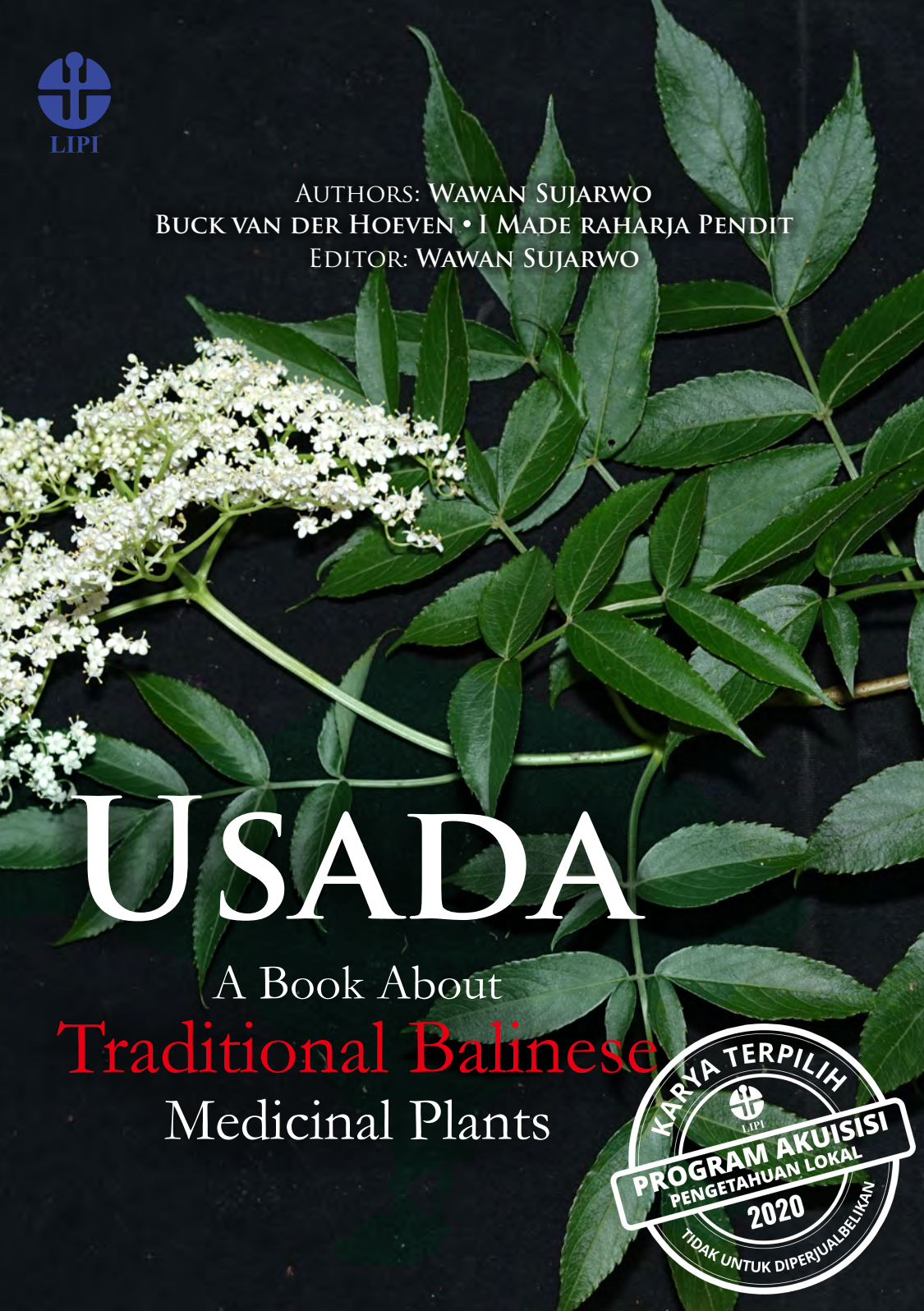

LIPI

AUTHORS: WAWAN SUJARWO
BUCK VAN DER HOEVEN • I MADE RAHARJA PENDIT
EDITOR: WAWAN SUJARWO

USADA

A Book About Traditional Balinese Medicinal Plants

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A Book About Traditional Balinese Medicinal Plants

LIPI Press

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PUBLISHER'S NOTE

LIPI Press, as a scientific publisher, has the responsibility to produce high-quality scientific publications. The fulfillment of this statutory obligation is one of the publisher's roles in promoting the educational and intellectual life of the nation as mandated by Preamble of the 1945 Constitution.

This book entitled *Usada: A Book about Traditional Balinese Medicinal Plants* presents various types of medicinal plants Bali Botanical Gardens along with the information on their uses by the people of Bali.

We hope that this book will aid the readers in finding sources of information on the diverse range of plants that have been used for centuries as traditional medicine in Bali. It is of our expectation that this book will also become a useful reference for researchers, policy makers, and botany enthusiasts who are interested in medicinal plants. Finally, we thank all those who made this publication possible.

LIPI Press

FOREWORD

Bali Botanic Garden is an ex-situ conservation institution that plays an important role in the preservation of Indonesian plant species. Some of the collections in Bali Botanic Garden share a close relationship with Balinese Hinduism, e.g. medicinal plants. Balinese indigenous knowledge of the various types of plants used as medicine has been documented in a sacred book called *Lontar Usada Bali*. It is an ancient book about traditional Balinese medicine, written on coconut (*lontar*) leaves. A collection of medicinal plants is planted in a complex called Usada Park in the gardens as an attempt to raise a public awareness about these ancient plants and their special healing properties.

One of the efforts to support plant conservation activities is to disseminate information about the types of medicinal plants collected by Bali Botanic Garden along with the information on their uses by the people of Bali.

Lastly, I would like to thank the researchers and writers who have tried wholeheartedly and all those who have helped in the preparation of this book. I wish this book will be able to add to

the readers' insight in learning about the diverse range of plants that have been used for centuries as traditional medicine in Bali.

Bali, June 2019

Dr. Bayu Adjie
Director of Bali Botanic Garden
Indonesian Institute of Sciences (LIPI)

PREFACE

Plants and their properties have always been an interest of many Indonesians. In Bali, plants have been used as treatments for all kind of diseases for generations. Unfortunately, these plants, especially their traditional medicinal uses, have not been widely documented. Therefore, it gave us the inspiration to write a book about Balinese medicinal plants in English in the hope of attracting global attention. It will be the first popular book which is written in English about Balinese medicinal plants and could provide the foundation for further interest and research in this area. We are very grateful to have the opportunity to write this book and we hope that it will be interesting not only for researchers and academics, but also for common botany enthusiasts who are interested in medicinal plants.

This book was written through a collaboration of three people along with the cooperation of the employees of the Bali Botanic Garden. These employees work under the Indonesian Institute of Sciences (LIPI). They have the knowledge of the plants in question and have helped us immensely by documenting the medicinal uses and the method of how these plants may be prepared. This cooperation resulted in the book that you now have in your hand.

We hope you enjoy reading this book and hopefully you will find it to be greatly useful.

Bali, June 2019

Authors

PROSPECTS IN BALINESE MEDICINAL PLANTS

Medicine is very advanced and of a superior quality, but the medicine practise we know today is very different from that over the course of history, from ancient beliefs and folklore to the highly advanced experts we have now. This does not mean that the practises in ancient times were wrong. A lot of the decoctions and potions they made in the mid-centuries had real applications and truly helped people. The placebo effect was an issue and there were also a lot of illegal practises that were based on influencing the mind instead of really curing people of an illness. However, this does not mean they were all faulty. A good explanation for the weaker effects is the doses of the medicinal compound in the medicine itself (Sujarwo et al. 2017). When a plant decoction truly cured people, it is required that the plants have some sort of biological activities, i.e. antibacterial, anti-inflammatory, antioxidant, etc. (Ramawat et al. 2009; Sujarwo et al. 2015).

A lot of people prefer natural products instead of synthetic products to cure diseases. They are convinced that nature will provide everything the human body needs and synthetic products are often considered toxic for the body or have a lot of negative side effects (Sujarwo, 2015). For these people, homeopathic products

provide a solution. To extend the scale of homeopathy, i.e. the amount of diseases that can be cured, and to have it accepted as a real medicine practise, researches are required of a vast array of different plants. Tropical plants are known for having medicinal properties, but the amount of tropical plant species and the lack of research about them are holding development back. To get a better understanding, further research is required. However, the plants used by native people might be not known to research facilities throughout the world. A starting point for research could be a book about a small area where native medicinal practises are used. The small island of Bali in the Indonesian archipelago is such a place. The area contains tropical plants used for medicine by the native people. The native Balinese who practise traditional medicine call it *usada* in their native tongue. The term comes from a Sanskrit word, *ausadhi*, meaning plants that are used for medicinal purposes. This *usada* knowledge was originated from India and spread out to Bali in the 5th century (Nala, 1993). In this book, the term *usada* will refer to the traditional medicine practised in Bali (Sujarwo et al. 2016).

There are many books written in Indonesian about the practise of Balinese medicinal plants (*usada*), and to the best of researchers knowledge, there are none written in English. Indonesian Institute of Sciences (LIPI) wanted to change that fact and would like to contribute to the documentation of Balinese medicinal plants. This documentation is important to avoid loss of Balinese ethnobotanical knowledge as well as plant diversity in the middle of rapid modernisation and globalisation. Also, this book is intended to introduce *usada* Bali to the international audiences and to get more attention at the global level. Bali Botanic Garden is a part of LIPI and has a special area devoted to such plants called "Usada Park". So far, the garden has 332 species of typical Balinese medicinal plants within the collection (Kebun Raya Bali 2018).

The book will not be very scientific, i.e. minimising botanical terms, but rather inducing more interests in the practise of traditional Balinese medicinal plants and could be a good starting point for further research in this area (Tengah et al. 1995; Sujarwo et al. 2015). It could provide a baseline of a research about the medicinal properties of the plants.

In this book, the readers will find some common and uncommon Balinese plants (native to the Malesian region, or even outside this region but cultivated and naturalised within the region) that are used for *usada*. This book is a guide for people who are interested in nature and like to determine a species based on a simple description and photographs. This book will feature 50 species of plants, including their medicinal uses which are totally derived from Balian *usada*, an indigenous medical practitioner who is knowledgeable on plant uses. Also, this book provides, from the literatures, biological activities for each plant. The plant species are currently held within the collections of the Bali Botanic Garden, but they can be obtained everywhere, depending on the habitat suitability, on the island of Bali or even in the wider Malesian region, a floristic region that comprises the political entities of Malaysia, Singapore, Indonesia, Brunei Darussalam, Philippines, East Timor, and Papua New Guinea. Floristic region refers to the region where plant species naturally occur. It is also called floristic kingdom or floral kingdom, any of six areas of the world described by Armen Takhtajan (1986). The regions are Boreal (North America, Europe, northern and central Asia, and North Africa), Paleotropical (African, Indo-Malaysian, and Polynesian subregions), Neotropical (South and Central America), South African, Australian, and Antarctic.

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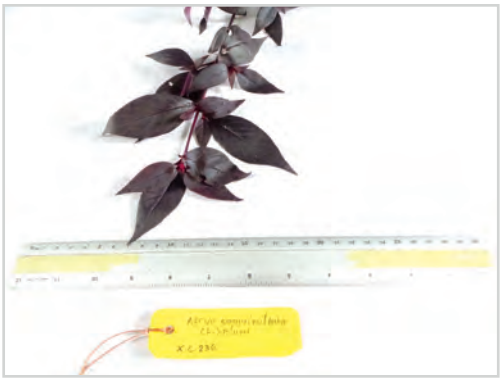
LIST OF MEDICINAL PLANTS



Aerva Sanguinolenta (L.) Blume;
Amaranthaceae

Names:

Bayem barak (Balinese), sambang colok (Indonesian), and kapuok bush (English).

Botanical information:

Aerva sanguinolenta is a shrub that can grow between 0.4 and 1 m tall. The plant is highly recognisable due to its red purplish colored foliage. The stems are strongly velvety due to its whitish or yellowish hairs. The leaves are broadly to narrowly elliptic to lanceolate, narrowed to flat at the base and pointed at the tip with an entire margin. All leaves are densely woolish on both sides due to the white hairs and about 1.5–18 cm long and 0.8–6 cm wide. The flowers are clustered, purple, and about 0.8–8 cm long and 0.4–0.6 cm wide. The petals are densely woolly.

Floristic region (origin):

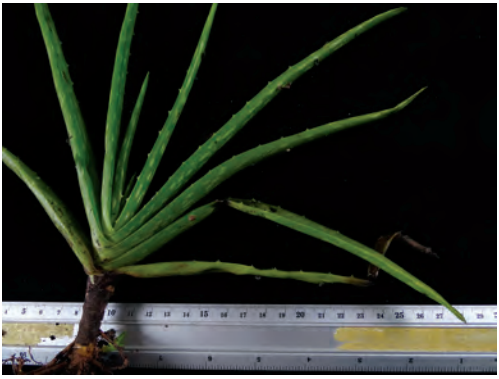
Indian region (Bangladesh, Bhutan, India, Nepal, and Pakistan), Indochina region (Cambodia, Myanmar, Laos, South China, Thailand, and Vietnam), Malesian region (Indonesia, Malaysia, and Philippines).

Medicinal uses:

Decoction of young leaves and stems for diabetes and smooth menstruation.

Biological activities (from the literatures):

Analgesic, anti-inflammatory, antimicrobial, and hepatoprotective.



Aloe vera (L.) Burm.f.;
Xanthorrhoeaceae

Names:

Lidah buaya (Balinese, Indonesian) and aloe (English).

Botanical information:

Aloe vera is a small, light green succulent plant with thick leaves. The color of the stem is the same as its branches, but sometimes brownish due to the quality of the soil in which it grows. There are about 20 leaves growing from the base of an adult plant. It grows in a straight, dense rosette, about 40–50 cm long and 6–7 cm wide. The top side of the leaves is concave, while the bottom side is convex. The top side is grey-greenish and oftentimes reddish. The margin of the leaves is serrate and has spinose teeth. The spices are about 1.5 cm apart from each other, influenced by the plants' age. The blossoms are about 3 cm long and have bright red of color. The fruits are loculicilade capsules and young plants are also often speckled.

Floristic region (origin):

Sudano-Zambesian region (Eritrea, Ethiopia, Oman, Somalia, South Sudan, Sudan, and Yemen).

Medicinal uses:

Aloe vera gel paste is applied to the skin for skincare (skin rejuvenation, anti-acne, sun burn, and haircare (shampoo), while the juice of *Aloe vera* leaves is used as a diuretic.

Biological activities (from the literatures):

Antibiotic, anticancer, antidiabetic, and antifungal.

Ardisia crenata Sims;
Primulaceae

Names:

Mata ayam (Balinese), ardisia (Indonesian), and coralberry (English).

Botanical information:

Ardisia crenata is an evergreen shrub that can grow up to 2 m tall. The stem is woody and brown. The leaves are dark green on their top side and have a leathery texture. They attach alternately, glossy, thick, and elliptic-lanceolate shaped with a crenate margin, in the margin bacteria grows named calluses. The flowers are white to pinkish in color and quite fragrant. The berries are coral to scarlet red with a shiny surface.

Floristic region (origin):

Indian region (India), Indochina region (Myanmar, South China, and Vietnam), and Malesian region (Indonesia, Malaysia, and Philippines).

Medicinal uses:

Ripen fruits are directly consumed for endurance and stamina.

Biological activities (from the literatures):

Antithrombin.

Ardisia humilis Vahl;
Primulaceae

Names:

Lempeni (Balinese, Indonesian) and jetberry (English).

Botanical information:

Ardisia humilis is an evergreen shrub around 3 m tall. The plant has one main stem, and a discoloration pattern of white, green and black. The branches are a key characteristic of this shrub. The leaves are ovate to elliptical shaped, and have a clear midrib. They are about 15–18 cm long and 5–7 cm wide, leathery texture, and glabrous. The margin of the leaves can be entire, serrate, crenate, and undulate depending on age and variety. The flowers are leathery and pink or purplish red of color, and about 0.5 cm broad. The petals are nearly free, ovate and glabrous. The fruits are dull red or purplish black of color and around 0.5 cm in diameter.

Floristic region (origin):

Indochina region (Myanmar, South China, and Vietnam) and Malesian region (Indonesia, Malaysia, and Philippines).

Medicinal uses:

Ripen fruits are directly consumed for endurance and stamina.

Biological activities (from the literatures):

Antibacterial, antimicrobial, and antiplasmodial.

Areca catechu L.;
Arecaceae

Names:

Buah jambe (Balinese), pinang (Indonesian), and betel palm (English).

Botanical information:

Areca catechu is a palm tree with a wide foot containing horizontal rings and it can grow up to 20 m high. The trunk is solitary, slender, erect, and ranging from 20–30 cm in diameter. The leaves are about 1.5–2 m long and pinnate with numerous, crowded leaflets. The flowers are whitish and sweetly fragrant. The fruits are yellow to orange when ripen and about 6 cm long. The seeds are brown, oval, and flattened.

Floristic region (origin):

Malesian region (Philippines).

Medicinal uses:

Ripen seeds are directly consumed for stomach problems and coughing.

Biological activities (from the literatures):

Analgesic, anti-inflammatory, and antioxidant.

Averrhoa carambola L.;
Oxalidaceae

Names:

Belimbing (Balinese, Indonesian), star fruit (English)

Botanical information:

Averrhoa carambola is a shrub that can be multistemmed or solitary, and grows up to 3 or 5 m tall. The stem is light brown, smooth or finely fissured creating roughness. The leaves attach alternate or pinnate, and about15–25 cm long with an entire margin. They are sensitive to touch and will react the same way as certain *Mimosa* species, but not as sensitive as *Mimosa*. The flowers are pentamerous, meaning that they have five parts. The petals surround the purple corolla, and pink of color. The fruits are large and they can grow up to 8 cm long. They have a cross-section characteristic resembling a five pointed star. Unripen fruits will be yellowish green turning orange-yellow when ripen. Each of the cells in the fruits contains five seeds.

Floristic region (origin):

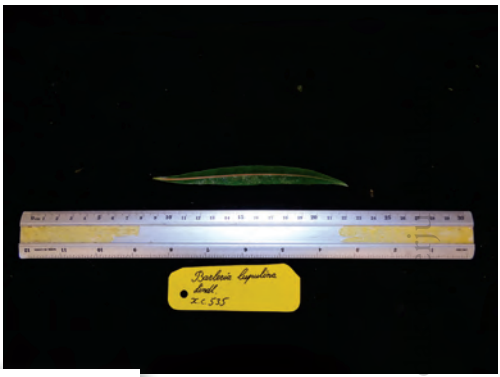
Indian region (India and Sri Lanka) and Malesian region (Indonesia and Malaysia).

Medicinal uses:

The leaves juice serves for heartburn.

Biological activities (from the literatures):

Analgesic and antihyperglycemic.



Barleria lupulina Lindl.;
Acanthaceae

Names:

Landep (Balinese, Indonesian) and hop-headed barleria (English).

Botanical information:

Barleria lupulina is a shrub that is easily recognisable due to its long narrow leaves. The leaves are linear-oblong with elongated sides and the margin entire. However, what sets them apart is their pink to red main veins. The pink reddish color is only found on the upper side of the leaves, whereas the bottom side is green. The flowers have a corolla tube opening up to 1 cm long petals. After germination, the flower creates a capsule with four seeds.

Floristic region (origin):

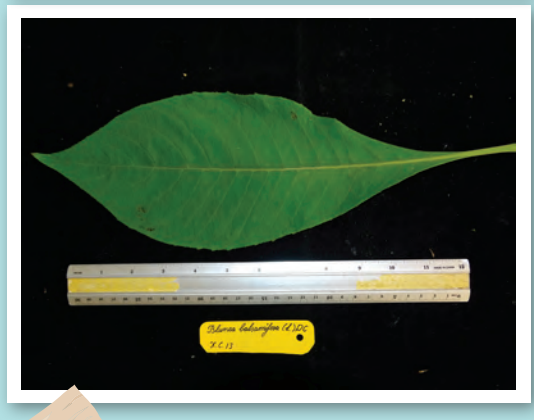
Madagascan region (Madagascar and Mauritius).

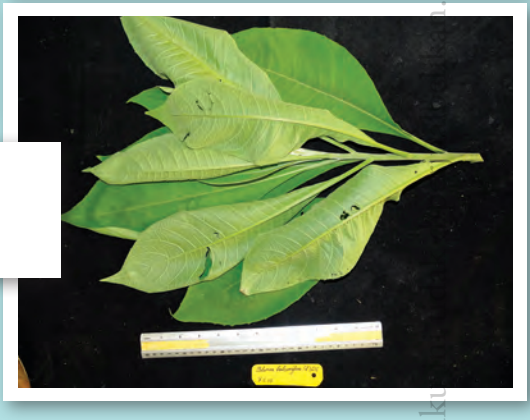
Medicinal uses:

The juice of leaves is applied to the skin as venom antidote and for sprains.

Biological activities (from the literatures):

Antibacterial and antidiabetic.





Blumea balsamifera (L.) DC.;
Compositae

Names:

Sembung (Balinese, Indonesian) and sambong (English)

Botanical information:

Blumea balsamifera is an evergreen shrub that can grow up to 4 m tall and is strongly fragrant of camphor. The stem is greyish-brown of color and erect, but when cut it can grow additional branches, and the bark is soft. The branches attach terete and have a woolish villous due to yellow-white hairs. The leaves are light green on the top side, velvety with a serrate margin. They are about 6–30 cm long and 1.5–12 cm wide. The blade of the leaf is variable shaped ranging from ovate-oblong to oblong-lanceolate. The flowers are yellowish at the end and clustered in an axillary panicle. The panicle grows up to 10–50 cm long and 6–30 cm wide. A single flower head is about 6–10 mm in diameter. The fruits are slightly curved and have an obscure 5-ribbed achene. They are brown with a few short hairs sparsely attached.

Floristic region (origin):

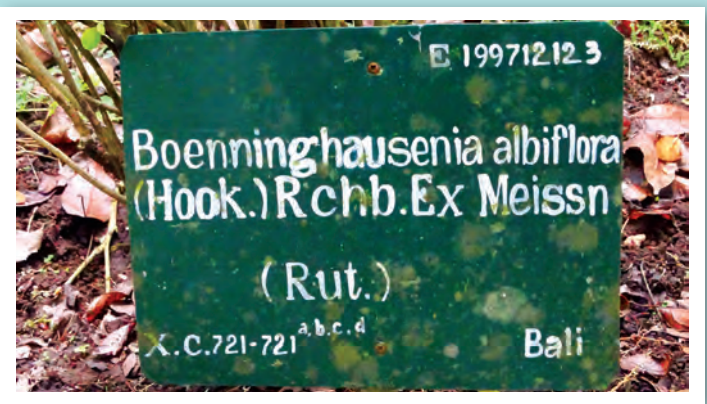
Indian region (Bangladesh, India), Indochina region (Cambodia, Myanmar, Laos, South China, Thailand, and Vietnam), and Malesian region (Indonesia, Malaysia, and Philippines).

Medicinal uses:

Decoction of leaves for fever, heartburn, and bronchitis.

Biological activities (from the literatures):

Anti-inflammatory, antimicrobial, antioxidant, antiplasmodial, antitumor, and hepatoprotective.



Boenninghausenia albiflora (Hook.) Rchb. Ex Meisn.; Rutaceae

Names:

Ingu (Balinese), kelor hutan (Indonesian), and white Himalayan rue (English).

Botanical information:

Boenninghausenia albiflora is a shrub that can grow up to 1 m tall. The leaves are small, and resemble the common Rue (*Ruta graveolens*), but more glaucous and finely divided. The leaves are alternately arranged on the twig divided by 3 or 5 pinnate with an entire margin. The leaflets are about 0.5–1.5 cm long and 0.5–1 cm wide. The stem is brownish-red and can be a bit velvety. The flowers are small, and grow on a large panicle. The white petals are about 0.5 cm long and oblong shaped. The fruits are about 0.5 cm in diameter and when ripen split in distinct fruitlets.

Floristic region (origin):

Indian region (Bangladesh, India, Nepal, and Pakistan), Indochina region (Cambodia, Laos, Myanmar, South China, and Thailand), Malesian region (Indonesia, Malaysia, and Philippines).

Medicinal uses:

Decoction of leaves for fever, rheumatism, and heartburn.

Biological activities (from the literatures):

Antibacterial.

Centella asiatica (L.) Urb.;
Apiaceae

Names:

Piduh (Balinese), pegagan (Indonesian), and centella (English).

Botanical information:

Centella asiatica is a green perennial herb and has creeping stolons. It can grow up to 20 cm long. The plant produces multiple green stems with single leaf. The stems are thin, long, and do not have a scent. The leaves are kidney shaped with a crenate margin.

Floristic region (origin):

Indian region (Bangladesh, Bhutan, India, Nepal, Pakistan, and Sri Lanka) and Malesian region (Indonesia, Malaysia, and Philippines).

Medicinal uses:

Decoction of leaves for diabetes, bronchitis, fever, haemorrhoids, and increasing memory.

Biological activities (from the literatures):

Antibacterial, antifeedant, antifilarial, antileprotic, antistress, and antitubercolosis.

Cinnamomum sintoc Blume;
Lauraceae

Names:

Sintok (Balinese, Indonesian, English).

Botanical information:

Cinnamomum sintoc is a tree that can grow up to 40 m high. The trunk is dark brown or grey-brown. The bark is smooth or finely fissured. The inner bark is reddish and has strong cinnamon fragrant. The leaves are about 7–22 cm long and 3–8.5 cm wide, elliptic to ovate-lanceolate shaped, light green on the top side and greyish green on the bottom side. They are leathery and attach opposite to the twigs. The margin of the leaves is sinuous and can be a characteristic for determining the plant. When the leaves are crushed, they produce a cinnamon-like scent.

Floristic region (origin):

Indochina region (Cambodia, Laos, Thailand, Vietnam), Malesian region (Indonesia, Malaysia, the Philippines).

Medicinal uses:

Bark paste is applied to the skin for swelling and wounds.

Biological activities (from the literatures):

Anticandidal and antidermatophytic.

Clerodendrum buchananii (Roxb.) Walp.; Lamiaceae

Names:

Kembang agoda (Balinese, Indonesian) and pagoda flower (English).

Botanical information:

Clerodendrum buchananii is a tree with easily determined green leaves. The leaves are about 7–20 cm long and 6–17 cm wide with a serrate margin, shaped like a heart (cordate), and have a clear midrib. The flowers are pink or red and bell shaped, all of them grow in a terminal panicle. The panicle can grow up to 45 cm long. The fruits are fleshy and turn from red to dark purple, it contains one seed.

Floristic region (origin):

Indian region (India) and Malesian region (Indonesia and Malaysia).

Medicinal uses:

Juice of roots is applied to the skin for rheumatism.

Biological activities (from the literatures):

Anti-inflammatory, antimalarial, antimicrobial, and antioxidant.

Coffea robusta L. Linden;
Rubiaceae

Names:

Kopi robusta (Balinese, Indonesian) and robusta coffee (English).

Botanical information:

Coffea robusta is a small tree that produces the famous Robusta coffee beans. It can grow up to 12 m high, but usually smaller. It tends to grow like an umbrella. The tree is easily recognised for its broad leaves. The leaves are elliptic with an apiculate point with an entire margin. The beans are in clusters together on the branches and grow on axillar or stem node. They are green and red when ripen.

Floristic region (origin):

Guineo-Congolian region (Cameroon, Congo, and Nigeria).

Medicinal uses:

Decoction of seeds powder for inducing relaxation.

Biological activities (from the literatures):

Antibacterial and antioxidant.

Coix lacryma-jobi L.;
Poaceae

Names:

Jali-jali (Balinese, Indonesian) and adlay (English).

Botanical information:

Coix lacryma-jobi is an annual to perennial grass that can grow up to 3 m tall. The leaves are linear-oblong to cordate shaped at the base and acuminate at the top. The leaves' sheaths are on the stem and they grow up to 6 cm long. The stem is hard and strong. One of the characteristics of the plant is the berries which grow on the top of stems. The berries range from white, beige, and brown or green in color.

Floristic region (origin):

Malesian region (Indonesia and Malaysia).

Medicinal uses:

Decoction of seeds for diarrhea and seed paste is applied to the skin for skincare.

Biological activities (from the literatures):

Anticancer and antitumor.

Cordyline fruticosa (L.) A.Chev.;
Asparagaceae

Names:

Andong (Balinese, Indonesian) and cabbage tree (English).

Botanical information:

Cordyline fruticosa is a shrub which is easily recognisable due to its colorful leaves. The leaves are lancet shaped with an entire margin, and about 20–60 cm long and 10–15 cm wide. They are pink and green, featuring large splashes of Bordeaux red. The colorisation also depends on the cultivation. The stem is long and thin. The seeds are shiny black, and the fruits are spherical and shiny red. The plant is used by many tribes for various purposes. Therefore, the plant is widely cultivated.

Floristic region (origin):

Indian region (Bangladesh), Indochina region (Cambodia, Laos, Myanmar, South China, Thailand, and Vietnam), Malesian region (Indonesia, Malaysia, New Guinea, and the Philippines), and Northeast Australian region (Australia).

Medicinal uses:

Drink the decoction of roots for stamina increase and diarrhea.

Biological activities (from the literatures):

Antimicrobial.

Cordyline rubra Otto & A.Dietr.;
Asparagaceae

Names:

Andong merah (Balinese, Indonesian) and palm lily (English).

Botanical information:

Cordyline rubra is a shrub with a woody base and colorful leaves. The leaves are Bordeaux red with a purplish tint, sometimes can be pink, but it is unusual. They are about 15–50 cm long, 3–5.5 cm wide, and narrow-elliptic shaped with an antire margin. The petiole is 5–20 cm long and gradually flattened towards the base of the leaf. The panicles are about 20–40 cm containing reddish flowers with small petals. The fruits are red and about 1 cm in diameter. The plant is different from other *Cordyline* species, i.e., *Cordyline fruticose*, in which the stem is beige or brown.

Floristic region (origin):

Northeast Australian region (Australia).

Medicinal uses:

Leave decoction for heartburn.

Biological activities (from the literatures):

Antibiotic, anticholesterol, antifungal, and antimicrobial.

Curcuma sylvatica Valeton;
Zingiberaceae

Names:

Temu-temuan (Balinese, Indonesian) and curcuma (English).

Botanical information:

Curcuma sylvatica is an annual herb. The leaves are light green on both sides and elliptic-lanceolate shaped with sinuate margin. A leaf has a midrib and side veins which are clearly visible at the upper side. The veins create a lobulated margin. The leaves are narrower than *Curcuma domestica*. The flowers are white and the petals grow in a crown formation with pink or purplish tips. The stem of the flower is green, and grows in a similar form as the main stem.

Floristic region (origin):

Malesian region (Indonesia).

Medicinal uses:

Rhizomes for stamina increase.

Biological activities (from the literatures):

Anti-inflammatory and antioxidant.

Epiphyllum crenatum (Lindl.) G. Don; Cactaceae

Names:

Wijaya kusuma (Balinese, Indonesian) and crenate orchid cactus (English).

Botanical information:

Epiphyllum crenatum is a succulent plant with no leaves. The leaf-like parts are actually thickened stems or branches. The stem is hard and rough. The plant belongs to the cacti family and also demonstrates some characteristics of a cactus. The margins are notched or scalloped. The main indicator is the lack of small veins in the green area and new leaf-like parts can grow from the veins. The flowers grow at the base of a stem about 18–29 cm long and 10–20 cm in diameter. The flowers start with green and then form a yellowish white flower, it can also be reddish amber. The outer petals are disconnected from each other. The inner tepals can grow as long as the outer and it has white or sometimes yellowish color. The flowers open in at night and produce a pleasant fragrant.

Floristic region:

Caribbean region (Belize, El Savador, Guatemala, and Honduras) and Madrean region (Mexico).

Medicinal uses:

Flower decoction for hepatitis.

Biological activities (from the literatures):

No report.

Euchresta horsfieldii (Lesch.) Benn.;
Leguminosae

Names:

Pranajiwa (Balinese, Indonesian, English).

Botanical information:

Euchresta horsfieldii is a shrub which has a brown woody rough-texture stem. The new twigs are also woody and strong in structure with little flexibility. The leaves are green and possess a smooth texture. They are oftentimes oblique elliptic with a lanceolate tip and an entire margin. A leaf is about 13 cm long and 5 cm wide. The side veins are less visible than midrib, but on the bottom side of the leaf, the side veins are more visible. The fruits are a bit elongated and green.

Floristic region (origin):

Malesian region (Indonesia).

Medicinal uses:

Ripen seeds are directly consumed as a health tonic for stamina increase.

Biological activities (from the literatures):

Anticancer and antioxidant.

Ficus quercifolia Blume;
Moraceae

Names:

Uyah-uyah (Balinese, Indonesian) and figs (English).

Botanical information:

Ficus quercifolia is a tree which has a woody base and is recognised by the shape of its leaves. The leaves are pinnatifid shaped with an undulate margin, strong, green, and rough in the base. The bark is hard and cannot be scratched open. The upper surface of the leaf is smooth, whereas the bottom surface is rough. The fruits are light to darker green when unripen. Red and yellow fruits are indicators of ripeness and can be more easily opened. The inside of the fruit have many brown seeds with a sweet scented sticky liquid.

Floristic region (origin):

Malesian region (Indonesia, Malaysia, and Philippines).

Medicinal uses:

The juice of aerial roots are applied to the skin for antidote.

Biological activities (from the literatures):

No report.

Gardenia jasminoides J.Ellis;
Rubiaceae

Names:

Jempiring (Balinese), kacapiring (Indonesian), and cape jasmine (English)

Botanical information:

Gardenia jasminoides is a shrub or small tree with a woody stem that can grow up to 2 m tall. It has a smooth stem which is usually beige or brown. The green leaves grow on brown woody twigs. A specific characteristic is the horizontal groves that grow every 2.5–3 cm apart on the twigs. The leaves are green, smooth, and leathery with one midrib. The leaves are lanceolate shaped with a sinuate margin. The flowers are 5–10 cm in diameter, white with a strong sweet scent. There are many cultivars differentiated by the flowers. When the flowers are old, they are oftentimes turn into yellowish cream.

Floristic region (origin):

Eastern Asiatic region (China, Japan, Korea, and Taiwan).

Medicinal uses:

Drink the decoction of leaves as a diuretic.

Biological activities (from the literatures):

Anti-angiogenic, antihyperlipidemic, and antioxidant.

Graptophyllum pictum (L.) Griff.;
Acanthaceae

Names:

Don temen (Balinese), daun ungu (Indonesian), and caricature-plant (English).

Botanical information:

Graptophyllum pictum is a large shrub that can grow up to 3 m tall. The stem is woody, strong, brown or beige of color, and smooth texture. However, some parts of the stem can be rough, especially near the base. The leaves are Bordeaux red on the topside and greenish to slightly orange on the bottom side with a smooth leathery texture. They are about 10–15 cm long, broadly ovate shaped, and pointed at both ends with a sinuate margin. The flowers are purple and about 3–12 cm long. The corolla is crimson purple, funnel shaped, and about 2–3 cm long.

Floristic region (origin):

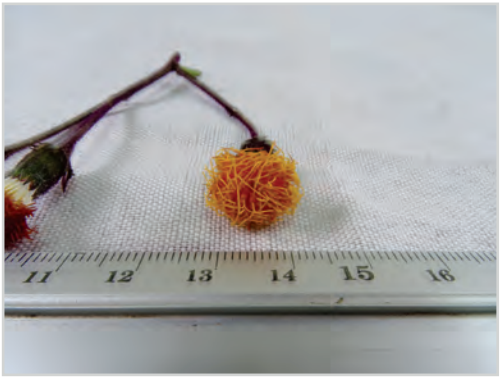
Malesian region (Indonesia and New Guinea).

Medicinal uses:

The juice of leaves is applied to the skin for skincare benefits.

Biological activities (from the literatures):

Antibacterial, anti-inflammatory, and antioxidant.



Gynura aurantiaca
(Blume) Sch.Bip. ex DC.:
Compositae

Names:

Daun dewa (Balinese), umyung (Indonesian), and purple passion (English).

Botanical information:

Gynura aurantiaca is a perennial shrub with a woody base that can grow between 60 and 90 cm tall. The green leaves are recognisable due to their purple hairs that grow upon them, giving the impression that they are purple. The leaves are ovate with a serrate margin. During the spring, the plant produces flowers which are orange-yellow. The inflorescence is a corymb. The berries grow at the shoot stem, green of color, and are also covered with purple hair.

Floristic region (origin):

Malesian region (Indonesia, Malaysia, and Philippines).

Medicinal uses:

Decoction of young stems and leaves for liver problems and hepatitis.

Biological activities (from the literatures):

Antiviroid.

Hibiscus rosa-sinensis L.;
Malvaceae

Names:

Pucuk (Balinese), kembang sepatu (Indonesian), and Chinese hibiscus (English).

Botanical information:

Hibiscus rosa-sinensis is a shrub that can grow up to 2.5 m tall. Its woody stems do not contain any lenticels. The leaves are green, and sometimes have visible yellow spots. They are glossy, solitary, ovate shaped with an acute tip, and the margin is serrate. The plant is easily determined by its large red flowers which are conspicuous, trumpet shaped. Since there are many cultivation, the wild and cultivated species are very different. The flower always has 5 petals with prominent orange tipped red anthers.

Floristic region (origin):

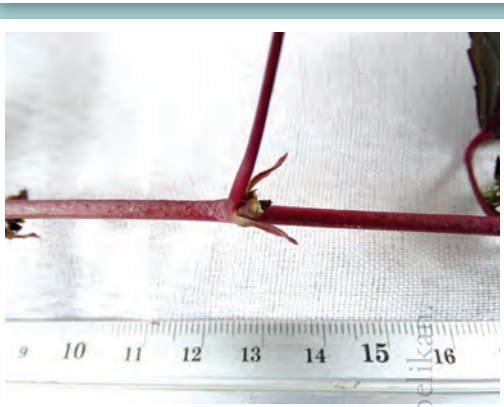
Eastern Asiatic region (China, Japan, Korea, and Taiwan).

Medicinal uses:

Decoction of young leaves for facilitating labor.

Biological activities (from the literatures):

Analgesic, antibacterial, antidiabetic, and antioxidant.



Hibiscus sabdariffa L.; Malvaceae

Names:

Rosela (Balinese, Indonesian) and roselle (English).

Botanical information:

Hibiscus sabdariffa is an erect shrub that grows up to 3.5 m tall. Old stem is brown and smooth texture. The stem has a deep penetrating taproot. The younger branches and twigs are purplish red of color. The leaves are palmate shaped with a serrate margin. They are mainly dark green to purplish red. One leaf has five main veins and grows into the filament. The flowers are large and colored in a lighter pink than the twigs and leaves. The fleshy sepals become enlarged and succulent. Therefore, they make an excellent jelly. The capsules of fruits are ovoid and hairy. They are about 5 cm long and 5.3 cm wide.

Floristic region (origin):

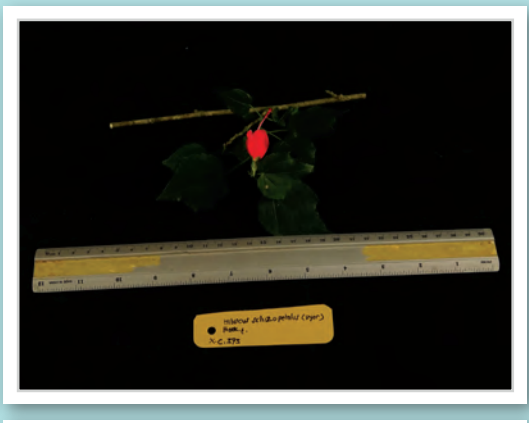
Guineo-Congolian region (Cameroon, Congo, Ghana, Nigeria, and Togo).

Medicinal uses:

Flower decoction for heartburn.

Biological activities (from the literatures):

Antibacterial, antifungal, and antimicrobial.



Hibiscus schizopetalus (Dyer) Hook.f.;
Malvaceae

Names:

Pucuk (Balinese), kembang sepatu gantung (Indonesian), and fringed rosemallow (English).

Botanical information:

Hibiscus schizopetalus is a shrub that can grow up to 2–2.5 m tall. The woody stems grow wildly. The young twigs are green, flexible, and slightly smooth. The leaves are soft and less grooved than the previously mentioned, *H. rosa-sinensis*. They are palmate shaped, dark green with a serrate margin. The flowers are not widely open and smaller than other *Hibiscus* species. The drooping pollens resemble Japanese lanterns. Therefore, *H. schizopetalus* is also known as the Japanese lantern as common name. The petals are fringed, recurved, and have a red color.

Floristic region (origin):

Uzambara-Zululand region (Kenya, Mozambique, Tanzania).

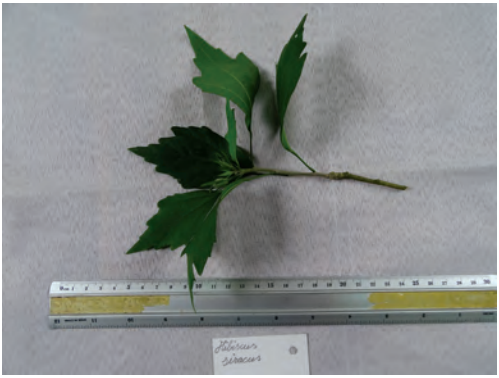
Medicinal uses:

Leaf juice for facilitating labor and heartburn.

Biological activities (from the literatures):

Analgesic, antioxidant, and antipyretic.

Hibiscus syriacus L.;
Malvaceae



Names:

Pucuk (Balinese), bunga sharon (Indonesian), and rose of sharon (English).

Botanical information:

Hibiscus syriacus is a shrub that can grow up to 1.5–2 m tall. The stem is brown and fairly smooth. The number of leaves are less than other *Hibiscus* species. The leaves are about 9 cm long and 4 cm wide, green, smooth, and palmate shaped. They are mostly three-lobed with a serrate margin.The flowers are often pink and can also be dark pink (almost purple), light pink or white, but that also depends on variety. They are open at the top with multiple anthers. The flowers are showy, hollyhock-like, and have more than 5 petals. One main pistil can be identified among other anthers.

Floristic region (origin):

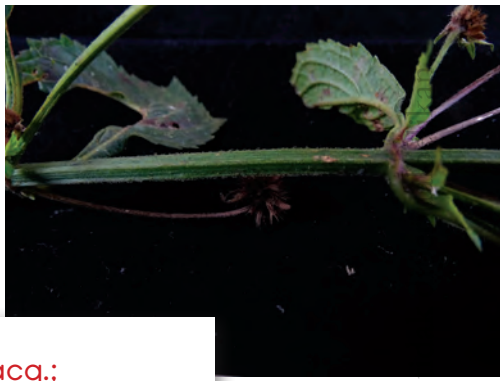
Eastern Asiatic region (China, Japan, Korea, and Taiwan).

Medicinal uses:

Leaf juice for facilitating labor and haircare.

Biological activities (from the literatures):

Anti-inflammatory and antioxidant.



Hyptis capitata Jacq.;
Lamiaceae

Names:

Bube (Balinese), rumput knop (Indonesian), and knobweed (English).

Botanical information:

Hyptis capitata is a green shrub that can grow up to 2 m tall. The stem is green, square, and segmented. When the stem grows old, it can be hollow. The leaves grow on the opposite sides. They are dark green on the topside and lighter on the bottom side. Also, the leaves are broadly elliptic to lanceolate shaped with a serrate margin and have 5–7 pairs of scabrid veins. The flowers are small, white, and grow in a small head at the top/tip of stem. Once the flowers wilt, they will drop off leaving tiny brown spikes. If the spikes are removed from the head, they will then fall apart. The flower and the spike head have a fresh scent when crushed.

Floristic region (origin):

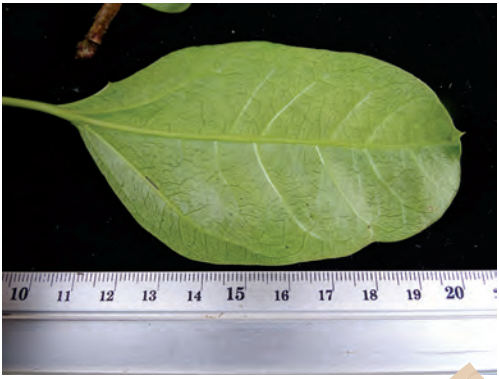
Caribbean region (Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama) and Madrean region (Mexico).

Medicinal uses:

Leaf juice is applied to the skin for skincare.

Biological activities (from the literatures):

Antimicrobial and antioxidant.



Jatropha integerrima Jacq.;
Euphorbiaceae

Names:

Batavia (Balinese, Indonesian) and peregrine (English).

Botanical information:

Jatropha integerrima is an evergreen shrub that can grow up to 4.5 m tall. The bark is brown to beige and has a rough texture. The stem can divide very early, grows multiple branches, and features many bumps that resulted in a rough texture. The leaves are oblong to obovate shaped with a bit sinuate margin. They are green and have a midrib with net veins. The flowers are red and about 1 cm long and usually grow in clusters. The fruits are oval shaped, and about 1–2 cm long. The seeds are approximately 1 cm long.

Floristic region (origin):

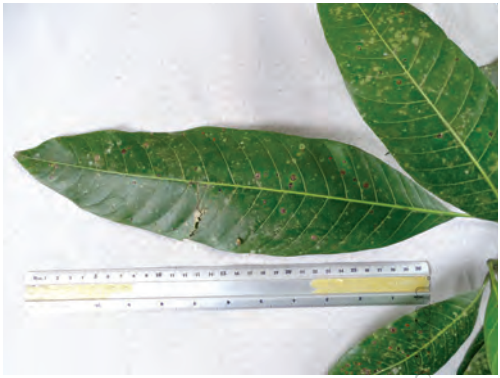
Caribbean region (Cuba, Dominican Republic, Haiti).

Medicinal uses:

The sap is applied to the tooth for dental care.

Biological activities (from the literatures):

Antimicrobial and antioxidant.



Mangifera indica L.;
Anacardiaceae

Names:

Poh (Balinese), mangga (Indonesian), and mango (English).

Botanical Information:

Mangifera indica is very recognisable because the tree is grown from one trunk, but can also consist of multiple branches. It can grow up to 20 m high. The bark is brown with many thin fissures. When a twig is cut, it produces a white latex exudate. A key characteristic is its large leaves, which grow in clusters throughout the whole tree, even on older branches. The leaves are dark green with a midrib and net veins. They are oblong-lanceolate shaped with a bit sinuate margin, leathery, and about 16–30 cm long and 3–7 cm wide. Young leaves are red. Inflorescence is about 16 cm or more in length. The panicle has many small greenish white or pink flowers. The flowers have 5 petals, radially symmetrical, slightly hairy, and a nice scent. Also, the fruit formed is an irregulary egg-shaped fleshy drupe which is slightly compressed. The size is about 8–12 cm long and attached at a stalk. The skin of the fruit is smooth and has greenish yellow to reddish color. The flesh is considered soft, sweet, and juicy.

Floristic region (origin):

Indian region (Bangladesh, India, and Pakistan).

Medicinal uses:

Leaf decoction for diabetes and hypertension.

Biological activities (from the literatures):

Analgesic, antibacterial, antifungal, anti-inflammatory, antioxidant, and immunomodulatory.

Maranta arundinacea L.;
Marantaceae

Names:

Arus (Balinese), garut (Indonesian), and arrowroot (English)

Botanical information:

Maranta arundinacea is a perennial erect herb that can grow up to 1.2 m tall. The main characteristic is the rhizome connection in the roots. The rhizome penetrates more deeply into the soil, hence it is named arrowroot. It can also be recognised by long and thin (ovate-lanceolate shaped), and light green leaves with an entire margin. One leaf is about 25 cm long and 6 cm wide. The leaves grow petiolate from the inside of the stem, which is quite unusual. The stem is light green, strong, and smooth to touch.

Floristic region:

Amazonian region (Colombia and Peru), Brazilian region (Brazil), Caribbean region (Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama), Madrean region (Mexico), and Region of the Guayana Highlands (Venezuela).

Medicinal uses:

Rhizome decoction for heartburn.

Biological activities (from the literatures):

Antidiarrheal and antioxidant.

Medinilla speciosa Blume;
Melastomataceae

Names:

Trijata (Balinese), parijoto (Indonesian), and showy Asian grapes (English).

Botanical information:

Medinilla speciosa is a terrestrial shrub that grows up to 4 m tall. The leaves are rather large, sessile, ovate and elliptic shaped with an entire margin. A leaf is about 21.5 cm long and 12.5 cm wide. The plant produces an exuberant bloom with pink branches and clusters of pink flowers. The flowers have 4 petals, occacionaly 5 petals, and they are about 1 cm in diameter. The berries are about 1 cm in diameter, black and juicy in open ends. The ripen berries are squeezable, while unripen berries are still pink and very hard.

Floristic region (origin):

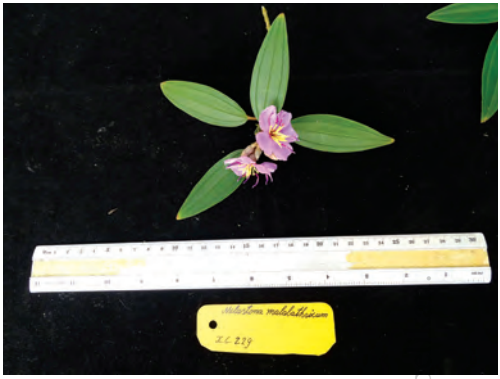
Malesian region (Indonesia, Malaysia, and Philippines).

Medicinal uses:

Fruits juice for stamina increase.

Biological activities (from the literatures):

Antihyperlipidemic and antiobesity.



Melastoma malabathricum L.;
Melastomataceae

Names:

Kedukduk (Balinese), senduduk (Indonesian), and malabar melastome (English)

Botanical information:

Melastoma malabathricum is a shrub or small tree up to 5 m tall with an orange or reddish scaly stem. The leaves are lanceolate shaped and slightly hairy with an entire margin. They are green in color and about 2–15 cm long and 0.6–6.5 cm wide. The hairs can make the leaves smooth if touched towards the tip, but rough when stroked towards the base. Mostly hairs are white, but there are few that can be red. The midrib is clearly visible on both upper and lower sides. The flowers are up to 8 cm wide, purple with a brownish red and white hairy head. The fruits are about 0.5 to 1 cm spherical and can open at the top. Ripen fruits are soft, dark purple, and sweet pulp that can stain the tongue.

Floristic region (origin):

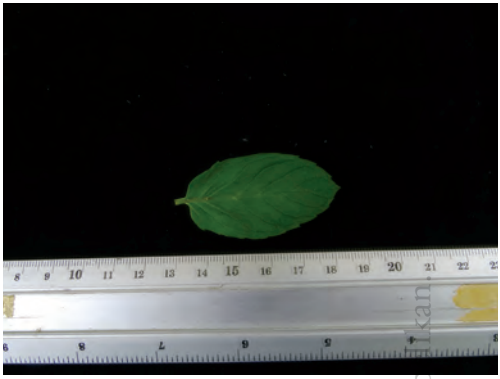
Eastern Asiatic region (China, Japan, Korea, and Taiwan), Indian region (Bangladesh and India), Indochina region (Cambodia, Laos, Myanmar, Thailand, and Vietnam), Malesian region (Indonesia, Malaysia, and Philippines), and Northeast Australian region (Australia).

Medicinal uses:

Leaf juice is applied to the skin for skincare.

Biological activities (from the literatures):

Anti-inflammatory, antimicrobial, antinociceptive, and antipyretic.



Mentha arvensis L.;
Lamiaceae

Names:

Daun poko (Balinese, Indonesian) and corn mint (English).

Botanical information:

Mentha arvensis is a perennial herb with a red purplish base. It grows between 0.5 and 1 m tall. This herb can grow side twigs from the stem with leaves attached on opposite sides. The leaves are green and have a midrib with side veins. They are smooth, quite flexible, ovate or elliptic shaped with a serrate margin, and the size is about 1.5–5 cm long and 1–2 cm wide. The whole plant has a minty scent coming from the leaves. The flowers are small, white, and grow about 0.5 cm in diameter. They have four petals, separated at the bottom like bell-shaped (campanulate). The flowers are located in clusters at the leaf axils. The fruits are nutlets and contain only a single seed.

Floristic region (origin):

Eastern Asiatic region (China, Japan, Korea, and Taiwan), Indian region (Bangladesh, Bhutan, India, Nepal, and Pakistan), Irano-Turanian region (Armenia, Azerbaijan, Georgia, Iran, Turkey, and Turkmenistan), Mediterranean region (Algeria, Greek, Italy, Libia, Marocco, Spain, and Tunisia), North American Atlantic region (Canada and United States).

Medicinal uses:

Leaf decoction for diarrhea.

Biological activities (from the literatures):

Analgesic, antibacterial, antimicrobial, and antioxidant.

Mirabilis jalapa L.;
Nyctaginaceae

Names:

Kembang sore (Balinese), bunga pukul empat (Indonesian), and four o'clock flower (English).

Botanical information:

Mirabilis jalapa is a perennial herb that grows around 20–30 cm tall. The stem is brown and smooth. The fully grown leaves are shaped like a heart (cordate), whereas the smaller leaves still have an oval shaped with an entire margin. The flowers can be in various colors, have 5 lobes, and are crumpled. The fruit is a false pericarp created from the flowers.

Floristic region (origin):

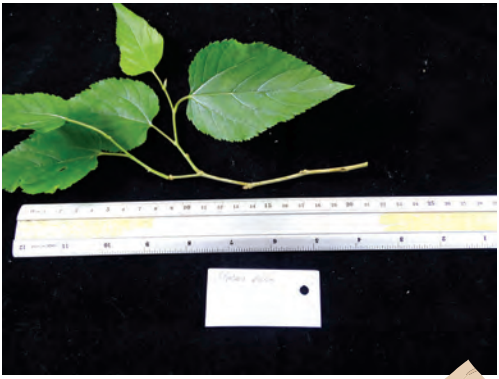
Caribbean region (Guatemala) and Madrean region (Mexico).

Medicinal uses:

Drink the decoction of flowers for stamina increase.

Biological activities (from the literatures):

Antibacterial, antimicrobial, antinociceptive, antioxidant, and antispasmodic.



Morus alba L.; Moraceae

Names:

Besaran (Balinese), murbei (Indonesian), and white mulberry (English).

Botanical information:

Morus alba is a shrub or moderate-sized tree with a smooth greenish beige woody stem when young, but rough caused by vertical fissures when old. It can grow up to 35 m high. The twigs are greenish brown and have leaves attached alternately. The leaves are light green and the midrib is even lighter in color. They are ovate shaped with three-lobed with a serrate margin. The flowers are greenish with four free petals. The fruits consist of many drupes enclosed in a fleshy perianth that can be up to 5 cm long. They are white, pinkish white, purple, or black. Also, they are commonly known as the mulberry.

Floristic region (origin):

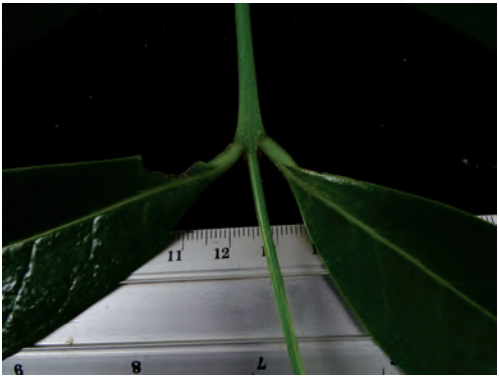
Eastern Asiatic region (China).

Medicinal uses:

Gargle the decoction of roots for dental care or drink the decoction of leaves as a diuretic.

Biological activities (from the literatures):

Antimicrobial, antioxidant, antiproliferative, and antiulcer.



Phaleria octandra (L.) Baill.;
Thymelaeaceae

Names:

Mut (Balinese, Indonesian) and white daphne (English).

Botanical information:

Phaleria octandra is a shrub with a beige brown woody stem and has a very rough texture. There are many lenticels on old stem, whereas younger branches have less lenticels. The leaves are glabrous lanceolate shaped with an entire margin and the blade is about 7.5–23 cm long and 2–10 cm wide. They are green and have a very clear midrib. The bottom side of the leaves are lighter in color than the top side. The flowers grow in a cluster on the end of a woody twig; they are white with a greenish shine. The fruits are sessile and have red skin; the size is about 1 to 1.5 cm long.

Floristic region (origin):

Malesian region (Indonesia, Malaysia, and New Guinea), Northeast Australian region (Australia).

Medicinal uses:

Drink the decoction of leaves for cervical cancer and decoction of dried ripen fruits for hypertension and liver cancer.

Biological activities (from the literatures):

No report.

Phyllanthus urinaria L.;
Euphorbiaceae

Names:

Isep getih (Balinese), meniran (Indonesian), and chamber bitter (English).

Botanical information:

Phyllanthus urinaria is an annual herb, erect that grows up to 60 cm tall. The stems are woody, thin, and the color of the base is brown, but quickly turns to greener. The leaves are arranged alternately. They are simple, glabrous, oblong, sessile, and lanceolate shaped with an entire margin. The topside of the leaves is green and the bottom side is lighter green. The edges of a leaf are clearly visible as it is a little bit thicker than the surface of the leaf. The leaves are large at the tip and smaller towards the petiole. The flowers are in the axils of the leaves. Male flowers grow towards the apex of branchlets, while female flowers are located at the basal parts of the branchlets, both are about 1 mm long. The berries are red, quite small, and covered in bumps. They are hard, but can be opened to reveal a clear inside with reddish fluid.

Floristic region (origin):

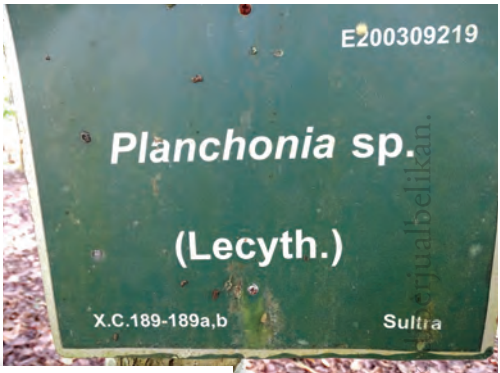
Eastern Asiatic region (China, Japan, Korea, and Taiwan), Indian region (Bangladesh, Bhutan, India, Nepal, Pakistan, and Sri Lanka), Indochina region (Cambodia, Laos, Myanmar, Thailand, and Vietnam), and Malesian region (Indonesia, Malaysia, and the Philippines).

Medicinal uses:

Drink the decoction of leaves for diarrhea.

Biological activities (from the literatures):

Antibacterial, antinociceptive, antiviral, and hepatoprotective.



Planchonia valida (Blume) Blume;
Lecythidaceae

Names:

Kutat (Balinese), putat (Indonesian), and planchonia (English).

Botanical information:

Planchonia valida is a tree with a rough brownish green bark, while older trees have a greyish brown bark. The tree can grow up to 50 m high. The bark is very strong, but can be scraped off with a hard nail. The leaves are cuneate shaped with an entire margin and oftentimes assymatrical. They have a clear midrib with side veins connected all over and grow near the bud of the branch. Some leaves are green, but most of them are orange to red. The flowers are arranged in racemes up to 13.5 cm long. The petals are greenish, and about 1.5–3.5 cm long. The fruits are ovoid to ellipsoid, pale green, and about 1.5–2.5 cm long. The seeds are ovoid.

Floristic region (origin):

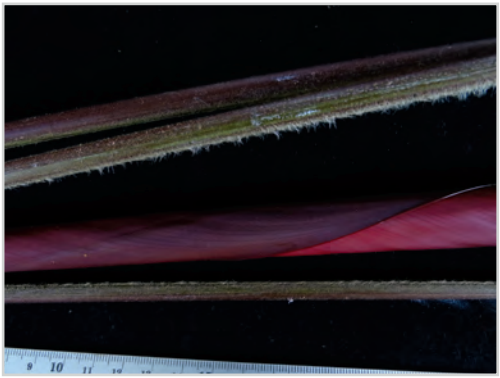
Malesian region (Indonesia and Malaysia).

Medicinal uses:

Drink the juice of the bark for stamina increase.

Biological activities (from the literatures):

Antidiarrheal.



Pleiostachya pruinosa (Regel) K.Schum.;
Marantaceae

Names:

Maranta (Balinese, Indonesian) and wheat calathea (English)

Botanical information:

Pleiostachya pruinosa is a terrestrial herb that grows up to 2.5 m tall. It is very recognizable due to its overly large leaves and color. The leaves are ovate-oblong shaped and about 60–90 cm long and 20–35 cm wide with a serrate margin. The topside of the leaves is dark green, whereas the bottom side is reddish brown to purplish. The flowers grow in inflorescence, alternate, strong, pointy, and dry. The inflorescence is about 15 cm long. When flowering is over, the spike dries out and becomes beige. The stem becomes a terete part of the leaf, smooth, and covered in fine hairs with white to beige of color.

Floristic region (origin):

Caribbean region (Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama) and Madrean region (Mexico).

Medicinal uses:

The juice of roots, stems, and young leaves is applied to the skin for rheumatism and skincare.

Biological activities (from the literatures):

No report.

Plumbago zeylanica L.;
Plumbaginaceae

Names:

Bama (Balinese), daun encok (Indonesian), and Ceylon leadwort (English)

Botanical information:

Plumbago zeylanica is a shrub that may be difficult to recognise because it does not have unique leaves. The twigs are hard and woody. The leaves grow alternately green, smooth, ovate or elliptic-ovate, and about 3 to 7 cm long and 1.5 to 3.2 cm wide with a slightly serrate margin. The flowers are the most recognisable characteristic. They are small and have 5 white petals. A petal is about 0.5 cm long. The flowers grow oftentimes in panicle racemes, after crushing the flowers, they give a pleasant soft scent.

Floristic region (origin):

Indian region (India, Pakistan, and Sri Lanka), Malesian region (Indonesia, Malaysia, and Philippines), and Northeast Australian region (Australia).

Medicinal uses:

The juice of the roots is applied to the skin for skincare and rheumatism.

Biological activities (from the literatures):

Anti-inflammatory, antimycobacterial, and antioxidant.

Plumeria alba L.;
Apocynaceae

Names:

Jepun (Balinese), kamboja putih (Indonesian), and white frangipani (English).

Botanical information:

Plumeria alba is a shrub that is quite bald, especially around the stem area. The stem is very broad, rough, and whitish beige. The leaves are obovate shaped, but the tip is acute in comparison to other *Plumeria* species. They are about 6–22 cm long and 2–7 cm wide, making them quite large, both sides are green in color. Each leaf has a midrib with net veins to the edge of leaves with an undulate margin. The most interesting part is flowers. A flower has 5 white petals and a yellow core. The flowers grow in clusters at the end of a long stalk. The fruit is a dry follicle that splits along one side to release winged seeds.

Floristic region (origin):

Caribbean region, i.e. Belize, Costa Rica, Cuba, Domenican Republic, El Salvador, Guatemala, Haiti, Honduras, Nicaragua, and Panama.

Medicinal uses:

The juice of flowers is applied to the skin for smallpox.

Biological activities (from the literatures):

Antibacterial, anti-inflammatory, antioxidant, and antitumour.

Rhinacanthus nasutus (L.) Kurz;
Acanthaceae

Names:

Manukan (Balinese, Indonesian) and snake jasmine (English)

Botanical Information:

Rhinacanthus nasutus is a shrub that can grow up to 2 m tall with beige woody stems. Although the stem is smooth, it has a lot of bumps that cause the impression of roughness. All leaves grow on green twigs, which are quite flexible and herbaceous. The leaves grow opposite from each other on the twigs, but they can alternate sometimes and have a midrib with net veins to the edge leaves. They are oblong (elongated-shaped) with an entire margin. The shape of flowers is like a bird. One closed petal grows in an extension of the stalk simulating the beak, while the others grow back forming the wings.

Floristic region (origin):

Indian region (India).

Medicinal uses:

The juice of leaves is applied to the skin for skincare.

Biological activities (from the literatures):

Antiallergic, antihemolytic, antihyperlipidemic, antioxidant, and antiviral.

Salvia splendens Sellow ex Schult.;
Lamiaceae

Names:

Salvia merah (Balinese, Indonesian) and scarlet sage (English)

Botanical information:

Salvia splendens is an herb which has a segmented green stem and can grow up to 1 m tall. The stem is very hard and has vertical grooves in the bark. The branches and twigs are segmented, but the segments are close to each other, ranging from 1–3 cm long. The leaves are elliptic shaped, green, and sometimes can be purplish at their base, especially the petiole is purple. They are about 4–7 cm long and 3–5 cm wide with a dentate margin. When the leaves are crushed, it emits a subtle pleasant scent. The flowers are red and grow in a spike-like terminal racemes that are about 15–25 cm long. A flower is about 1 cm long and the twigs are segmented and red in color.

Floristic region (origin):

Brazilian region (Brazil).

Medicinal uses:

The juice of leaves is applied to the skin for skincare.

Biological activities (from the literatures):

Antibacterial and antihyperglycemic.

Sambucus javanica Blume;
Adoxaceae

Names:

Gegirang (Balinese), sangitan (Indonesian), and Chinese elder (English).

Botanical information:

Sambucus javanica is a shrub that can grow up to 2 m tall with beige bark that can peel off from the stem. The bark is soft and squeezable, but it is woody and rough. The leaves are pinnate shaped with a serrulate margin and have the leaflets that occur in 2–6 pairs. Each pinnate is about 6–22 cm long and 6.5 cm wide. The leaflets are oblong to linear lanceolate. The topside of the leaves is light green with one midrib, while the bottom side is greyish and rough as opposed to the topside which is much smoother. Besides, the leaves can be oblique. When the leaves are broken, white string-like are emitted from the veins. They are strong enough to hold the dangling leaf in place. Small white flowers grow in a cymose corymb at the end of inflorescence. The berries are reddish purple and round shaped with a slight scent. Ripen berries are squeezable and the seeds are yellowish beige surrounded by a sticky exudate.

Floristic region (origin):

Indian region (Bangladesh, Bhutan, and India), Indochina region (Cambodia, Laos, Myanmar, Thailand, and Vietnam), and Malesian region (Indonesia, Malaysia, and the Philippines).

Medicinal uses:

The juice of whole plant is applied to the skin for wounds and dermatitis.

Biological activities (from the literatures):

Anti-inflammatory and antioxidant.

Stachytarpheta indica (L.) Vahl;
Verbenaceae

Names:

Pecut kuda (Balinese, Indonesian) and blue snakeweed (English).

Botanical information:

Stachytarpheta indica is a shrub with a beige woody stem. The stem is strong, rough, and green in color. The branches are beige and slightly smoother. However, new twigs are green and smooth. The leaves are green and have a midrib with net veins to the edge leaves. They attach opposite, ovate to elliptic shaped, and about 2–5 cm long and 1–3 cm wide with a dentate margin. Once the leaves are crushed, they give a subtle scent. The inflorescence is a terminal spike. The flowers are purple and have five petals which are about 0.5 cm in diameter.

Floristic region (origin):

Amazonian region (Colombia and Peru), Brazilian region (Brazil), Caribbean region (Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama), Madrean region (Mexico), and Region of the Guayana Highlands (Venezuela).

Medicinal uses:

The leaves decoction drink is for tonsillitis.

Biological activities (from the literatures):

Analgesic, antibacterial, anti-inflammatory, antipyretic, hepatoprotective, and hypoglycemic.

Syzygium polyanthum (Wight) Walp.;
Myrtaceae

Names:

Jangan ulam (Balinese), salam (Indonesian), and Indonesian bayleaf (English).

Botanical information:

Syzygium polyanthum is a tree that can grow up to 30 m high. It has a woody trunk which is soft and can be scratched with a fingernail. Underneath bark is a lightly orange. The twigs are hard and strong with green leaves attached. The leaves are waxy, smooth, strong, and have a clear midrib. They are elliptic or lanceolate shaped, flavourful smell, and are arranged in opposite. A leaf size is about 5–16 cm long and 2.2–7 cm wide with an entire margin. The flowers are creamy white of color and located in clusters at the leaf axil. The fuits are fleshy and round. They are red to purplish black when ripen.

Floristic region (origin):

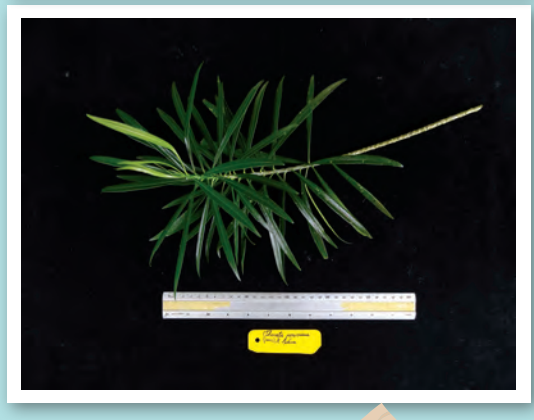
Indochina region (Cambodia, Laos, Myanmar, Thailand, and Vietnam) and Malesian region (Indonesia, Malaysia, and the Philippines).

Medicinal uses:

The leaves' juice is for stomachache and diarrhea.

Biological activities (from the literatures):

Antibacterial, antidiabetic, antihyperglycemic, and antioxidant.



Thevetia peruviana (Pers.) K.Schum.;
Apocynaceae

Names:

Palit sedangan (Balinese), ginje (Indonesian), and yellow oleander (English).

Botanical information:

Thevetia peruviana (synonym: *Cascabela thevetia* (L.) Lippold) is a small tree or shrub that can grow up to 2.5 m tall. It has a beige stem and green twigs. The stem is rough due to its small bumps that grow on the bark. The branches near the buds can be greyish. The leaves are about 13–15 cm long and 0.5–1 cm wide, long and thin (lanceolate shaped), smooth, leathery, waxy with an entire margion. They are dark green on top and light green underneath, spirally in arrangement, and linear. All leaves have one clear midrib and the veins are visible. The flowers are bright yellow and funnel-shaped with five petals spirally twisted. The fruits are round with a diameter of 4 cm, and contain a seed. The fruits become black when they are ripen. All parts of the plant contain a milky liquid.

Floristic region (origin):

Caribbean region (Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama) and Madrean region (Mexico).

Medicinal uses:

Drop the juice of leaves for sore eyes or eye strain.

Biological activities (from the literatures):

Antidiarrheal, antifungal, and antimicrobial.

Vitex trifolia L.;
Lamiaceae

Names:

Liligundi (Balinese), legundi (Indonesian), and simpleleaf chaste-tree (English).

Botanical information:

Vitex trifolia is a shrub or small tree that can grow up to 5 m tall. The stem is small and woody, brown and sometimes a slightly beige. The young twigs are green. The leaves are oblong-elliptic or obovate to oblanceolate shaped with an entire margin. They are small and light green and attached on opposite arrangement. Also, the leaves are quite soft and has a strong pleasant scent when crushed. Each leaf has a midrib with net veins to the edge leaves and the size is about 1.5–7 cm long and 0.8–4 cm wide. The flowers bloom in a terminal and axillary of the upper leaf axils. The panicles have many flowers and can grow up to 23 cm long. The fruits are yellow or reddish turning into blue or black; they are ovoid and about 0.5 cm in diameter.

Floristic region (origin):

Eastern Asiatic region (China), Indian region (Bangladesh, Bhutan, India, Nepal, Pakistan, and Sri Lanka), Indochina region (Cambodia, Laos, Myanmar, Thailand, and Vietnam), Malesian region (Indonesia, Malaysia, and the Philippines), Northeast Australian region (Australia), and Sudano-Zambezian region (Eritrea, Ethiopia, Oman, Somalia, South Sudan, Sudan, and Yemen).

Medicinal uses:

The juice of leaves is applied to the skin for warming the body.

Biological activities (from the literatures):

Antibacterial, anticancer, anti-inflammatory, antioxidant, and antipyretic.

Xanthosoma sagittifolium (L.) Schott.; Araceae

Names:

Keladi selem (Balinese), Talas belitung (Indonesian), Arrowleaf elephant ear (English).

Botanical Information:

Xanthosoma sagittifolium is a shrub which is easily recognised by its black branches. It can grow about 1.5 m tall. The stem is covered with a brown fibrous net at the base. The branches are strong, smooth, but they are not woody and waxy. The green black-tinged leaves are large and unique, have three main veins, shape like an arrow (sagittate), become thick towards the base, and about 45 cm long and 35 cm wide. The top of the leaves is smooth and waxy. The flowers are greenish, white spathe enclosing a white spadix.

Floristic region (origin):

Amazonian region (Colombia and Peru), Andean region (Bolivia), Brazilian region (Brazil), Caribbean region (Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama), and Guayana Highlands region (Venezuela).

Medicinal uses:

The juice of rhizomes is applied to the skin for skincare.

Biological activities (from the literatures):

Analgesic, antihyperglycemic, anti-inflammatory, antileukemic, and antioxidant.

CHALLENGES FOR DEVELOPING BALINESE MEDICINAL PLANTS

Usada provides a substitute for man made pharmaceuticals that are low in cost to produce and fight illnesses effectively. Nature will provide a solution for all our problems, the only thing required is finding the right plants and using them in such a way that the active compound can do its job. The Balinese people have created these recipes for generations and are a leading example for the rest of the world to follow. Therefore, the potential that *usada* can offer the man made pharmaceutical industry could be highly beneficial. Drugs that fight all sorts of physical problems are already in stores around the world, but most of them are not derived naturally.

A lot of plants used in *usada* are also focused on treating upper airway infections, such as bronchitis, sinusitis, or fever, as well as treatments against bowel diseases and diarrhea. More drugs created upon a natural base could be developed to treat stomach burn, heartburn, and helping women with menstruation issues. Rheumatism, hepatitis, and diabetes are also diseases that *usada* can treat.

The cosmetic industry could benefit by considering these documented plants in the products for their skincare properties, which include reducing acne, humidifying the skin, and antiaging effects.

However, to make an effective drug or product, the responsible compound should be isolated to find the particular effectiveness of the drug.

The amounts of species used in *usada* are extensive and not all of the plants could fit into this book. Time and funds are required to extend this book further in the hope that more people around the world will be able to find the necessary of plants to treat their condition or to develop a new product.

The 50 species described in the book are a mere example and a starting point for further research. Why does the plant help in these illnesses? What are the active compounds responsible for curing the illnesses? Those questions can only be answered by conducting further study. High pressure chromatography is a research method used to select the individual compounds in each species and with that information specific research can answer the question: why does the plant cure the illness?

After requiring this information, a lot of new applications could also be discovered within the same species. In this book, only the most common treatment is described, but these plants might also have different applications that have not been mentioned. If high pressure chromatography could be applied, then their properties and applications could be defined more clearly.

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GLOSSARY

Acuminate: Tapering to a long point in a concave manner.

Acute: Pointed, having a short apex that is angled less than 90 degrees.

Anthers: A part of the male reproduction organ in a flower.

Apiculate: Tapering and ending in a short slender point.

Bordeaux red: A color consisting of a darker red shade with a purple tint.

Cordate: Shaped like a heart with the petiole attached to the stem.

Corolla: All the petals of a flower together.

Corymb: Unbranched. Flat-topped or convex because outer pedicels are longer than inner hollyhock-like.

Crenate: Wavy-toothed, it is like dentate with rounded teeth.

Cuneate: Triangular, wedge-shaped.

Diuretic: Stimulation of producing urine.

Entire: A smooth margin without teeth.

Elliptic: Oval with a short or no point.

False pericarp: A fake layer of the fruit. Not really a pericarp, but it looks like it. Most of the times it is an enlarged body of another part of the fruit.

Filament: The other part of the male reproduction organ in a flower.

Floristic Region: The region where flora species naturally occur.

Follicle: A dry unilocular fruit formed from one carpel.

Glaucous: Having a waxy coating that gives it a frosted appearance.

Heartburn: When stomach acid returns up the oesophagus and causes a burning sensation.

Homeophathy: An alternative medicinal practise system that is often questioned on its reliability.

Inflorescence: A group or cluster of flowers arranged on a stem.

Labiates: Parts that are shaped or arranged like lips.

Lancet: Shaped like a lance tip.

Lanceolate: Long, wider in the middle. The leaf is shaped like a lance tip.

Lenticels: Porous tissue with large intercellular spaces in the bark of a tree or plant.

Linear: Long and very narrow like a blade of grass.

Lobulated: Indented with the indentations not reaching the centre.

Loculicilade: Shape of *Aloe vera* fruit, like a capsule.

Lontar *Usada:* Traditional herbal medicine (*usada*) written down upon *lontar* (coconut leaves).

Meristem: The growing point or points in a plant. It consists of cells that are not differentiated yet.

Nerves: A vascular organ in leaves that is responsible for the transportation of water and nutrients.

Oblanceolate: Much longer than wide and the wide portion of the leaf is near the tip. It is the reversed lanceolate.

Oblong: Having an elongated form with slightly parallel sides.

Oblique: Asymmetrical leaf base, one side is lower than the other.

Obovate: Teardrop shaped, it is the reversed ovate.

Ovate: Oval, egg shaped with a tapering to a point. The widest portion of the leaf is near the base.

Ovoid: Oval-like.

Palmate: Palm-shaped, lobes or leaflets stemming from the leaf base.

Panicle: Complex inflorescences.

Petals: A morphological characteristic of a flower, the petals often have a bright color to attract bees.

Petiolate: Growing on a petiole.

Pinnatifid: Having lobes with incisions that extend less than halfway towards the midrib.

Pistil: Female reproduction organ in a flower.

Placebo: The phenomenon when people believe they get a cure and get better without receiving a medicinal compound.

Ridges: Extensions in the cork of the bark of a tree.

Sessile: Leaf, which is resting on the surface and it does not have a petiole.

Serrate: Saw-like toothed with an asymmetrical teeth pointing forward.

Serrulate: Finely serrate.

Simple: Leaf blade in one continuous section, it does not contain leaflets.

Sinuous: Deep, wavelike indentations can be seen as coarsely crenate.

Spadix: A type of spike with small flowers on a fleshy stem.

Spathe: A large bract or pair of bracts forming a sheath to enclose the flower cluster.

Spikes: Type of raceme with flowers that do not have a pedicel.

Spinose teeth: Teeth looking like spines.

Terete: 3-D shaped. The cross-section is more or less cylindrical without grooves or ridges.

Toothed: A kind of edge of a leaf where the edge is not smooth, but has pointy teeth like a saw. There are many different types of toothed edges; the proper terms are serrate or denticulate. This term is used in order to make the descriptions readable for common people.

Twigs: Newly formed branches of a bush or tree, they are commonly bendy and green.

Undulate: With a wavy edge, but it is shallower as sinuate.

Usada: Traditional herbal medicine practised in Bali.

Veins: The vascular tissues of a leaf located in the spongy area. They are extensions of the nerve.

FLORISTIC REGION

- **HOLARCTIC KINGDOM**
  - BOREAL SUBKINGDOM
    - Circumboreal Region
      - Arctic Province
      - Atlantic-European Province
      - Central-European Province
      - Illyrian or Balkan Province
      - Euxine Province
      - Caucasian Province
      - Eastern European Province
      - Western Siberian Province
      - Altai-Sayan Province
      - Middle Siberian Province
      - Transbaikalian Province
      - Northeastern Siberian Province
      - Okhotsk-Kamchatka Province
      - Canadian Province
    - Eastern Asiatic Region
      - Manchurian Province
      - Sakhalin-Hokkaido Province
      - Japanese-Korean Province
      - Valcano-Bonin Province
      - Ryukyu or Tokara-Okinawa Province
      - Taiwanian Province
      - Northern Chinese Province
      - Central Chinese Province
      - Southeastern Chinese Province
      - Sikang-Yunnan Province
      - Eastern Himalayan Province
      - Khasi-Manipur Province
    - North American Atlantic Region
      - Appalachian Province
      - Atlantic and Gulf Coastal Plain Province
      - North American Prairies Province
    - Rocky Mountain Region
      - Vancouverian Province
      - Rocky Mountain Province

- TETHYAN (ANCIENT MEDITERRANEAN) SUBKINGDOM
  - Macronesian Region
    - Azorean Province
    - Medeiran Province
    - Canarian Province
    - Cape Verde Province
  - Mediterranean Region
    - Southern Moroccan Province
    - Southwestern Mediterranean Province
    - South Mediterranean Province
    - Iberian Province
    - Balearic Province
    - Liguro-Tyrrhenian Province
    - Adriatic Province
    - East Mediterranean Province
    - Crimean-Novorossiysk Province
  - Saharo-Arabian Region
    - Saharan Province
    - Egyptian-Arabian Province
  - Irano-Turanian Region
    - Western Asiatic Subregion
      - Mesopotamian Province
      - Central Anatolian Province
      - Armeno-Iranian Province
      - Hyrcanian Province
      - Turanian or Aralo-Caspian Province
      - Turkestanian Province
      - Northern Baluchistanian Province
      - Western Himalayan Province
    - Central Asiatic Subregion
      - Central Tien Shan Province
      - Dzungaro-Tin Shan Province
      - Mongolian Province
      - Tibetian Province
- MADREAN SUBKINGDOM
  - Madrean Region
  - Great Basin Province
  - Californian Province
  - Sonoran Province
    - Province of the Mexican Highlands
- **PALEOTROPICAL KINGDOM (PALEOTROPICS)**
- AFRICAN SUBKINGDOM
  - Guineo-Congolian Region
    - Upper Guinea Province
    - Nigerian-Cameroonian Province
    - Congolian Province
  - Uzambara-Zululand Region
    - Zanzibar-Inhambane Province
    - Tongoland-Pondoland Province
  - Sudano-Zambezian Region
    - Zambezian Subregion
      - Zambezian Province
    - Sahelo-Sudanian Subregion
      - Sahelian Province
      - Sudanian Province
    - Eritreo-Arabian Subregion
      - Somalo-Ethiopean Province
      - South Arabian Province
      - Socotran Province

- Omano-Sindian Subregion
  - Province of Oman
  - South Iranian Province
  - Sindian Province
- Karoo-Namib Region
  - Namib Province
  - Namaland Province
  - Western Cape Province
  - Karoo Province
- St. Helena and Ascension Region

MADAGASCAN SUBKINGDOM

- Madagascan Region
  - Eastern Madagascan Province
  - Western Madagascan Province
  - Southern and Southwestern Madagascan Province
  - Comoro Province
  - Mascarene Province
  - Seychelles Province

INDOMALESIAN SUBKINGDOM

- Indian region
  - Sri Langka Province
  - Malabar Province
  - Deccan Province
  - Upper Gangetic Plain Province
  - Bengal Province
- Indochinese Region
  - South Burmese Province
  - Andamanese Province
  - South Chinese Province
  - Thailandian Province
  - North Indochinese Province
  - Annamese Province
  - South Indochinese Province
- Malesian Region
  - Malesian Subregion
    - Malay Province
    - Kalimantan (Bornean) Province
    - Philippinean Province
    - Sumatran Province
    - South Malesian Province
  - Papuan Subregion
    - Celebesian (Sulawesian) Province
    - Moluccan Province
    - Papuan Province
    - Bismarckian Province
- Fijian Region
  - New Hebridean Province
  - Fijian Province

POLYNESIAN SUBKINGDOM

- Polynesian Region
  - Micronesian Province
  - Polynesian Province
- Hawaiian Region
  - Hawaiian Province

NEOCALEDONIAN SUBKINGDOM

- Neocaledonian Region
  - Neocaledonian Province

NEOTROPICAL KINGDOM (NEOTROPICS)

- Caribbean Region
  - Central American Province
  - West Indian Province
  - Galapageian Province

- Region of the Guayana Highlands
  - Guayana Province
- Amazonian Region
  - Amazonian Province
  - Llanos Province
- Brazilian Region
  - Caatinga Province
  - Province of Uplands of Central Brazil
  - Chacoan Province
  - Atlantic Province
  - Paranà Province
- Andean Region
  - Northern Andean Province
  - Central Andean Province

CAPE KINGDOM

- Cape Region
  - Cape Province

AUSTRALIAN KINGDOM

- Northeastern Australian Region
  - North Australia Province
  - Queensland Province
  - Southeast Australian Province
  - Tasmanian Province
- Southwest Australian Region
  - Southwest Australian Province
- Central Australian or Eremaean Region
  - Eremaean Province

HOLANTARCTIC KINGDOM (HOLANTARCTIS)

- Fernándezian Region
  - Fernándezian Province
- Chile-Patagonian Region
  - Northern Chilean Province
  - Middle Chilean Province
  - Pampean Province
  - Patagonian Province
  - Magellanian Province
- Region of the South Subantarctic Islands
  - Tristan-Goughian Province
  - Kerguelenian Province
- Neozeylandic Region
  - Lord Howean Province
  - Norfolkian Province
  - Kermedecian Province
  - Northern Neozeylandic Province
  - Central Neozeylandic Province
  - Southern Neozeynadic Province
  - Chathamian Province
- Province of New Zealand Subantarctic Islands

Source: Takhtajan (1986)

INDEX TO SCIENTIFIC NAMES

ABOUT THE AUTHORS

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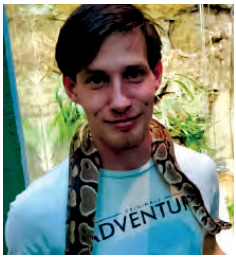
Wawan Sujarwo is an ethnobotanist at the Indonesian Institute of Sciences (LIPI). His primary area of research is on the relationship between plants and people, especially in traditional Balinese communities. He has widely documented Balinese ethnobotanical knowledge in many renowned international journals. He received a PhD in ethnobotanical sciences from Università degli studi di Roma Tre, Italy.

Buck van der Hoeven



Buck van der Hoeven is a Dutch student. He studies the applied biology in HAS University Venlo, Netherland. He completed a three month internship program in Bali Botanic Garden, supervised by Dr. Wawan Sujarwo. During his internship, he documented many of the medicinal plants found within the Usada Park of the botanic gardens.

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I Made Raharja Pendit is a senior public relation officer in Bali Botanic Garden. He has worked in the garden for more than 30 years and has a strong interest in medicinal plants. He obtained his bachelor in agronomy and has participated in many flora expeditions to the eastern part of Indonesia.

USADA

A Book About Traditional Balinese Medicinal Plants

"Nature has provided us a solution for our health problems. The only thing required is finding the right plants and using them in such a manner that the active compound can do its job."

This book about Balinese traditional medicinal plants serves as an effort to disseminate information about various types of medicinal plants collected by Bali Botanical Gardens along with the information on their uses by the people of Bali. The Balinese people have created these recipes for generations and are a leading example for the rest of the world to follow.

Written through collaboration of three authors who worked in Bali Botanical Gardens, under the Indonesian Institute of Sciences, this book gathered information of those ancients plants found in Bali Botanical Gardens as well as their special healing properties.

Besides promoting the medicinal properties found in those plants, this book also elaborates diverse skincare properties from these documented plants in which the cosmetic industry could also benefit.

We hope that it will be interesting not only for researchers and academics, but also for common botany enthusiasts who have an interest in medicinal plants. Furthermore, we hope that more people around the world will be able to find the necessary plants to treat their condition or to develop a new product.

Happy reading!

LIPI

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