

## Biodiversity of Medicinal Plants at Sambas Botanical Garden, West Kalimantan, Indonesia

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## ABSTRACT

Botanical garden is one of *ex-situ* conservation which has function as germ plasm conservation, education/research, and recreation. To conserve plants biodiversity, many local governments in Indonesia propose to cooperate with LIPI to build botanical gardens. Sambas botanical garden with an area  $\pm$  300 ha in West Kalimantan is one of a botanical garden which is under construction. As new exploration site, many biodiversity in this area has not been entirely explored yet including its medicinal plants. Methods used in this study including field survey and interview techniques. The objective of this study is to explore a biodiversity of medicinal plants in that area. This study identified 30 medicinal plants, representing 20 families and 25 genera. It indicated that Sambas botanical garden has many highly potential values of medicinal plants. Therefore, a proper management including medicinal plant for this area is strongly required.

**Keywords:** *Sambas, botanical gardens, medicinal plants*

## INTRODUCTION

Indonesian flora plays an important role in the world biodiversity as contributes to 15.5% of total world flora. However, it is under threatened due to high rate of deforestation [1]. In 2012, Indonesia lost 840,000 hectares of its primary forest that caused massive biodiversity loss [2]. Indonesian government responses this problem with issue regulations such as 'Indonesian Agenda 21' and 'Indonesian Biodiversity Strategy and Action Plan (IBSAP)' [1]. These projects area is to reduce rate of biodiversity loss and to build botanical gardens representing the overall 47 types of Indonesian ecosystems [3].

As implementation of the project, Sambas botanical garden located in West Kalimantan was established in 2008. Sambas Regency governments to collaborate with LIPI established a Sambas Botanical Garden as 300 ha in Subah based on preliminary surveys [4, 5]. Sambas botanical garden is among 47 gardens being the only one botanical garden which has tidal area and has major riparian plants dominated by *Dillenia suffruticosa* and *Barringtonia macrocarpa* [5].

Although Sambas Botanical Garden is predicted has great diversity on medicinal plants but information about medicinal plants and uses in this area is very lack [4]. Moreover, as the garden is located directly adjacent to the oil palm plantation, it may have continued unsuitable impact to the habitats of Medicinal plants. Therefore, as a new botanical garden site an exploration of medicinal plant in this area is considered very important and the outcomes of the exploration would contribute to conserve useful medicinal plant in *ex-situ* conservation. Hence, the objectives of this study are to explore a biodiversity of medicinal plants in that area.

## MATERIALS AND METHODS

*Study area*

Study site is conducted in Sabung Village, Subah District, Sambas Regency, West Kalimantan within area 300 ha, 32 – 75 masl. Geographically has coordinate LW 109° 27'47,05" - 109° 29' 24,14" and PN 01°15'45,22" – 01°17'3,30". This village is located/part Sambas Botanical Garden (Figure 1). Sambas botanical garden is surrounded by palm oil plantation. This researched was done on 15<sup>th</sup> to 19<sup>th</sup> September 2015.

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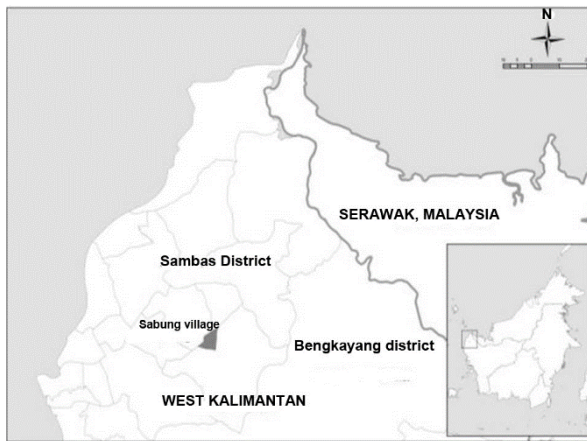


Figure 1. Study Site: Sabung Village, Subah District, Sambas Regency, West Kalimantan, Indonesia

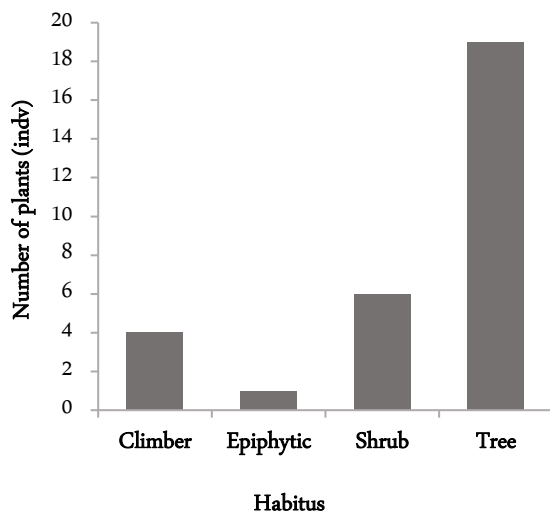


Figure 2. The number of medicinal plant species based on its habitus

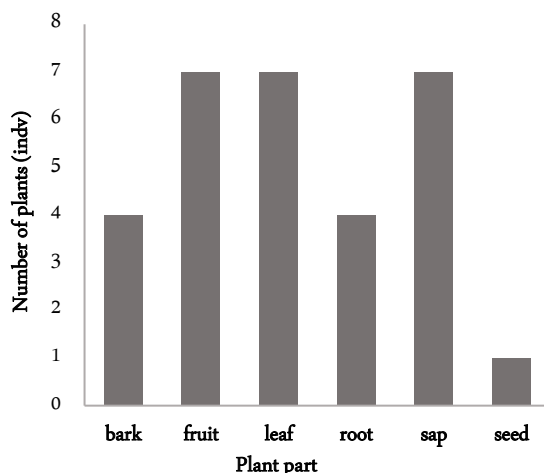


Figure 3. The number of medicinal plant species based on utilization part of plant

### Method

This study uses explorative survey and collecting data with interview local people and direct observation. The respondents are one Shaman and two local people who use traditional medicine and all as a farmer by educated at elementary school. The respondents were asked regarding their knowledge about medicinal plants, including the plants name, uses and how their uses and process it also recorded.

Taxonomic samples initially pressed between absorbent paper saturated with denatured ethanol and packed in heavy plastic bags, were subsequently dried, identified and deposited at the Herbarium Center for Plant Conservation- Bogor Botanical Garden, Java (Indonesia).

### RESULTS AND DISCUSSION

Our exploration of medicinal plants found that there are 30 medicinal plants species used by local people around Sambas Botanical Gardens. Table 1 lists data from 30 species presenting 20 families and 25 genera, arranged alphabetically according to family, giving local names, and part uses.

Based on its habitus from 30 medicinal plant species, it is rated that tree, shrub, climber, and epiphytic are 64%, 20%, 13%, and 3% respectively. Moreover, tree is the most dominant habitus of medicinal plants in Sambas (Figure 2). We also found Sambas Botanical Garden is a tree highly dense forest thus vegetation in basal forest is not growing well. This situation also happened in Tane Olen Area, East Kalimantan in which tree is more dominant than other habitus [6].

We found that leaf, sap, and fruit are the part that is used by local people in this area as much as 23% (7 species) each (Figure 3). Sambas people use leaves as their dominant treatment alongside sap and fruit. This situation also happened in East Kalimantan in which Tunjung Berung tribe used leaves as a dominant treatment [7]. It is because leaves are the easiest part of plant to be taken and to be processed.

The ailments have been sorted into 19 general categories. Overall, diarrhea is the most dominant ailments alongside cancer as much as 12% (Figure 4). The next most common ailments were recorded for herbal treatments were fever and sore. We resume some important families for medicine uses and compare with other records and chemical compounds.

### Apocynaceae

Apocynaceae family has many biologically active

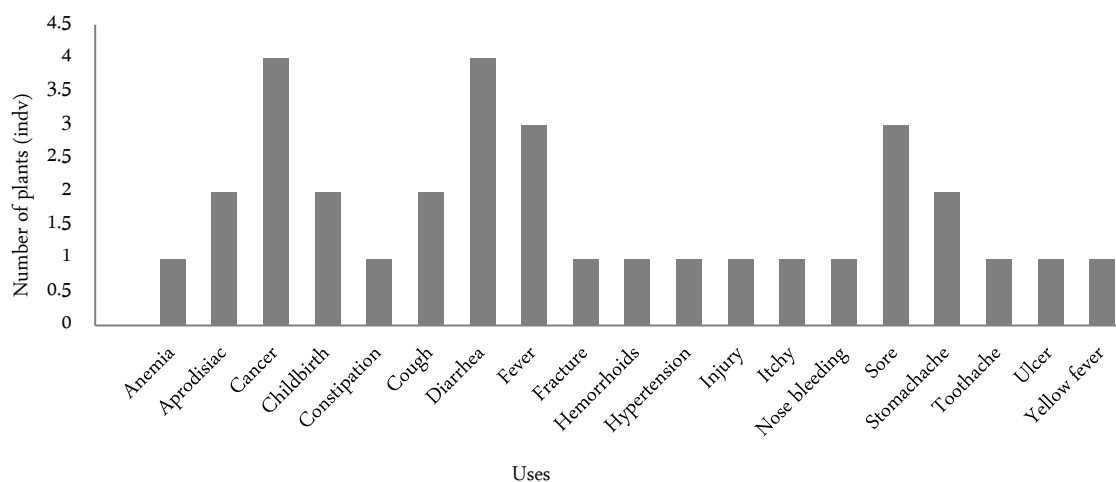


Figure 4. The number of medicinal plant species based on its uses

compounds [8] for treating diseases such as gastrointestinal ailments, fever, malaria, pain and diabetes [9]. *Dyera costulata* (Miq.) Hook.f. is used as toothache medicine in Sambas area but in south of Thailand, people use it for fever, inflammation, and pain treatment [10]. Chemically, *D. costulata* is reported has flavonoid which is as an antinociceptive, antipyretic, anti-inflammatory drug [10], analgesic [11], and antimalaria [9].

Meanwhile, the stem of *Rauvolfia verticillata* (Lour.) Baill is used as decoction for mother after childbirth in order to get well soon in Sambas. Different uses in Indo-China people is use root as hypertension, sedative [12], hypertension, inflammation, and fever [13]. Alkaloid compounds of *R. verticillata* is 9-hydroxynoracronycine and it has potential against breast cancer [13]. The *Willughbeia* sp. is known that fruit is edible in Malaysia [14] but in Sambas are it is used as anemia treatment.

#### **Burseraceae**

In Sambas, the leaves of *Garuga pinnata* Roxb mixed with durian's leaves useful for constipation treatment. In the other hand, cytotoxic activity [15] and antidiabetic has been reported [16].

#### **Cecropiaceae**

*Poikilospermum suaveolens* (Blume) Merr has broad distribution in Malesia region including India and southern China [17]. The leaves are used for ulcer treatment in Sambas and Serawak [18] has similar treatment. However, in Sabah, this species used for after childbirth treatment and in Negeri Sembilan *P. suaveolens* for sore eyes treatment [19, 20].

#### **Clusiaceae**

Member of Clusiaceae on this list is consisting of 2 species of *Calophyllum* and 3 species of *Garcinia*. The *Calophyllum* genus are used for cancer (*Calophyllum pulcherrimum*) and sore treatment (*Calophyllum* sp.) in Sambas. Moreover, *Calophyllum* is potential for AIDS treatment [21]. Meanwhile, genus *Garcinia* is reportedly applied to women after childbirth, a decoction of leaves and roots is used against earache in Java [22]. It is interesting that we found *Garcinia picrorhiza* Miq. in Sambas. However, its distribution on east part of Indonesia and Papua New Guinea [23].

#### **Menispermaceae**

*Arcangelisia flava* (L.) Merr. is well-known as fever and sprue treatment [24]. In Sambas, West Kalimantan, this species used for yellow fever. In Central Kalimantan, this species usually used for malaria, dysentery, fever treatment and as a tonic [25]. The plant contains berberine (alkaloid) useful for antibacterial, anthelmintic, and anti-inflammatory [8]. Extract from *A. flava* for antibacterial activity has been reported [26].

#### **Rubiaceae**

*Sarang Semut* (*Myrmecodia* sp.) is usually used by Sambas people for general cancer treatment. Meanwhile, in Papua related species, *Myrmecodia tuberosa* Jack, is known as therapeutic usage including cancer. It is also reported that the compound in this species has potency as immune modulatory agent [27]. Another species, *Rennelia elliptica* Korth, is widely used as aphrodisiac by local people in Sambas. Vernacular name of this spe-

Table 1. Medicinal plants list and uses of Sambas Botanical Garden

Scientific Name	Vernacular Name	Uses
<b>APOCYNACEAE</b>		
<i>Dyera costulata</i> (Miq.) Hook.f.	Jelutung	Toothache
<i>Rauvolfia verticillata</i> (Lour.) Baill	Belarang keras	Cut stem then dry and boil it. Usually mother consume it after give birth in order to get well soon.
<i>Willughbeia</i> sp.	Jantaan	Anemia
<b>ASTERACEAE</b>		
<i>Blumea balsamifera</i> (L.) DC.	Sembung	Itchy
<b>BOMBACACEAE</b>		
<i>Durio testudinarius</i> Becc.	Durian kura	Seed and rind pounded, wipes on the opposite with injury part.
<b>BURSERACEAE</b>		
<i>Garuga pinnata</i> Roxb.	Barru	Together with Durian's leaves pounded soften, wipes as long as 10 minutes at stomach and wrist to address constipation.
<b>CAESALPINIACEAE</b>		
<i>Caesalpinia</i> sp.	Klibangan	Resin smeared on sore.
<i>Caesalpinia</i> sp.	Akar serapat	Jamu for giving birth.
<b>CECROPIACEAE</b>		
<i>Poikilospermum suaveolens</i> (Blume) Merr	NN	Young leaves burned, squeezed, then placed on ulcer.
<b>CLUSIACEAE</b>		
<i>Calophyllum pulcherrimum</i> Wall.	Mentangor	Resin as cancer medicine
<i>Calophyllum</i> sp.	Tangur miding	Resin for sore treatment
<i>Garcinia nervosa</i> Miq.	Asam kandis	Fruit sliced, dried, smoothly squeezed, add water and salt. Eat as hemorrhoids treatment.
<i>Garcini apicrorhiza</i> Miq.	Mentangur	Resin mixed with coconut oil as sore medicine.
<i>Garcinia</i> sp.	Manggis hutan	Cancer
<b>DILLENIACEAE</b>		
<i>Dillenia excelsa</i> Martelli	Simpur laki	Scraped fruit and rub on sick stomach
<b>DIPTEROCARPACEAE</b>		
NN	Kembang se-mangkok	Dried fruit soaked in cold water, after become jelly-shaped eat as cough and fever medicine.
<b>HYPERICACEAE</b>		
<i>Cratoxylum cochinchinense</i> Blume	Mampat	Five leaves pressed, put on hot water and add enough salt. Drink it as diarrhea medicine.
<b>LAURACEAE</b>		
<i>Cinnamomum cullilawan</i> Blume	Kayu lawang	Drink root as tea for fever treatment.
<i>Litsea</i> sp.	Piawas	Leaves + betle leaves pounded, wipes on stomach
<b>MENISPERMACEAE</b>		
<i>Arcangelisia flava</i> (L.) Merr.	Belaran kuning	Yellow fever
<b>MYRTACEAE</b>		
<i>Syzygium</i> sp.	Jambu Marekang	Diarrhea
<b>PHYLLANTHACEAE</b>		
<i>Baccaurea macrocarpa</i> (Miq.) Müll.Arg.	Tampoi	Diarrhea
<b>PIPERACEAE</b>		
<i>Piper</i> sp.	Sirih Merah	Nose bleeding
<b>RUBIACEAE</b>		

Continue

Table 1. Medicinal plants list and uses of Sambas Botanical Garden (*Continued*)

Scientific Name	Vernacular Name	Uses
<i>Myrmecodia</i> sp.	Sarang Semut	Cancer
<i>Rennelia elliptica</i> Korth.	Ginseng Kalimantan	Aphrodisiac
<b>SAPOTACEAE</b>		
<i>Chrysophyllum roxburghii</i> G.Don.	Pulai lilin	A drop of resin mixed in glass of water, drink it as hypertension treatment.
<i>Madhuca motleyana</i> (de Vriese) J.F.Macbr.	Belubur	Add resin with sugar and pour water, drink as fever treatment.
<b>SIMAROUBACEAE</b>		
<i>Eurycoma longifolia</i> Jack	Pasak bumi	Aphrodisiac
<i>Leea indica</i> (Burm.f.) Merr	Kayu gemali	Stem bonded with fracture bone.
<b>THYMELAEACEAE</b>		
<i>Aquilaria malaccensis</i> Lam	Gaharu	Cough, Diarrhea, Cancer

cies is named *Ginseng Kalimantan* due to morphological similarity of the root with Korean Ginseng. This plant contains anthraquinones which has strong inhibitory activity against *Plasmodium falciparum* [28].

#### ***Simaroubaceae***

*Eurycoma longifolia* Jack is indigenous plant to South East Asian region and well-known species for febrifuge, fever treatment, and aphrodisiac [29], [30]. It is named *Pasak Bumi* or *Tongkat Ali* in Malaysia. This plant grows in acid and sandy soil usually in secondary forest. Chemical compound like 'quassinoid' in this plant has potential anti plasmodicidal activity and anti-tumor promoting [31]. Root of *Pasak Bumi* also reported has cytotoxic toward human lung cancer and breast cancer and anti-malarial against the resistant *Plasmodium falciparum* [32]. In Kedayan community, Sarawak, Malaysia, *Tongkat Ali* is used for high blood pressure, diabetes and weak liver [30]. The root is boiled and make drinks [18].

*Leea indica* (Burm.f.) Merr. has strong antioxidant activity due to gallic acid compound in this plant [33]. In Sambas, this plant is used to treat bone fracture. Whereas, in Java the leaves are used for headache, in Moluccas applied to cuts and wounds [34], and the leaves of *L. indica* are applied for treating obstetric diseases or body pain in North Thailand [35].

#### ***Thymelaeaceae***

*Aquilaria malaccensis* or *Gaharu* is applied for cough, diarrhea, and cancer treatments in Sambas. Flavonoid compounds in this species might provide a high value of antioxidant activity [36]. Conservation status of *A. malaccensis* Lam is vulnerable due to the over exploit-

tation and extensive international trade [37].

This study identified 30 medicinal plants species from Sambas Botanical garden. Tree is dominant habitus found in this area. Fruit, Sap, and Leaf is part of the plant are mostly utilized to heal the disease. Cancer and Diarrhea are the most dominant ailments and fever and sore are followed. Some important species are resumed for medicinal uses compare with previous information and chemical compounds. *Arcangelisia*, *Myrmecodia*, *Rennelia*, *Eurycoma*, and *Aquilaria* species can be regarded as high potential medicinal plants in Sambas region. Sambas botanical garden has not only considerably high value of medicinal plants also high threat from the adjacent oil palm plantation. Thus, it is strongly required to make proper conservation strategies to protect these medicinal species. As *ex-situ* conservation, botanical garden has to develop strategies to manage plants properly.

#### **CONCLUSION**

The existing medicinal plants in Sambas Botanical Garden identified high species diversity (there are 30 species in 20 families and 25 genera), which are dominated by tree habitus. Sambas Botanical Garden play a major role in preserving local wisdom in terms of helping preserve medicinal plants in communities where far from the treatment site.

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