high. In 1926, specimens were recorded in By Depok, Jakarta which then was once a forested area. Now Jakarta is fully urbanized and is no longer forested (A.P. Keim 2012, *pers. comm.*).

Vernacular Name: *rajak* (Dayak, Balaban Dialect) (A. P. Keim, *et al*, 2011)

Uses: Leaves are used for baskets, mats and handicrafts. (A. P. Keim, *et al*, 2011)

Specimen examined: INDONESIA, Jakarta, Depok, Sarengses, no date, *Anon 1154* (BO!); Java Depot, Batavia, 11 Oct 1926, *Dr J. Beumee 6801* (BO); MALAYSIA, F.R. Port Dickson, Sungei Menyala, 1957 *T.C. Whitmore 300* (BO!).

3. FREYCINETIA SCANDENS Gaudich

Freycinetia scandens Gaudich., Ann. Sci. Nat. 1, 3 (1824) 510; Atlas, Bot. in Freycinet, Voy. l'Uranie et Physicienne (1826) 432, t. 42. Typus: Gaudichaud (P!) 'crescit in insula Timor...'

F. gaudichaudii R. Br. & Benn. in Horsfield, Pl. Jav. Rar. 1 (1838) 31, t. 9; F. v. Mueller in Bentham, Fl. Austral. 7 (1878) 151; Bailey, Queensl. Flora (1902) 1690. Typus: Horsfield (BM!) from Java.

F. mulleri Martelli, Webbia 3 (1910) 311, 313, based on *F. gaudichaudii* F.v. Muell. (non R. Br. & Benn.) in Bentham, Fl. Austral. 7 (1878) 151. Typus: nil

F. propinqua Domin, Bibl. Bot. 85 (1915) 150. Typus: Domin (PR) prob.) not seen. F. n. sp (No. 306), Domin, op. cit. 151. F.n. sp, (No. 305), Domin, op. cit. 151 ('affinis nom. Ined)

F. gonocarpa Moore, in Gibbs, Contr. Hytogeogr. Bellenden – Ker II, J. Bot. 55 (1917) 309. Typus: Gibbs 6348 (BM!) from Queensland.

Description: Climber, up to 10 – 30 m high. *Leaf*, narrow 8 – 17.6 cm long, 1 – 5 cm wide, distinctly elliptic-lanceolate, minute spine at the base and apical margin. *Infructescence* with 0.5 – 3.5 cm long peduncle, pedicel 1.5 – 2.0 cm, partly scabrous on upper part. *Cephalium* 0.5 – 3.5 cm long and 0.4 – 1.3 wide, glabrous. *Stigmatic remains* 1 -2.

Distribution: Java, Sunda Island, Timor, Sangi and Talaud Islands, New Guinea, and Queensland.

Habitat: Locally common in rainforest, from near sealevel up to about 1000 m, frequent along

streams or riverbanks.

Notes: Fruit green when young. Bracts white from red.

Specimen Examined: INDONESIA, Bogor, Java, 23 Aug 1900, *Koorders* KDS 1757 (BO!); Java, *Koorders* KDS 28368 (BO!); East Java, 17 May 1957, M. *Jacobs* 4822 (BO!); Petak, 58 via Pacuran 3, Baturraden, Central Java, 22 April 2005, Ary P. Keim AK 369 (BO!)

4. FREYCYNETIA IMBRICATA Blume

Freycinetia imbricate Blume, Rumphia 1: 157, t. 40, f. 1-11. 1837. – Lectotype: Java, “silvis intactis monotium altissimorum Javae occidentalis”, Blume 2066 (L, holo, *sh.* 908. 164-676).

Freycinetia schefferi Solms in Linnaea 42: 98. 1878. –Syntypes: Java, cult. In Hort. Bog., Scheffer s.n. (GOET, holo)

Freycinetia kingiana Ridl., Mat. Fl. Malay Penins. 2: 234. 1907. – Lectotype: Malay Peninsula, Perak, Goping King’s Collector = Kunstler 4654 (SING!, holo; Fl *n.v.*), designated by B.C. Stone (1970b, c:204).

Freycinetia imbricata var. *hispidula* B.C. Stone, Gard. Bull. Singapore 25: 204. 1970. –Type: Stone 5847-a, (KLU, holo), Malay Peninsula, Selangor, Genting Sempah, Jul 1966.

Freycinetia imbricate var. *kuchinensis* (Martelli) B.C. Stone, Gard. Bull. Singapore 25: 215. 1970. --
Freycinetia kuchinensis Martelli, Webbia 3: 178, 320 (“*kuchinensis*”). 1910 – Lectotype: Sarawak, Kuching, Beccaru PB 782-bis (Fl, holo), designated by B.S. Stone (1970-b: 215, “type”).

Description: Climber up to 30 m, stem 0.4-0.6 in diameter; *Leaf*, 15.3-31.5 cm long, 1.1-1.8 cm wide, narrowly elliptic, acute, with minute spines on basal and apical margin; *Infructescence* terminal and lateral, 3.5-8 cm long, with 1-2 cephaliums, peduncle 0.7-1.1 cm, pedicel 1.2-2.2 cm, glabrous, cephalium 1.4-3.5 cm long and 0.9-2.1 wide, globose to ellipsoid, berries ca. 0.4 cm; *Stigmatic remains* varies from 2-4.

Distribution: Java (West Java), Malay Peninsula (Johor, Pahang, Perak, Selangor), Sumatra (widely distributed), Borneo (Sarawak and Sabah).

Habitat: Lowland tropical forest to lower mountain forests from 500 – 1100 m. Fruiting season on March, April, July, and September.

Vernacular name: harashas.

Uses: Unknown.

Specimen Examined: INDONESIA, West Java, Res Batavia, Mt. Limus (Burangrang) 22 July 1920, *Backhuizen v/d Brink* 4348 (BO!); West Java, South Bandung, Southern of Ciwidey, Cibarengkok 12 March 1974, *J. Dransfield* 4175 (BO!); West Java, Mt. Salak, Kampung Bobojong 20 September 1896, *Kooders* 24135 (BO!); West Java, Mt. Halimun, Slope of Mt. Kendeng, 7 March 2000, W.S Hoover et al. 32727 (BO!); West Java, Mt. Halimun, Cikaniki River 9 March 2000, W.S. Hoover et al. 32220 (BO!)

5. FREYCYNETIA JAVANICA

Freycinetia javanica Blume in Rumphia 1:156, t.41 (1835). Figure 1,1-b. Type: Java (Blume, L).

F.lucens Ridl in Mat. Fl Malay Penin. 2: 232 (1907) in Fl. Malay Penin. 5: 80 (1925); Type: Singapore (*Ridley* 3703, lectotype, SING).

F.montana Ridl in Mat. Fl Malay Penin. 2: 232 (1907) in Fl. Malay Penin. 5: 82 (1925). Type: Perak (*Ridley* 5194, lectotype, SING).

Description: Climber 3-20 m high. *Stems* 0.3 - 2 cm diameter, glabrous, internodes 0.4 – 4.5 cm. *Leaf*, lanceolate, oblanceolatae, 12 – 26 cm long and 0.8 – 4 cm wide, acuminate, abruptly acute, narrow at the base, normally green, young leaf pale pinkish and yellowish; aurical pale green, entire, obtuse at the apex. *Infructecence* terminal, bracts orange or yellow. *Cephalium* elongate-ellipsoidal, spiral, 3 – 4, 1- 5.5 cm long, 0.5 – 3 cm wide. *Stigmatic remains* 3 – 6. *Root* with spines.

Distribution: Malaya (including lower Kra Peninsula), Singapore, Sumatra, Borneo, Java

(SaramatJava mountain, Mountain Paniism Bogor, Mountain Ielomago, Jakarta, Java Preanger Garoed, Java Preanger Garoed, Baturraden, Banyumas, Central Java, West Java, Mt. Halimum, Cikaniki village, Java, Bes Batavia, Insula Java Preangn, S.W Java, Ujung Kulon Nature Reserve). Habitat: Wet, humid mountain, lowland tropical rainforest, dark brown soil, commonly mountain, lowland up to 800 – 1450 m above sea level,

Vernacular name. *Ojot Pandan, Pandan rambat.*

Note: Fruiting observed in May

Specimen examined. INDONESIA, Foot hill of Saramat Java mountain, 1920, C.A.Backer, 265 (BO!); Jakarta, 3 Aug 1918, C.A.Backer, 25796 (BO!); Java, Bes Batavia, 4 Sep 1921, C. A. Backer, 31586 (BO!); West Java, 5 Oct 1920, R.C.Bakhuizen v/d Brink, 4710 (BO!); West Java, 9, Jun 1890, M.M.J.V. Balgooy & H. Wiriadinata, 2887 (BO!); Mountain Paniism Bogor, 9 Dec 1923, Balh, 6147(BO!); Java Preanger Garoed, Forbes, 477(BO!); Bogor, 18/12/1940, BC.Houe, 17345 (BO!); Jakarta, 25.12.1929, Coos Keewis, 4007 (BO!); Central Java, Banyumas, Baturraden, Petak 58 via Pancuran 3, 23 Apr, 2005, Ary. P.Keim, 347(BO!); Central Java, Banyumas, Baturraden, Petak 58 via Pancuran, 23 Apr, 2005, Ary. P. Keim, 377 (BO!); Baturraden Central Java Petak 58 via Parcuran 21, Apr, 2005, Ary. P. Keim, 311 (BO!); Baturraden, 22.4.2005, Ary P.Keim, 371 (BO!); Baturraden, 22.4.2005, Ary P.Keim, 370 (BO!); Baturrater, 21.4.2005, Ary P.Keim, 310 (BO!); Java Preanger Garoed, 28 January 1897, Koorders, 26693 (BO!); Insula Java Preangn, 1896, S. H. Koorders, 25831B (BO!); West Java, Mt. Halimum, Cikaniki village, 7 Mar 2000, H. Wiradinata W.S. Hoover & J. Hunter, 31338 (BO!); S.W Java, Ujung Kulon Nature Reserve, 30 Dec 1963, Nengah Wirawan, 164 (BO!).

6. FREYCINETIA INSIGNIS Blume

Freycinetia insignis Blume (1835) 158, t. 42 – Type: Java, West Java, Bogor (then Buitenzorg), Gede Mountain, *Blume s.n* (Lectotype:L)

Description: Robust climber 6 – 15m high. *Stem* 1.0 – 1.5 cm in diameter. *Leaf*, lanceolate-elongate, 30 – 105 cm long; leaf margin smooth, pleats present on terminal and basal parts of leaf; auricle is tapered; bracts are purple-white. *Infructescence*, terminal with 2 – 3 cephalium; peduncle 3 – 10 cm long and are in purple colour; pedicles 3 – 4 cm long. *Cephalium* are normally ellipse to elongate 3 – 10 cm long and 2 – 4 cm wide. *Stigma* 1-2 and brown in color. Young fruit is green.

Distribution: Common throughout Java, Peninsular Malaysia and Singapore.

Habitat. Mostly found in foothill or low land Montane Forest at 600 m – 2000 m asl. Fruiting season from July to November. Common species in highlands of Java.

Specimen Examined: INDONESIA, Bogor, Cibodas, Java, 15 Oct 1970, *J. Dransfield* 985 (BO!); G. Halimun, Sukabumi, 1974, *J. Dransfield* 4209 (BO!); Cibodas, 15 October 1970, *J. Dransfield* 985 (BO!); Gunung Soenda, Boerangrang, 1920, *Koorders* 4604 (BO!); Cibodas, 1909, *Koorders* 2650 (BO!); Cibodas, Java, 1909, *Koordes* 4209 (BO!); Cianjur, Bandung, Java, 12 May 1902, *Koorders* KDS 40167 (BO!); Java, 5 December 1902, *Koorders* KSD 40167, (BO!); Gunung Telemojo, Java, 1897, *Koorders* KDS 27887 (BO!); Cibodas, Java, 1974, Cibodas, 1908, *Scheffer* 1456 (BO!); Java, 1914, *O. Willis* 041 (BO!); Java, 9 September 1914, *O Willis* 841 (BO!); G. Tangkuban Perahu, Java, 6 June 1915, *Van Leeuwen-Reijvaan* 2270 (BO!); Cibodas, 1979, *V. Steenis* 1597, (BO!); West of Nirmala, 1941, *V. Steenis* 12410 (BO!)

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Group Orchidaceae

Taxonomy of the Genus *Grammatophyllum* Blume (Orchidaceae) in Java

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Abstract

A taxonomic study of the genus *Grammatophyllum* Blume in Java, Indonesia has been conducted in the Bogor Botanical Gardens and in Herbarium Bogoriense. At present, only two species of *Grammatophyllum* have been recorded in Java. They are *Grammatophyllum speciosum* and *G. stapeliiflorum*. Key to the species, descriptions, illustrations, and data on the distribution of the species are provided.

Introduction

Grammatophyllum is a genus of 14 recognized species throughout the world (WCSP, 2012). *Grammatophyllum* occurs in dense rainforests of Southeast Asia from Burma to Borneo, Indonesia, the Philippines, New Guinea, and the Southwest Pacific islands. They are fairly large epiphytic orchid (Comber, 1990) in which the well known *G. speciosum* is the heaviest orchid species that can weigh up to more than a ton. Its pseudobulbs are usually short with few oblong leaves and placed closely together except in *G. speciosum* in which the pseudobulbs form into long stem which can reach up to 2 or 3 metres long with many linear leaves along the stem (Fig. 1). Orchids in this genus produces several racemes, bearing many large, yellow to green with distinct dark purplish-brown spotted flowers.

The name *Grammatophyllum* is derived from the Greek words 'gramma' (letter) and 'phyllon' (leaf), which refers to the dark markings in the flowers.

Grammatophyllum Blume, Bijdr.: 377 (1825).

Synonyms: *Gabertia* Gaudich., Voy. Uranie: 425 (1829); *Pattonia* Wight, Icon. Pl. Ind. Orient. 5: t. 1750 (1851); *Sadokum* D.Tiu & Cootes, Austral. Orchid Rev. 72(6): 39 (2007).

Key to the species

- + Pseudobulbs formed into long stems, 2–3 m long, more than 3 leaves, linear, inflorescence erect or arching, abnormal flowers present at base of inflorescence, flowers widely open, lip with 3 keels ***G. speciosum***
- Pseudobulbs short and conical, 9–22.5 cm long, 2 or 3 leaves, oblong, inflorescences stiffly pendulous, abnormal flowers absent, flowers not widely open, lip with 2 keels..... ***G. stapeliiflorum***

1. *Grammatophyllum speciosum* Blume; *Pattonia macrantha* Wight, Icon. Pl. Ind. Orient. 5: t. 1750 (1851); *Grammatophyllum fastuosum* Lindl., Paxton's Fl. Gard. 2: 159 (1852); *Grammatophyllum macranthum* (Wight) Rchb.f., Xenia Orchid. 2: 16 (1862); *Grammatophyllum giganteum* Blume ex Rchb.f., Linnaea 41: 107 (1876); *Grammatophyllum pantherinum* Rchb.f., Gard. Chron., n.s., 9: 788 (1878); *Grammatophyllum cominsii* Rolfe, Ann. Bot. (Oxford) 5: 506 (1891); *Grammatophyllum sanderianum* auct., Gard. Chron., III, 14: 15 (1893); *Grammatophyllum papuanum* J.J.Sm., Bull. Dép. Agric. Indes Néerl. 45: 11 (1911).

Pseudobulbs formed into long stem, 1.5-2.5 m long, when young it is erect, afterwards hanging down, leafy throughout when young, internodes 2-2.5 cm long. **Leaves** 50-64, linear, acute, 2-2.5 cm wide, 30-68.5 cm long, alternately arranged, sheathing at the base, green to yellow-green in color. **Inflorescence** raceme, erect, sometimes arching, c. 2-3 meters long, bearing c. 50 flowers (Fig. 3), a few abnormal sterile flowers at the base in which stigma, lip and one sepal are absent (Fig. 5). **Flowers** widely opened, 8-13 cm wide and 8.5-15 cm long (Fig. 4), sweetly scented when fresh, pedicel 7.5-9.5 cm long, bract lanceolate, 2.5-2.7 cm long, 0.6-0.8 cm wide (normal position). **Sepals** oval to oblong, with undulated margins and falcate base, yellowish-green to yellow with purple brown spots, **dorsal sepal** 4.4-6.5 cm long and 2.0-3.0 cm wide (Fig. 8), **lateral sepals** 4-6.0 cm long and 1.4-2.7 cm wide. **Petals** oblong-ovate, color and margins are same as sepals, 4.0-6.0 cm long and 2.0-2.5 cm wide (Fig. 9). **Lip** 2.0-2.7 cm long and 2.5-3.0 cm wide, side lobes about 2 cm and midlobe 2.7 cm in length, keels 3, extending from middle part of lip disc to base of epichile, side lobes enveloping the column, upper part of the midlobe with soft and yellowish hairs, apex acute to rounded, yellowish-green with purple-brown spots and longitudinal purple-brown stripes (Fig. 10). **Column** yellowish-green with faint purple spots, 2-2.5 cm long. **Fruit** a capsule, 10 cm long, 5 cm wide, dark brown when dry, with c. 9-10 cm long peduncle (Fig. 11).

Distribution. Rare in Java. South-East Asia (Burma, Borneo, Philippines), New Guinea, Solomon Islands.

Habitat and ecology. It grows as a trunk epiphyte, often in the first fork of a tree which has a light canopy.

Specimens examined. *Backer* 7153 (BO), 2 sheets; *Backer* 1223 (BO), 2 sheets; *Backer* 1900 (BO), 2 sheets; *R.C. Bakhuizen v/d Brink* 5085 (BO), notes: abnormal flowers; *Backer*, no collector's number (BO)

2. *Grammatophyllum stapeliiflorum* (Teejism. & Binn.) J.J.Sm., Orchid Java : 487 (1905); *Cymbidium stapeliaeflorum* Teijs. & Binn. in Nat. Tijdschr. Nid. Ind. 24 : 319 (1862); *C. huttonii* Hook. f. in Bot. Mag. 93 : t. 5676 (1867); *Grammangis huttonii* (Hook. f.). Benth. in Benth. & Hook. f., Gen. Pl. 3 : 538 (1883); *Cymbidium stephensii* Ridl. in Jour. Bot. 38.: 71 (1900); *Grammangis stapeliaeflora* (Teijsm. & Binn.). Schltr., in Engl., Bot. Jahrb. 45, Beibl. 104 : 53 (1911).

Pseudobulbs short and conical, close together, 9-22.5 cm long, 3-4 cm wide, and bearing 2 or 3 leaves on each pseudobulb, internodes 2-6 with 0.5-7 cm length (Fig. 2). **Leaves** 15-40 cm long, 4-6.5 cm wide, oblong, apex acute, upper and lower surface glabrous, margins entire, leaf sheath 3.5-6 cm long. **Inflorescences** pendulous, 14-25 cm long, 10-12 flowers, abnormal flowers absent (Fig. 6). **Flowers** not wide open, c. 3 cm wide, greenish brown with purple to dark brown blotches (Fig. 7), the peduncles 1.2-2.5 cm. Dorsal sepal oblong-ovate, hooded, facing forward over the column, 4 cm long, c. 2 cm wide (Fig. 12); lateral sepals greenish-brown with purple to dark brown blotches, falcate, acute, 3.2-3.3 cm long, c. 1.6 cm wide. **Petals** densely blotched or spotted at basal-half, dark brown at apical-half, spatulate, slightly curved, acute, c. 3.2 long, c. 1 cm wide (Fig. 13). **Lip** trilobed, cream-pale yellow, blotched or spotted brown, lip disc with two keels from middle part of lip disc to base of epichile, c. 1 cm long, side-lobes oblong c. 2 cm long, c. 0.8 cm wide; mid-lobe obovate, c. 2.4 cm (Fig. 14). **Column** cream-yellowish, flushed brown, c. 2.5 cm long, c. 0.3 cm wide (Fig. 15). Anther cap not seen.

Distribution. Java (West Java, Bogor, Cigudeg, Sukabumi, Cisolok, Sirnarasa, South of Babdoeng), Malaysia, Philippines, Sulawesi, Sumatra and New Guinea.

Habitat and ecology. Epiphyte and terrestrial, found in primary forest and secondary forest, sea level from 500 to 950 m.

Specimens examined. 79, 1905. Asep Sadili, Nurdin & Vway W.M. 92, 1999. (BO); Jacobson 2225, 1917. (BO); H.A.B. Bünnemeijer 299, 1917. (BO); R.C. Bakhuizen v d Brink 630, 1920. (BO); S.M. Latif 18, 1934. (BO); W.F. Winckel 1951, 1928. (BO); Asep Sadili & Dian Komara 502, 2000. (BO).

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Fig. 1. Large specimen of *G. speciosum* growing in Bogor Botanical Gardens. Photo: S.-H. Lee.



Fig. 2. Habit of *G. stapeliiflorum* from Orchid house in Bogor Botanical Gardens. Photo: P. Taraksa



Fig. 3 (left). Inflorescence of *G. speciosum* from Bogor. **Fig. 4** (top right). Normal flower (front view). Photos: S.-H. Lee. **Fig. 5** (bottom right). Abnormal flower. Photo: P.T. Ong.



Fig. 6 (left). Inflorescence of *G. stapeliiflorum* from Peninsular Malaysia. **Fig. 7** (right). Flower (front view). Photos: P.T. Ong.



Fig. 8 (top left). Dorsal sepal of *G. speciosum* from Bogor. **Fig. 9** (top right) Petal. **Fig. 10** (bottom left). Lip. **Fig. 11** (bottom right). Capsule. Photos: S.-H. Lee.

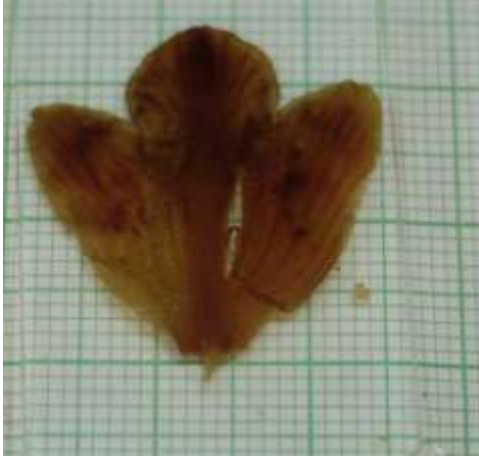


Fig. 12 (top left). Dorsal sepal of *G. stapeliiflorum* from Bogor. **Fig. 13** (top right) Petal. **Fig. 14** (bottom left). Lip. **Fig. 15** (bottom right). Column (side view). Photos: P. Taraksa.

Group Arecaceae

A Taxonomic Revision of the Rattan Genus *Daemonorops* (Arecaceae: Calamoideae) in Java

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Abstract

Four (4) species of *Daemonorops* are reported for Java, viz., *D. melanochaetes*, *D. rubra*, *D. hirsuta* and one species proposed as new species, *Daemonorops* sp. nov. The presence of *Daemonorops hystrix* in Java is confirmed although the name is regarded as a synonym of *Daemonorops hirsuta*. *Daemonorops oblonga* Blume is reduced to synonymy under *Daemonorops hirsuta*. *Daemonorops* sp. nov. is closely allied to *Daemonorops hirsuta* but differs in stem size, leaf sheath armature, and seed surface.

KEY WORDS: *Daemonorops*, new species, leaf sheath armature, Java.

Introduction

The rattans (Arecaceae: Calamoideae) include nine genera in South and Southeast Asia, viz. *Calamus*, *Calospatha*, *Ceratolobus*, *Daemonorops*, *Korthalsia*, *Plectocomia*, *Plectocomiopsis*, *Pogonotium*, and *Retispatha*. *Calospatha* has already been reduced to synonymy under *Calamus* (Dransfield *et al.* 2008). The genus *Daemonorops* includes about 112 species distributed from Andaman Island, Assam, Bangladesh, Borneo, Cambodia, China Southeast, East Himalaya, Hainan, Jawa, Laos, Malaya, Maluku, Myanmar, Vietnam, Sumatera, Philippines, Taiwan, Sulawesi, Thailand, and New Guinea (Dransfield *et al.* 2008). In Java, five (5) species had been reported by Backer and Bakhuizen van den Brink (1968) including *Daemonorops rubra*, *Daemonorops oblonga*, *Daemonorops hystrix*, *Daemonorops melanochaetes*, and *Daemonorops palembanicus*. Govaerts & Dransfield (2008) listed only three species in Java which include *Daemonorops melanochaetes*, *Daemonorops oblonga* and *Daemonorops rubra*; and *Daemonorops hystrix* is reduced as a synonym of *Daemonorops hirsuta*.

The genus *Daemonorops* was described by Blume (1830), based on a single species which he named *Daemonorops melanochaetes* Blume. *Daemonorops* is the largest genus of climbing rattans after *Calamus*. The genus is divided into two sections based on the inflorescence viz., Sections *Cymbospatha* and *Piptospatha* (Beccari 1911). Species in Section *Cymbospatha* have concave boat-shaped bracts which are at anthesis completely enclosed by the prophyll (the first bract) and splitting longitudinally to expose the flowers, while Section *Piptospatha* the bracts split to the base and only the lower part is enclosed by the prophyll (Rustiami *et al.* 2011). The bracts in Section *Piptospatha* usually fall at anthesis and occasionally only the prophyll remains (Furtado 1953).

A taxonomic study of *Daemonorops* from Java has not yet been done. There were varied number of species recognized based on published reports. For instance, Backer & Bakhuizen van den Brink (1968) recognized *Daemonorops palembanica*, while Beccari (1911) stated that such species only occurs in Palembang Province, Sumatra. Recently, Govaert & Dransfield (2008)

treated *D. hystrix* as a synonym species of *D. hirsuta* from Borneo; hence, there is a need to examine the *Daemonorops* species in Java to determine the number of species and also establish the proof of status of *D. hystrix* as a species as reported by Backer and Bakhuizen van den Brink (1968).

Material and Methods

A total of 43 herbarium specimens from Herbarium Bogoriense (BO) of *Daemonorops* species from Java were examined. Species morphological characteristics were determined and comparative morphological data was used as the main source of evidence in developing species concept (Davis & Heywood 1963; Dransfield 1999). Information recorded from the field such as location, general habitat, altitude, association with other plant and among others, was also noted. The type specimen is based on a photograph in *Rumphia*, Volume 2 & 3 (1847).

Taxonomic account

Daemonorops

Daemonorops Blume in J.A. & J. H. Schultes, Syst. Veg. 7 (2): 1333 (1830).

Solitary or clustering rattans, acaulescent to high-climbing hapaxanthic (then always very short stemmed) or paleonatic, dioecious. Sheaths usually heavily armed with spines, the spines frequently highly organized. Flagellum absent. Knee frequently present. Leaves ecirrate in acaulescent species or longly cirrate. Leaflets variously arranged. Inflorescence male and female superficially similar, but within the genus of two basic types: one with all bracts enclosed within the outermost bract or prophyll, splitting along their length to exposed the flowers (Section *Cymbospatha*) or the others with bract splitting along their entire length to leave no tubular portion and frequently falling (Section *Piptospatha*). Bracts variously armed. Partial inflorescences longer than subtending bracts in Section *Piptospatha*; bracteoles and “involucre” inconspicuous. Male rachilla bearing male solitary flowers, male flowers small, cup-shaped; calyx with three small lobes; corolla split to the base into 3 petals; stamen 6, slightly epipetalous; pistillode minute. Sterile male flower found with each female flower, as the fertile male, but stamens with empty anthers. Female rachilla bearing many flowers in dyads consists of one female flower and one sterile male flower. Female flower with calyx truncate or shallowly 3-lobes; corolla with 3 petals; gynoeceum with 3 stigmas and with 3 loculi. Sterile flower smaller or at least more slender than the female ones, with well-formed calyx and corolla and 6 sterile stamens and an abortive ovary. Fruit variously shaped, tipped with stigmatic remains and covered with reflexed scales. Seed only one, covered by thin to thick, sweet or sour sarcotesta. Endosperms deeply ruminant. Embryo basal.

Distribution. 112 species. Based on Dransfield *et al.* (2008), the geographical distribution of *Daemonorops* is more restricted than *Calamus*. The center of the distribution of both sections are similar: China, India to New Guinea, specifically Sumatera, Malaya, Borneo and Malay Peninsula. *Daemonorops* does not occur in Africa, Himalaya, India, and Sri Lanka, and Australia.

Habitat & ecology. Rather disturbed primary forest, on alluvial soils near rivers, flat to gently sloping terrain, ridge tops, lowlands forest, and steep hill slopes in primary forest on volcanic soils. (Rustiami *et al.* 2011). Species are mostly confined to primary tropical rain forest on a great variety of soils, some species with narrow ecological requirements. A few are of a rather more weedy nature, abundant in forest habitats with high-light intensities such as riverbanks; one species in Borneo, *Daemonorops longispatha*, grows on the landward margin of mangrove forest. Some species are strictly montane, occurring at altitudes up to ca. 2500 m above sea level. Several species in Borneo are confined to heath forest, or to limestone, or serpentine rock. With so many species, it is difficult to give more precise ecological data (Dransfield *et al.* 2008)

Identification key to *Daemonorops* species in Java

- 1a. Bracts concave boat-shaped which are at anthesis completely enclosed by the prophyll (the first bract) and splitting longitudinally to expose the flowers..... ***Daemonorops melanochaetes***
- 1b. Bracts split to the base and only the lower part is enclosed by the prophyll; usually fall at

- anthesis and occasionally only the prophyll remains.....2
- 2a. Fruit globose, with scanty red resinous sap, very shortly rostrate **Daemonorops rubra**
- 2b. Fruit oblong to obovoid, acute at apex, without red resinous sap3
- 3a. Stem very slender, leaf sheath covered by solitary, short, bulbous based spine, scattered around the leaf sheath, seed rugose with a groove along one side.....**Daemonorops sp. nov.**
- 3b. Stem robust, leaf sheath covered by rigid, irregular robust spines, seed without groove
..... **Daemonorops hirsuta**

Species description of *Daemonorops* in Java

1. *Daemonorops melanochaetes* Blume, in J.J. Roemer & J.A. Schultes, Syst. Veg. 7: 1333 (1830).
Type specimen: *Rumphia*, Vol. 2. Tab. 134.

Calamus melanochaetes (Blume) Miq., Verh. Kon. Ned. Akad. Wetensch. Afd. Natuurk. 11: 28 (1868).
Daemonorops javanica Furtado, Gard. Bull. Straits Settlements. 9: 170 (1937).

Gregarious clump forming rattan, climbing to 10 m. Stem with leaf sheath to 4 cm in diameter; stem without leaf sheath 2 cm in diameter; leaf sheaths with dense long, brown-black spines; leaf sheath mouth armed as the rest of the sheath. Knee prominent. Ocrea papery short, up to 1 cm long. Leaves to 3 m, petiole to 30 cm long with backward spines on rachis, abaxially and adaxially. Leaves very large, up to 400 cm; petiole stout, aculeate especially along the margins, 15-40 cm; sheath with flat, short or long, more or less seriate prickles up to 4 cm long; leaf-segments linear, shortly acuminate, on lower surface with distinct side-nerves, thinly setose-aculeate, greyish green when dry, larger ones 30-60cm by 15-28cm. Leaflets arranged regularly, consist of 50 pairs in one side, basal leaflet 19.7-20.8cm, apical leaf 16.2cm long, 1cm width, the longest one 59 cm long; leaflets acuminate, thorny on the apex, reddish, transversal veinlets present, inconspicuously, small bristles occur along main venation up to the apex; solitary hook like spine under leaf rachis; cirrus 50 cm-117 cm long, armed with hook like spines. Young male inflorescence enclosed in overlapping spathes, prickles on outer primary spathe very thin, bristle-like solitary, black when dry, up to 3.5cm. Staminate inflorescences shortly peduncled or sessile, in outline broadly fusiform, swollen. Male prophyll c. 22cm; spathes long-rostrate, outer ones lanceolate, narrowed towards the ends, concave, 30-35cm or more by 3-5cm; inner spathes thin-papery, the lower ones more or less aculeate, c. 30-40 cm, the other ones unarmed, shorter, inside brown. Pistillate inflorescence: female fertile flower somewhat shorter than male; the sterile male flower about as long as female; male primary lateral axes dense, up to 13cm; calyx c. 2 mm; corolla c. 5 mm. Fruit globose, 18-20 mm; scales 15-seriate; yellowish brown, with darker margins on the beak. Seed globose, 1.3 x 1.3 cm.

Distribution. W. Java to Central Java

Habitat & ecology. Lowland forest to hill slope, 150-800 m asl.

Uses. Not recorded.

Vernacular name. Not recorded

Specimen examined. W. Java, Lebak, Tjipatujah, 03 Aug. 1936, *Soemawiria* 2, fruiting (BO!); Java, Lengkong, District Sukabumi, 14 Nov 1910, *John Dransfield* 1043, fruiting (BO!); Djember, N. lb. Watangan 5, 28 Feb 1940, *Chr. Neersteegh* 4879, fruiting (BO!); Batavia Depok, 1923, *Beumie* 5689, fruiting (BO!); Central Java, Argodjembangan, 25 Nov 1951, *A. Kostermans* 6348, fruiting (BO!, K, A).

Note. This is the only species of *Daemonorops* Section *Cymbospatha* occur in Java. This species can be recognized easily by having the first bract (prophyll) enclosed the whole inflorescence.

2. *Daemonorops rubra* (Reinw. ex Mart.) Blume, *Rumphia* 3:6 (1847). Type specimen picture seen in *Rumphia*'s book kept in BO.

Calamus ruber (Reinw. ex Mart., Hist. nat./ palm. 3: 209 (1838); *Palmijuncus ruber* (Reinw. ex Mart) Kuntze, revis. Gen. pl. 2:732 (1891).

Daemonorops accedens Blume, *Rumphia* 2: vii (1838); *Calamus accedens* (Blume) Miq., Verh. Kon. Ned. Akad. Wetensch., Afd. Natuurk. 11: 28 (1868). *Palmijuncus accedens* (Blume) Kuntze, Revis. Gen. pl. 2: 734 (1891);

Rotang accedens (Blume) Baill., Hist. Pl. 13: 300 (1895).

Tall climbing clustering rattan climbing up to 10m. Stem without leaf sheaths 2 cm in diameter, with leaf sheath 4 cm. Leaf sheath armed with robust, oblique, bulbous based in groups of spines and covered by scanty rusty indumentums. Knee prominently present, papery ocrea present, inconspicuously. The whole length leaves 3 m long, petiole 26.5–30 cm long, petiole armed with spines reflected blackish, spines 0.6–4 cm long; leaflets 30 pairs, arranged regularly, leaflet 43 cm x 2.6 cm, cirrus to 50–130.7 cm. Staminate and pistillate inflorescence unknown. Infructescence 36–44 cm long, prophyll 15.5–30 cm long and 3–3.5 cm width, peduncle 18 cm long; consists 6–7 partial infructescence. Fruit 2–2.1 cm long, globose with scanty red resinous sap, very shortly rostrate, covered with 8 scales in vertical rows, and 9 scales in horizontal rows. Seed globose; 1.1 cm long, 1.3 cm width.

Distribution. W. Java to E. Java

Habitat & Ecology. Lowland forest to hill dipterocarp forest at the river valley, 15–675 m asl.

Uses. Not recorded.

Vernacular name. Not recorded

Specimens examined. W. Java, Tjibalanac, Tjipatudjah, Tasikmalaja, 25 Jan 1971, *J. Dransfield 1200*, fruiting (BO); **Java**, Tjibalanac, Tjipatudjah, Tasikmalaja, *s.n.*; Tjibalanac, Tjipatudjah Tasik Malaia, 25 Jan 1971, *John Dransfield 1185*, fruiting (BO!, BH, K); South Sukabumi, Lengkong Forest Reserve, 15 July 1977, *J.P. Mogeia 1259*, sterile (BO!, BH, K); Java, Hutan Lindung Lengkong Cisampurawangun, Sukabumi, Jawa Barat, 17 Oct 1993, *Ram & MJ 1*, sterile (BO); Salak, 17 April 1936, *Heyne 3*, fruiting (BO); G. Handjuang Forest Reserve, Tjiletuh, Lengkong (district Sukabumi), 25 Nov 1970, *John Dransfield 1066*, fruiting (BO!); *Beccari, X.E.31*, fruiting (BO!); Pendjalim Ajam, 30 June 1916, *Koorders 4292*, fruiting (BO!); Pasir Kempoek Nirmala, *Backer 11099*, fruiting (BO!); Bivak Denbe Tjipatudja, *Backer 9080*, fruiting (BO!); Tjimonyet, Lengkong District Sukabumi, 14 Nov. 1970, *John Dransfield 1052*, fruiting (BO!, K).

Notes. This is the only species in Dragon's blood group of rattans in Java. The rest of the group occur in Borneo, Malay Peninsula, and Sumatra (Rustiami *et al.* 2004).

3. *Daemonorops hirsuta* Blume, Rumphia 2: t. 135 (1843). Beccari Ann. Roy. Bot. Gard. Calcutta 2:135 (1911). Type specimen: *t 135* in Rumphia 2 (1843).

Calamus hirsutus (Blume) Miq., Verh. Kon. Ned. Akad. Wetensch., Afd. Natuurk. 11:28 (1868); *Palmijuncus hirsutus* (Blume) Kentze, Revis. Gen. Pl. 2: 733 (1891).

Calamus oblongus Reinw. ex Blume in J.J. Roemer & J.A. Schultes, Syst. Veg. 7:1323 (1830), *Daemonorops oblonga* (Reinw. ex Blume) Blume, Rumphia 3:25 (1847), **synonym novum**

Calamus platyacanthus Mart., Hist. Nat. Palm. 3:206 (1838); *Daemonorops platyacantha* (Mart.) Mart., Hist. Nat. Palm. 3 (ed.2): 204 (1845); *Palmijuncus platyacanthus* (Mart.) Kuntze, Revis. Gen. Pl. 2:732 (1891).

Calamus hystrix Griff., Calcutta J. Nat. Hist. 5: 70 (1845); *Daemonorops hystrix* (Griff.) Mart., Hist. Nat. Palm. 3: 328 (1853); *Palmijuncus hystrix* (Griff.) Kuntze, Revis. Gen. Pl. 2: 733 (1891); *Daemonorops hystrix* var. *exulans* Becc., Rec. Bot Surv. India 2:224 (1902); *Daemonorops hystrix* var. *minor* Becc., Ann. Roy. Bot. Gard. (Calcutta) 12(1): 138 (1911).

Moderate clustering rattan with stems climbing to 10 m. Stem without sheaths to 0.13 – 1 cm in diameter, with sheaths to 0.3–1.75 cm; internodes 10–15 cm. Sheaths dull brownish green, swollen in upper half, ferruginously furfuraceous, strongly aculeate (2–4 cm); prickles on mouth of sheath much longer. Knee prominently present. Ocrea inconspicuous. The whole length of the leaves 120–150 cm long; petiole 30 cm – 50 cm long, 0.4 cm diameter, armed with solitary spines on the edge, spines 0.2–0.3 cm long. Leaflets very regular to 60 pairs, basal leaflet 23 cm x 0.6 cm, median leaflets 20.3 cm x 1.4 cm and apical leaf 22.4 cm x 1 cm, leaf cirrate to 2.5 m including petiole to 40 cm and cirrus to 75–77 cm; leaflets acuminate, thorny on the apex, reddish, small bristles occur along main venation up to the apex; solitary hook like spine under leaf rachis; cirrus 40 cm long. Staminate inflorescence unknown. Infructescence erect, *c.* 40 cm long, prophyll 10.5– 11 cm x 3.2 cm with scattered solitary spines up to 0.8 cm long, peduncle 7.2–24.1 cm long; consist of 4

partial inflorescence, rachilla 2.0-2.2 cm long, with up 7-9 fruits. Fruit c. 1.6 – 2.1 cm long, 0.6–1 cm wide, ellipsoid-oblong, covered with up to 12–15 scales in vertical rows, and 7–8 scales in horizontal rows with slightly darker margins. Young fruit oblong, pale green. Seed oblong-obovate and without groove, 2.1 cm long, 1 cm wide.

Habitat & ecology. Lowland forest to hill slope, 50-1550 m asl.

Uses. Not recorded

Vernacular name. Not recorded.

Specimens examined. West Java Tjibodas, 08 Jan 1971, *John Dransfield 1130*, fruiting (BO!, BH, K, L); E. Java, Sukamade, Cagar alam Meru/Betiri, 21 May 1973, *John Dransfield 3535*, fruiting (BO!, BH, L, K); W. Java, Tjibalanac, Tjipatudjah, Tasikmalaja, 23 Jan 1971, *John Dransfield 1152*, fruiting (BO!); Mt. Halimun National Park, slope Mt. Kendeng, 10 Mar 2000, *W.S. Hoover, M. Hendra and J. Hunter 32826*, fruiting (BO); Gn. Halimun, 25 Mar 2003, *Natsuki Watanabe K 14801*, fruiting (BO), E. Java, Sukamade, Cagar Alam Meru/Betiri, 21 May 1973, *John Dransfield 3538*, fruiting (BO!, BH, K); Java, Mt. Salak, Heyne 4, fruiting (BO!); Java Sukamade, Meru Betiri Nature Reserve, 20 April 1980, *U. Warsita Mahyar 9*, sterile (BO!, BH, L); Province Djember Besuki, 17 Aug 1895, *Koorders 2973*, fruiting (BO!); Jambi, Kerinci Seblat National Park, Lekok 50 Tumbi, Dusun Baru Village, Lempur District, Kerinci Regency, 14 Aug 2000, *Joko R. Witono 156*, fruiting (BO!, K); Sukamade, Meru Betiri Nature Reserve, 20 April 1980, *U. Warsita Mahyar 16*, fruiting (BO!, BH, K); Res. Besoeki Libjin, 1916, *Koorders 42933*, sterile (BO!); Salak, Heyne 21, fruiting (BO!); Cimonyet, Lengkong District Sukabumi, 14 Nov 1970, *John Dransfield 1053*, fruiting (BO!); G. Handjuang Forest Reserve, Tjiletuh, Lengkong, District Sukabuni, 26 Nov, *John Dransfield 1074*, fruiting (BO!); Pasir Kempaek Nirmala, 25 Dec 1913, *Backer 11098*, fruiting (BO!)

Note. This species slightly similar to *Daemonorops sp. nov.*, but it differs in the stem size, more robust, leaf sheath covered by rigid, short, irregular based spines, seed without groove.

4. *Daemonorops sp. nov.*

Scandent rattan, slender 0.8 cm – 0.9 cm. Stem with leaf sheath about 0.8 cm in diameter, without leaf sheath about 0.4 cm in diameter; leaf sheath armed with solitary, bulbous based spine, up to 1.5 cm long; leaf sheath mouth armed as the rest of the sheath, some spines short. Knee present conspicuously, armed as the rest of the sheath. The whole length of the leaves unknown; petiole 21.1cm – 25.8 cm long, 0.4 cm diameter, armed with solitary spines on the edge, spines 0.2-0.3cm long. Leaflets arranged regularly, basal leaflet 19.7-20.8cm apical leaf 16.2cm long, 1cm width; leaflets acuminate, thorny on the apex, reddish, transversal veinlets present, inconspicuously, small bristles occur along main venation up to the apex; solitary hook like spine under leaf rachis; cirrus 6.8cm-7.0cm long. Staminate inflorescence unknown. Young inflorescence present. Pistillate inflorescence pendulous, prophyll 15.4cm long darker near the mouth with scattered solitary spines up to 0.8cm long, peduncle 6.4cm long, two keeled; consist of 4 partial inflorescence, rachilla 2.0-2.2 cm long, with up 7-9 fruits. Fruit pendulous, about 0.8 cm -2 cm long, 0.7cm-1.1cm wide, oblong to obovoid, creamy brown when dried, apical beak present, up to 1 mm only; covered with up to 12 scales in vertical rows, a bit darker on the tip. Seed oblong, rugose with a groove along one side; 1.2cm long; 0.8cm wide; endosperm deeply ruminant. Young seedling unknown.

Distribution. Only known from type locality.

Habitat. Not recorded.

Uses. Not recorded.

Vernacular name. Not recorded

Specimens examined. Java, Pasir Walang, Nanggerang, 17 Aug 1913, *Backer 8729c*, fruiting (Holotype: BO!); *Backer 8727*, young inflorescence (BO!).

Note. This species slightly similar to *Daemonorops hystrix* in fruit characters, but it differs in the stem size which is more slender than the latter species, leaf sheath covered by solitary, short, bulbous based spines, scattered around the leaf sheath, seed oblong, rugose with a groove along one

side.

DISCUSSION

Based on evaluation of morphological characters of 45 herbarium specimens kept in BO confirmed that there are four species of *Daemonorops* occur in Java. The *Daemonorops* of Java divided into two sections, *D. melanochaetes* (Section *Cymbospatha*) and the other three species in section *Piptospatha* (*D. rubra*, *D. Hirsuta*, and *Daemonorops* sp. nov.). *D. rubra* can be distinguished easily by having red resin on the fruit scales.

Backer & Bakhuizen van den Brink (1968) mentioned earlier that *D. palembanica* occur in Java. However based on this study, this species does not occur in Java and can only be found in Sumatra island. Whereas Govaert et al. (2008) stated only three species of *Daemonorops* occur in Java. Taxonomic problem appeared when dealt with *D. hystrix* complex. Dransfield *et al.* (1997) mentioned that *D. hystrix* complex (including *D. hirsuta*) has proved to be taxonomically difficult.

Daemonorops hystrix in Java is confirmed as occurring in Java, although the name is regarded as a synonym of *Daemonorops hirsuta* (Govaerts & Dransfield 2005). Based on thorough examination of specimens, this study treats one other species of *Daemonorops* from Java, *D. oblonga*, as conspecific with *D. hirsuta* (as the earliest valid name of this species complex).

One new species proposed in this study. This new species closely allied to *D. hirsuta*.

ACKNOWLEDGEMENTS

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Group Zingiberaceae



Scientific Report

TAXONOMIC STUDY OF GENUS *ALPINIA*
(ZINGIBERACEAE) OF JAVA



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Training Workshop on Taxonomy of Terrestrial Plants (Monocots)

Herbarium Bogoriense, RC Biology - LIPI, Indonesia

12 - 16 March 2012

Dateline: March 16, 2012

Taxonomic Study of genus *Alpinia* (Zingiberaceae) of Java

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ABSTRACT. The genus *Alpinia* is the most taxonomically complex genus in the Zingiberaceae with 230 species occurring throughout tropical and subtropical Asia. Species of *Alpinia* often dominant in the understory of forests, while others are important ornamental and medicinal plants. They are diverse from country to country and there are four species belong to this genus (Zingiberaceae) in Java, Indonesia for group study at the Training Workshop on Taxonomy of Terrestrial Plants (Monocots) at Herbarium Bogoriense, RC Biology – LIPI, Indonesia. They are well defined and demonstrated.

KEY WORDS: Zingiberaceae, *Alpinia*, Terrestrial, Herbarium Bogoriense, Java, Indonesia.

INTRODUCTION

Alpinia Roxb. is the largest and most widespread genus in the Zingiberaceae with lot of species occurring from Sri Lanka and the Western Ghats of India to China, Japan, all of South-east Asia, the Pacific as far as Fiji, Samoa, and the Caroline Islands, and Australia as far south as Northern New South Wales (Larsen *et al.*, 1998; Smith, 1990). Most species grow in low- to mid-elevation forests and form clumps with stems from 1–4 m high, although species in east of Wallace's Line tend to grow much larger. It is also the type genus of the tribe Alpinieae, a rich of the family Zingiberaceae. This tribe consists of evergreen herbs, in which an abscission layer between the rhizome and the leafy shoots is lacking, the plane of distichy of the leaves is transverse to the direction of growth of the rhizome, and the lateral staminodes of the flowers are small, reduced to swellings at either side of the base of the labellum, or are entirely absent. Extrafloral nectaries are absent, and the fruit is usually spherical and dehiscent or fleshy (Kress *et al.*, 2002).

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Then, within the tribe Alpinieae, generic limits are difficult to discern. While some genera may be easily recognized by their respective morphological characters and/or geographic distribution, it is hard to identify an apomorphy or universal character for species currently assigned to *Alpinia*. Virtually all species flower terminally on the leafy shoots and all are Asiatic. These characters distinguish *Alpinia* from the Afro-American *Renealmia*, in which most species produce inflorescences on a separate, leafless shoot from the rhizome, but do not uniquely separate it from other members of the Alpinieae.

Perennial, erect herbs, with numerous leafy stems, 0.5-4 m high, rhizomes fleshy, creeping. Leaves numerous, distichous, lanceolate to ovate, lower and upper ones smallest, finely pinnately veined, subglabrous; usually petiolate, often sheathing ligule well-developed. Inflorescence usually terminal on leafy stem, spicate, paniculate or racemose, erect or occasionally drooping, when young usually protected by spathe-like sterile bracts; fertile bracts subtending a cincinnus of 2-many flowers; bracteoles normally present, sometimes tubular. Flowers bisexual, small to large, red, orange, yellowish to cream or white; calyx tubular, sometimes splitting unilaterally when flower expands; corolla tubular, tube usually not longer than the calyx, 3-lobed, lobes unequal, dorsal one largest, more or less hooded; labellum (anterior staminodes) usually large and showy, 2 lateral staminodes small or absent; fertile stamen one, subsessile or with well-developed filament, anther sometimes crested; ovary inferior, 3-locular, surrounded by messive glands, stigma expanded with a narrow, hairy orifice. Fruit a few-many-seeded, dehiscent capsule, crowned by calyx remnants. Seed angular, arillate, often aromatic.

Alpinia normally prefers humid, shady conditions and not too high temperatures, at least

during the night, e.g. 27-30°C during daytime and 17-18°C at night. They often occur in secondary vegetation, bamboo and teak forest, brushwood and ravines, rarely in primary forest. Near villages, they usually grow in the open. They require rich soils. *A. galanga* requires sunny or moderately shady locations. Soils should be fertile, moist but not swampy. Sandy-clay soils rich in organic matter and with a good drainage are preferred.

Uses. — The rhizome of medicinally used *Alpinia* is generally taken as a stomachic, for indigestion, stomach-ache and diarrhea, and also as an emetic and as an expectorant. It is also externally applied for rheumatism, wounds, sores and ringworm. The leaves are used for the latter purpose as well, with the intention of drawing blood to the skin.

KEYS TO SPECIES OF *ALPINIA* OF JAVA (INDONESIA)

1. Inflorescence raceme
 2. Bracteole connate and cup shaped, truncate, persistent; labellum bright orange with a broad white margin

1. A. javanica
 2. Bracteole opened to base, acute, caducous; labellum yellowish with red-spot at base red veins near margin

2. A. malaccensis
1. Inflorescence panicle
 3. Inflorescence pubescent; primary bracts 12-15.5 x 1-2 cm, apex acuminate

3. A. galanga
 3. Inflorescence glabrous; primary bracts 3.6-14x0.4-1.8 cm, acuminate with long tip

4. A. scabra

1. *A. javanica* Blume, Enum Pl. Javae I: 59, 1827

A. javanica Blume in Backer & Bakhuizen van Den Brink, Fl. Java III: 207 (1968). *A. javanica* Blume in Holttum, Gard. Bul. Sing. 13(1): 145-146 (1950).

Syn.

Languas javanica (Blume) Burkill, Bul. Misc. Inform. (1935) 318. — Type: *H. Kuhl & J.C. van Hansen s.n.* (holo L), Java.

Alpinia blumei D. Dietr., Syn. Pl. I (1839) 13. — Type: Material not seen.

Alpinia involucrate Griff., Not. Pl. Asiat. 3 (1815) 422. — Type: Material not seen.

Alpinia campanaria Ridl., J. Straits Branch Roy. Asiat. Soc. 86 (1927) 308. — Type: *H.N. Ridley* (20 December 1920) (holo K), Peninsular Malaysia.

Description. — Herbaceous plant stems close together, about 2 to 3 m high, swollen at base, greenish to brown. *Leaves* lanceolate, with unequal, acute base, gradually shortly acuminate (tapering with elongate tip), about 58 to 83 cm by 9 to 14 cm, light green; petioles pubescent, about 2.5 to 6 cm long; ligule, about 1 to 2 cm long, with truncate-obtuse, bilobed apex. Midrib stout with finely hairy. Primary side nerve thicker, whereas secondary one thin reticulate. Leaf sheath densely hairy near base of petiole and ligule. Inflorescence terminally erect or more or less pendulous, raceme, to about 20 cm long, tomentose, surrounded by 2 or 3 long persistent, narrowly obovate, many-nerved, papillose lower primary bracts, up to about 12 by 4 cm; *peduncle* more or less terete, the part protruding above the apex of leaf sheath very short; rachis thick flattened, bearing about 6 – 12 cincinni, stalks of cincinni variable about 2 to 6 cm long; *primary bracts* not connate, lower ones very large, spathaceous, the outer ones obovate, with rounded apex, glabrous, thin, brittle when dry; *secondary bracts* numerous, persistent, broad cup-shaped, the 2 outer ones about equal in size and permanently connate, white or pinkish, the mouth about 2 – 3 cm across, hairy at base and near edges. *Flower pedicels* about 2 to 3 cm long, pubescent; *calyx* funnel-shaped, with truncate-faintly lobed upper margin, more or less glabrous, c. 2.5 cm. *Labellum* broadly obovate, curled in upper half, bright orange with a broad white margin, 4 to 5 cm.

Infructescence about 16 to 26 cm long. *Fruits* globose, 1 to 2 cm diameter, with persistent calyces, 0.5 to 1.0 cm long, slightly hairs, green turning red when ripe; *stalk* stout, about 60 mm long.

Distribution. — Thailand, Peninsular Malaysia, Java, Borneo, Sumatra and Moluccas. Altitude at below 600 m.

Habital and Ecology. — Primary to secondary forest.

Uses. — Fruits are said to be edible.

Specimens examined.— JAVA: Batam, between Citorek and Monjang, June 22, 1911, C.A. *Bacher* 1807 (BO); Bogor, Doeugoes Iwoel, 1927, J. *Beume* A.505 (BO). BORNEO: East Kalimantan, Samarinda, Lempake, Universiti Mulawarman, Kebun Raya, 100 m asl. Aug 28, 1974, H. *Wiriadinata* 354 (BO). PENINSULAR MALAYSIA: Johore, base of Gunong Bekok, Nov 19, 1946, M.R. *Henderson* 38221; Perak, NE of Tapah, Kp. Sekam, alt. 700 m, Sept 2, 1982, W. *Ave* 110 (BO). SUMATRA: Indrgiri Hulu, Kec. Singingi, Peteai, S.M. Bukit Rimbang – Bukit Baling, Mar 3, 1991, E.A. *Widjaja* 4045 (BO); Palembang, Mocara Boea, July 10, 1915, W. *Grashoff* 522 (BO); Palembang, Banjarmasin, Sept 28, 1915, W. *Grashoff* 641 (BO); Palembang, A.Loear, July 26, 1928, C.N.A. *de Voogl* 202 (BO); Palembang, July 1920, F.H. *Endert* 999 (BO); Lampong, Kota Agung, Aug 22, 1915, *Cramer* 77 (BO); N. Sumatra, Bukit Lawang-Bohorak-Longkat, Feb 28, 1973, *Soedarsono* 398 (BO). NB. For the purpose of educational prospective we used specimens from other regions because of only two sets of javanese specimens available at BO.



Figure 1:

Family: ZINGIBERACEAE

Botanical Name: *A. javanica*

2. *A. malaccensis* (Burm. f.) Holtt.

A. javanica Blume in Backer & Bakhuizen van Den Brink, Fl. Java III: 207 (1968). *A. javanica* Blume in Holttum, Gard. Bul. Sing. 13(1): 145-146 (1950).

Syn.

Maranta malaccensis Burm. f., Fl. Indica (1768) 2.

Languas malaccensis (Burm. f.) Merr., Philipp. J. Sci. 19 (1921) 343.

Catimbium malaccense (Burm. f.) Holttum, Gard. Bull. Singapore 13 (1950) 155.

Description. — Herb 1-4 m. rhizome ca. 2.5 cm in diameter. *Leaves* lanceolate 40-94 by 6-13.5(-20) cm, apex acuminate, base cuneate, margin entire, undersurface and margin pubescent; petiole 3-7 cm. *Ligules* triangular up to 1 cm long, hairy; leaf sheaths closely longitudinally veined, hairy. Inflorescence racemose, in all parts densely covered with ferruginous hairs. *Bracts* lanceolate, 13-45 cm, acute, hairy. *Peduncle* about 10 cm. *Rachis* 20-30 cm, angular. *Bracteoles* white, ovate, 1.5-3 by 1 cm, acute, thin, sparsely hairy. *Flowers* white. *Calyx* white, funnel-shaped, hairy outside; tube 1-2 cm long; lobes 3, 1-1.3 by 1 cm, acuminate, red-tipped. *Corolla* white; tube 1-1.5 cm long; lobes oblong, 1.5-4 by 1-1.5 cm, apex obtuse, margin entire, hairy; labellum broadly ovate, 3-6 by 3-5.5 cm, apex 3-lobed, narrowed base, margin crenate, undulate, yellow with reddish brown at central and red lines at margin. *Stamens* white; filaments strap-shaped, 1-1.3 cm long, sparsely hairy; anther creamy white 1.7 by 0.8 cm; lateral staminode 2, ca. 0.5 cm long, red, hairy. *Ovary* globose, densely hairy. *Capsule* globose, ca. 3 cm in diameter, pubescent, orange to red; seed 3-4 angular, about 5 mm long, glabrous.

Vernacular Names.— INDONESIA: laja gowah (Sundanese), langkuas malaka (Maluccas), susuk (Lampung). MALAYSIA: puar, bangle. PHILIPPINES: tagbak babae (Tagalog), barapat (Igorot), birao-birao (Sulu), THAILAND: kha paa (northern, north-eastern). VIETNAM: ri[eef]ng malacca.

Distribution. — India towards Malaysia, Indonesia and the Philippine.

Habital and Ecology. — Primary and secondary forest; bamboo and teak forest, brushwood, ravines and shaded rocky outcrops at lowland to 1,000 m.

Uses. — All plant parts are fragrant, and contain essential oils. In Java the pounded rhizome is used to cure wounds and sores. An infusion of the ripe and unripe fruits with a little salt is taken as an emetic. In the Philippines a decoction of the fruit or the crushed seed is applied for gastralgia with tympanites. A decoction is used for bathing feverish people. The rhizomes were chewed in the Moluccas together with batel nut (*Areca catechu* L.) to make the voice strong and clear. The rhizome is occasionally used as a spice, and is eaten as a vegetable in India. The pounded rhizome is also used as an ingredient of poison.

Specimens examined.— Purwokerto (Pandak), alt. 100 m, Feb. 1, 1969, *Bernadius CO9041* (BO); Java, Oct. 19, 1942, *D.T.H. 1352* (BO); Treangu, Java, alt. 1,000 m, Dec. 13, 1918, *W. F. Winckel 328 B* (BO); Kiara Pajoeng. N. va. Tjiandjoer, West Java, alt. 550 m, Mar. 29, 1918, *C.A. Backer 23577* (BO); Ujung Kolon National Park, West Java, June, 14, 2008, *D. Arifiani, A. Supriatna, Adang DA686* (BO); Gunung Tukung Gede Nature Reserve, West Java, June, 27, 2009, *T. Djarwaningsih, M. Amir & Supriatna TD 918* (BO).



Figure 2:
 Family: ZINGIBERACEAE
 Botanical Name: *A. malaccensis*

3. *A. galanga* (L.) Willd.

Alpinia galanga (L.) Willd., Willd. Sp. pl. 1 (1797) 12. – Basionym: *Maranta galanga* L., Sp. pl., ed. 2, 1 (1762) 3. – *Languas galanga* (L.) Stuntz, U. S. D. A. Bur. Pl. Industr. Bull. 261 (1912) 21. – Type: Herb. Amboin. 5: 143, t. 63 (1747).

Syn.

Heritiera alba Retz., Observ. Bot. 6 (1791) 18. – *Alpinia alba* (Retz.) Roscoe, Trans. Linn. Soc. London 8 (1807) 346. – Type: J.G. König s.n., specimen lost.

Alpinia pyramidata Blume, Enum. pl. Javae (1827) 58. – *Languas pyramidata* (Blume) Merr., Enum Philipp. fl. pl. 1 (1923) 233. – Type: C.L. von Blume s.n. (holo L), Java.

Alpinia carnea Griff., Not. pl. asiat. 3 (1851) 420. – Type: Material not located.

Alpinia viridiflora Griff., Not. pl. asiat. 3 (1851) 423. – Type: Material not located.

Alpinia rheedii Wight, Icon. Pl. Ind. Orient. 6 (1853) 19, t. 2026. – Type: Material not located.

Alpinia zingiberiana Hook. f., Bot. Mag. (1887)t. 6944. – Type: Material not located.

Alpinia bifida Warb., Bot. Jahrb. Syst. 13 (1891) 275. – Type: Material not located.

Nguas javanica (Blume) Burkill, Bul. Misc. Inform. (1935) 318. – Type: *H. Kuhl & J.C. van Hansen* s.n. (holo L!), Java.

Alpinia blumei D. Dietr., Syn. Pl. I (1839) 13. – Type: Material not located.

Alpinia involucrate Griff., Not. Pl. Asiat. 3 (1815) 422. – Type: Material not located.

Alpinia campanaria Ridl., J. Straits Branch Roy. Asiat. Soc. 86 (1927) 308. – Type: *H.N. Ridley* (20 December 1920) (holo K), Peninsular Malaysia.

Description. — A robust herb, stems closely tufted, up to 2–3.5 m. Leaves lanceolate, about 22–46.5 cm x 3–9.5 cm, glabrous except for short-hairy base of midrib beneath and sometimes the edges toward the apex, apex acute or shortly acuminate and very shortly pointed; cuneate leaf base (wedge-shaped, triangular and tapering to a point at the base, petiole 0.5–1 cm long, more or less hairy beneath; ligule truncate (with the apex or base squared at the end as if cut off), to 1 cm long, short hairy. Inflorescence terminal, paniculate, racemiform, erect, pubescent, 15–32 cm long, peduncle 3.5 – 8.5 cm long; lateral branched of inflorescence 0.5–6 cm, rachis cincinnate bearing

1–5 flower (Indarto 6). Bracts with linear nerved, lanceolate, 12 x 1-1.5 cm, apex acuminate, the lowermost of bracts much longer, 15.5 x 1-2 cm (*D. Sulistiarini* 79). Flowers white-yellowish (*D. Sulistiarini* 79), calyx tubular, about 1 cm long, white, corolla tube terete about 1 cm long, 3 lobed, margin of corolla ciliate, white, labellum spatulate, white veined with reddish. Fruit obovate, crowned with persistent calyx, glabrous, rugose when dry, diam. 1-1.4 cm.

Vernacular Names.— Lengkuas merah (Indonesian), Laja (Sundanese), Laos (Javanese).

Distribution. — Peninsular Malaysia, Singapore, Sabah, Kalimantan, Philippines.

Habitat and Ecology. — Secondary forest about 300 m alt (*Indarto* 6), cultivated at village (*D. Sulistiarini* 79) or Kebun Obat (*Taopik Ridwan s.n.*).

Uses. — The rhizome is generally used as spice or source of essential oil and widely used in traditional medicine, in skin diseases, respiratory diseases, as a stomachic after childbirth, for intestinal problems, cancer of mouth and stomach and as an expectorant. In Java, the grated rhizome with a little salt is given on an empty stomach for an enlarged spleen. In the Philippines the rhizome are considered carminative and stimulant. The flowers and the young shoots are used as vegetable or as aspic. The compound galangin dyes wool yellow and yellowish-green with appropriate mordants. The seeds have the same taste and odour as the rhizome and are prescribed in Peninsular Malaysia in colic, diarrhoea, vomiting and herpes. An infusion of the leaves is taken as a post-partum medicine (Ibrahim Halijah 2001).

Specimens examined.— INDONESIA, West Java, Kebun Obat Unik Konservasi Budidaya Biofarmaka IPB Darmaga Bogor, 250 m alt., *Taopik Ridwan s.n.*, 2 sheets (BO); Indonesia, West Java, Tamanjaya, 29 Jan. 1984, *D. Sulistiarini* 79 (BO); Indonesia, West Java, Jasinga, Haur Bentes, 300 m alt., 20 March 1986, *Indarto* 6, 2 sheets (BO); Indonesia, Cultivated in Djerokarta, *leg.ign. s.n.* (BO); Cultivated in Hort. Bog. Java, *C.H.B. No. XV. K.B. LX VII. 5*, 2 sheets (BO).



Figure 3:
Family: ZINGIBERACEAE
Botanical Name: *A. galanga*

4. *A. scabra* (BL.) Burk.

Alpinia scabra (Blume) Naves, Nov. app. (1880) 226.

Syn.

Basionym: *Hellenia scabra* Blume, Enipl, Javae (1827) 60. — *Languas scabra* (Blume) Burkill, Gard. Bull. Straits Settle. 6 (1926). — Type: *H. Kuhi* & *J.C. van Hasselt* s.n. (September) (holo L), Hariang.

Description. — Stems 2-3 m. tall when flowering. Leaves 35.6-48.5 by 4.95-8.2 cm. oblong, edges with scattered stiff hairs, apex rather shortly acuminate, base cuneate, lower surface short-hairy or sometimes almost glabrous; petiole to about 1 cm. long; ligule to 1 cm. long, usually with 2 or 3 large branches (3.4-13.3 cm. long) in the lower part, the branches in the axils of long sheaths; apical portion, bearing short cincinni only, 20-30 cm. long; rachis rather stout, short-hairy or almost glabrous. Primary bracts towards base of inflorescence very small; towards apex up to 8 mm. long. Stalks of cincinni 1-2.5 cm. long; up to 6 flowers on each. Secondary bracts about 1 mm. long. Pedicel slender, about 5 mm. long; ovary at flowering about 1 mm. long. Calyx 5 mm. long, broadly, tubular, white, unequally 3-lobed, tips of lobes shortly pointed, hairy. Corolla tube slender, 8 mm. long; lobes about 10 mm. long, white. Labellum shorter than the corolla-lobes, white, cleft almost to the base, the two halves bilobed with narrow apical and wider lateral lobe. Filament elongating to nearly 1 cm.; anther 5 mm. long with a small crest. Staminodes hardly 1 mm. long, tooth-like, at base of lip. Fruit round, smooth, black, 10-12 mm. diameter, containing few seeds.

Vernacular Names.— Lengkuas Raya.

Distribution. — Java (probably Sumatra also) and Malay Peninsula.

Habital and Ecology. — It is common at moderate elevations (1,000-3,000 feet) on mountains in all parts of Malaya, and in the lowlands in N, Johore at least, and has been collected many times. Ridley describes the lip as bifid, the lobes are bilobed, much as in *A. melanocalpa*, but the median cleft much deeper.

Uses. — The leaves and rhizomes of *A. scabra* were used to perform preliminary cytotoxic tests against selected human cancer cell lines, namely MCF7 (hormone-dependant breast carcinoma cell line), HT29 (colon carcinoma cell line) and SKOV-3 (ovarian cancer cell line) by using an *in vitro* neutral red cytotoxicity assay.

Specimens examined.— INDONESIA, Mt. Halimun NP, West Java, Mar 10, 2000, W. S. Hoover 32822 (BO); Lensi Jamang, Cisarua, Mt. Halimun NP, West Java, alt. 900m, Jul 14, 2000, Asep sadidi & Dian Komara, 485 (BO); Mt. Halimun NP, West Jawa, alt. 700m, July 17, 2002, Gravendeel & De Wilde & Hovenkanp & Wiriadinata & students, 571 (BO); Citalahab, Mt. Halimun NP, West Java, alt. 1100m, Mar 20, 2004, 2283 (BO); Cikniki to Kendong, Mt. Halimun NP, West Java, Mar 9, 2000, H. Wiriadinata & J. Hunter, alt. 1000-1200m, 31448 (BO); Mt. Kendong, Mt. Halimun NP, West Java, alt. 900-1000m, Mar 7, 2000, W. S. Hoover & J. Hunter, 32709 (BO).



Figure 4:
 Family: ZINGIBERACEAE
 Botanical Name: *A. scabra*

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