

## Conference Paper

# Traditional Anti Malaria Plants Species of Balikpapan Botanic Garden, East Kalimantan-Indonesia

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## Abstract

Numerous Kalimantan plants species were traditionally utilized for its medicinal properties. Ex situ conservation of these species in Balikpapan Botanic Garden (BBG), one of the mostly recent launched botanic garden in Indonesia however, should be appreciated and encouraged to preserved the unique traditional plant-based medicine knowledge of Kalimantan people. An ethnobotany literature study was conducted to documented traditional medicine plant species collected in BBG used by indigenous people of Kalimantan to treat malaria. This study found nine plant species collected in BBG namely *Aleurites moluccanus* (L.) Willd., *Alstonia angustiloba* Miq., *Alstonia scholaris* L. R. Br., *Areca catechu* L., *Eurycoma longifolia* Jack, *Lansium parasiticum* (Osbeck) K. C. Sahn & Bennet, *Morinda citrifolia* L., *Peronema canescens* Jack and *Vitex pinnata* L. were traditionally used to treat malaria. Further literature study showed that some of these species exhibits biological activity toward *Plasmodium berghei* and *P. falciparum*. Three species of this list were classified as rare medical plants in Indonesia. However, further study will still be needed to fully confirm anti malaria activity of these plant species and its potential to become new anti-malaria medicine.

**Keywords:** Balikpapan Botanic Garden; ex situ conservation; Malaria; traditional medicine.

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## 1. Introduction

Knowledge of plant-based traditional medicine in Indonesia was an ancient local wisdom passed down from one generation to the next since long time ago. Javanese and Balinese people for example, has their own ancient medicine literatures, namely Serat Centini and Lontar Usada respectively [1, 2]. Recent studies recorded many plant species were traditionally used by Kalimantan people to treat several illnesses. For examples, forty-seven plant species was used by Dayak Tunjung people of East Kalimantan [3]. Dayak Ngaju people of Kapuas District, Central Kalimantan were reported to use 46 plant species as traditional medicine [4]. As much as 51 plant species were used by people of Serambai village in West Kalimantan to treats several illnesses [5]. While Dayak Seberuang people of Ensabrang village were used 60 plant species to treat 31 diseases [6]. Some of these plant species were traditionally used to treat

malaria, one of the deadliest parasitic infections diseases in the world, which in 2012 alone, killed about 627 000 people worldwide [7]. This study was conducted in order to documenting plant species collected in Balikpapan Botanic Garden, which traditionally used by people of Kalimantan to treat malaria. The result of this study was expected to become a foundation for further research in order to found out new anti-malaria drugs and overcome drug resistance *Plasmodium* problem.

## 2. Materials and Methods

Most recent data of collected plant in BBG was acquired from its registration unit. Ethnobotany literatures of Kalimantan island were then consulted to obtain information about traditionally used anti malaria plant species as well as its local name, cited parts, used procedure and ethnic groups used each species. These literatures included recent publications e.g. Setyowati et al. [4], Kustiawan [8], Setyowati [3], Noorcahyati [9], Takoy et al. [6] and Sari et al. [5]. Scientific name of each plant species was then confirmed using The Plant List 2013 database [10]. Search in recent scientific literatures was then conducted in order gain information about anti malaria activity of each plant species.

## 3. Result and Discussion

This study documented nine plant species belong to eight genera and seven families collected in BBG were traditionally used to treat malaria. These species were *Aleurites moluccanus* (L.) Willd., *Alstonia angustiloba* Miq., *Alstonia scholaris* L. R. Br., *Areca catechu* L., *Eurycoma longifolia* Jack, *Lansium parasiticum* (Osbeck) K. C. Sahni & Bennet, *Morinda citrifolia* L., *Peronema canescens* Jack and *Vitex pinnata* L. Table 1 show summary of plant species collected in BBG traditionally used to treat malaria by people of Kalimantan described in at least one scientific publication (e.g. Setyowati et al. [4], Kustiawan [8], Setyowati [3], Noorcahyati [9], Takoy et al. [6] and Sari et al. [5]).

Of all nine species documented in this study, barks of five species were used traditionally to treat malaria (Figure 1a) while drinking boiled water of the plants parts was the most common procedure to utilize these plants species. Eight species were used by drink boiled water of the plant parts (Figure 1c). Member of Apocynaceae and Lamiaceae were the most frequently used families as traditional medicine plants to treat malaria. Each were represented by two species respectively (Figure 1b).

Several scientific literatures confirmed some species of this list biological activity toward *Plasmodium* spp. *Alstonia scholaris* along with *Alstonia angustiloba* (Figure 2)

Scientific Name	Local name	Families	Used parts	Used procedure	Used by
<i>Aleurites moluccanus</i> (L.) Willd.	Perija, Kemiri	Euphorbiaceae	Barks	Boiled to drink	Banjar and Dayak ethnic
<i>Alstonia scholaris</i> L. R. Br.	Pulai	Apocynaceae	Barks	Boiled to drink	Kalimantan ethnics
<i>Alstonia angustiloba</i> Miq.	Pulai	Apocynaceae	Barks, Roots	Boiled to drink	Kalimantan ethnics
<i>Areca catechu</i> L.	Pinang	Arecaceae	Seeds	Boiled to drink	Dayak Tunjung
<i>Eurycoma longifolia</i> Jack	Pasak Bumi	Simaroubaceae	Roots	Boiled to drink	Kalimantan ethnics
<i>Lansium parasiticum</i> (Osbeck) K. C. Sahni & Bennet	Langsat	Meliaceae	Barks	Boiled to drink	Dayak Seberuang and other Kalimantan ethnics
<i>Morinda citrifolia</i> L.	Mengkudu	Rubiaceae	Leaves	Boiled to drink	Dayak Seberuang
<i>Peronema canescens</i> Jack	Sungkai	Lamiaceae	Barks	Boiled to drink	Kalimantan ethnics
<i>Vitex Pinnata</i> L.	Alaban	Lamiaceae	Seeds	Mashed for eat	Kutai and Dayak ethnic

TABLE 1: Traditional anti malaria plant species currently collected in balikpapan botanic garden along with description of its basic use.

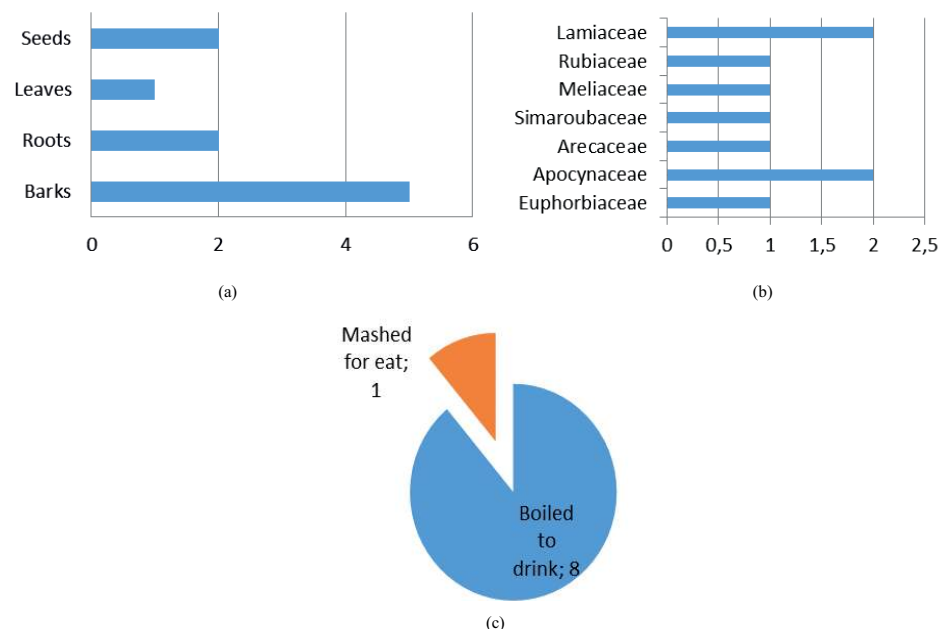


Figure 1: (a) The frequency of use of traditional anti malaria plants divided into parts of plants. (b) The frequency of use of traditional anti malaria plants divided into families. (c) The distribution of traditional anti malaria plant arranged by used procedures.

was used by some Kalimantan ethnic to threat illnesses, including malaria [9]. Literature study suggested that alkaloids compound found in *Alstonia scholaris* like Villalstonine, Macrocarpamine, Corialstonine and Corialstonidine were reported to be effective against *P. falciparum* [11]. *Peronema canescens* bark was used in by Kalimantan people



(a)

(b)

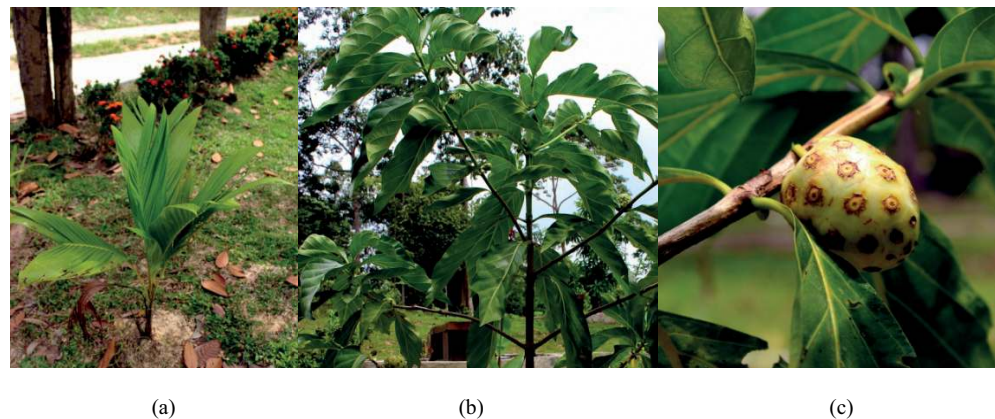
**Figure 2:** (a) Tree and (b) Leaves of *Alstonia angustiloba* Miq.



**Figure 3:** Leaves of *Peronema canescens* Jack.

to treat malaria and tonic drink [9]. The leaves of this species (Figure 3) were also used to treat malaria in South Sumatra region. Ethanol, acetone and water extract of *Peronema canescens* leaves was showed inhibition ability toward *P. falciparum* growth in vitro, as well as toward *P. berghei* growth in vivo [12].

*Lansium parasiticum* was empirically used to treat malaria by people of Dayak Seberuang in West Kalimantan, it was also used to treat malaria by other ethnic in Kalimantan and Sabah, Malaysia [6, 9, 13]. Barks and aqueous leaf extract of this species were reported to be able to reduce populations of both drug sensitive and



**Figure 4:** (a) Seedling of *Areca catechu* L. (b) Leaves and (c) Fruit of *Morinda citrifolia* L.

chloroquine-resistant strain of *P. falciparum*. In addition, the barks extract was also reported to be able to interrupt *P. falciparum* lifecycle [14].

*Areca catechu* (Figure 4a) was widely used for various puposes in Indonesia. Boiled water of *Areca catechu* seed was used by people of Dayak Tunjung tribe in East Kalimantan province to treat malaria and some other illnesses [3]. Butanol extract of *Areca catechu* was reported to exhibit anti malaria activity toward *P. berghei* both in in vitro and in vivo condition [8]. *Morinda citrifolia* was another species empirically used to treat malaria. Boiled water of *M. citrifolia* leaves (Figure 4b) were used by Dayak Seberuang people of West Kalimantan to treat malaria [6]. Extract of its fruit (Figure 4c) was reported to have lower inhabitation activity toward *P. bergei* than fansidar, a common malarial drug [15].

*Eurycoma longifolia* (Figures 5a and 5b) was arguably the most popular herb of Kalimantan island. Aphrodisiac properties aside, some Kalimantan ethnic groups used its roots (Figure 5c) to treat malaria [9]. Standard extract of *E. longifolia* root was reported had better inhibitory activity toward *P. falciparum* development than artemisinin as well as able to inhibit development of *P. berghei* in vivo [16, 17].

*Aleurites moluccanus* and *Vitex pinnata* was empirically used by people in Kalimantan to treat several illness. Banjar and Dayak ethnic of Kalimantan believed drinking boiled water of *Aleurites moluccanus* barks could cure malaria. While Kutai and Dayak Ethnic believed consuming grinded seed of *Vitex pinnata* could cure the same illness [9]. However, in our best knowledge, there was no scientifically report about anti *Plasmodium* activity for both species yet. Nevertheless, a report suggested that a close relative of *V. pinnata*, namely *V. mediensis* leaves and barks extract was reported to exhibits anti *Plasmodium* activity toward both chloroquin-resistant FCB strain and field isolates *P. falciparum* in vitro [18].

*Areca catechu*, *Alstonia scholaris* and *Eurycoma longifolia* were listed as rare medical plant by Indonesian Biodiversity Strategy and Action Plan 2003 to 2020 [19]. Of nine



**Figure 5:** (a) Tree (b) Flowers and (c) Root of *Eurycoma longifolia* Jack.

species in this list, five species were already planted at the field in BBG, while four other species were still cared in BBG nursery. *Alstonia agustiloba* was the most planted species in BBG, with as much as nine specimens were planted in BBG, while *Morinda citrifolia* and *Alstonia scholaris* each had only one specimen planted in BBG. *Areca catechu* and *Eurycoma longifolia* had three specimens planted in BBG respectively. *Alstonia angustiloba* and *Eurycoma longifolia* were also spontaneously growth in some parts of BBG. This condition confirmed the importance of BBG as one of plant conservation sites, especially for Kalimantan plant species with traditional medical properties.

## 4. Conclusions

Nine plant species collected in BBG were traditionally used as traditional medicine to cure malaria by indigenous people of Kalimantan. Literatures study suggested anti *Plasmodium* activity toward *P. berghei* and *P. falciparum* were occurring in some of these species. *Areca catechu*, *Alstonia scholaris* and *Eurycoma longifolia* were listed as rare medical plant in Indonesia. Five species of this list were already planted at the field while four other species were still cared in the BBG nursery. Two species, namely *Alstonia angustiloba* and *Eurycoma longifolia* were also spontaneously growth in BBG and indicated BBG as one of the important conservation site for Kalimantan medicinal plant species.

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