

The potential of medicinal plants from heath forest: Local knowledge from Kelubi Village, Belitung Island, Indonesia

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Abstract. Oktavia D, Pratiwi SD, Munawaroh S, Hikmat A, Hilwan I. 2022. *The potential of medicinal plants from heath forest: Local knowledge from Kelubi Village, Belitung Island, Indonesia. Biodiversitas 23: 3553-3560.* The heath forest ecosystem is home to hundreds of species in Belitung Island and is home to medicinal plant resources. The Belitung people prefer to use medicinal plants due to their easy availability and cheap therapy, compared to costly modern pharmaceuticals. In this study, we investigated the potential of medicinal plants from heath forests according to the local knowledge of the Belitung Malay community. This study was conducted in Kelubi Village, Belitung Island, Indonesia. Data and information related to medicinal plant properties were obtained through interviews with local people using an in-depth interview technique. We documented 86 species belonging to 48 families. The medicinal plants are classified into 48 families. The most abundant families are Rubiaceae (8 species), and Myrtaceae (8 species). Many species from the Myrtaceae family are used as medicinal species, such as, jemang (*Rhodamnia cinerea*), gelam (*Melaleuca leucadendra*), keremuntingan (*Rhodomyrtus tomentosa*), and sekudong pelandok (*Syzygium buxifolium*). The percentages of medicinal plant diversity based on habitus were 45% trees, 21% woody lianas, 13% small trees, 13% herbs, and 8% lianas. We also found that 23 species of medicinal plants were used as herbs after childbirth, and 10 species of plants were used to treat fever. Belitung Malay people use plants for traditional medicine to solve some diseases and therapy. We suggest that conservation efforts for the heath forest ecosystem should be a priority for the sustainable use of medicinal plants on Belitung Island.

Keywords: Kerangas forest, medicinal plant, Myrtaceae, traditional knowledge, woody plant

INTRODUCTION

Every local people have their own knowledge of the use of plants. They prefer to use medicinal plants over modern medicines due to their abundance of availability and low cost of treatment. Through their indigenous experiences, the people in an isolated location have found the curative activity of medicinal plants against certain diseases. For example, people of Dayak Desa of West Kalimantan, Indonesia use *Blumea balsamifera* to recover fever, *Cheilocostus speciosus* as a stamina refresher, and so on (Supiandi et al. 2019), while the people of Batak Toba of North Sumatra, Indonesia use leaves of *Ilex odorata*, and roots of *Calamus caesius* to recover fractures (Silalahi et al. 2019). Currently, the use of herbal remedies is becoming more popular (Kanwar et al. 2006; Rahayu et al. 2020). However, this has not been in balance with people's awareness of the potential of existing medicinal plants. Documentation of local knowledge related to the efficacy of plants in the heath forest is essential to be carried out as a basis for managing plants in a sustainable manner to avoid extinction (Bisht 2017; Smith-Hall et al. 2012). Natural resources that exist today are potential capital for

improving people's welfare. Potential capital will not be optimally useful if it is not managed properly.

Currently, modern people are changing their minds about medicines. They are familiar with modern drugs and have abandoned traditional remedies in favor of modern medicines that react rapidly. However, some of them are still concerned about traditional medicines and healing. An example of a community that still uses plants for traditional medicine is the Belitung Malay community. The use of medicinal plants by the Belitung Malay community has been carried out for generations. One of the medicinal plants used in the preparation of traditional herbs for women after giving birth which requires at least 44 species of medicinal plants (Fakhrurrazi 2001).

Kelubi village is located in the East Belitung district and is close to the heath forest ecosystem. Heath forest ecosystem is typically poor nutrient forest, however, at the same time, this is an advantage for the creation of plant's medicinal compounds. Unfertile soil limits leaf production and positively selects long-lived leaves. Plants in heath forests could increase leaf lifespan by producing a great diversity of carbon-based chemicals (e.g., tannins). A wide local people's understanding of medicinal plants has altered

the local landscape. Many species of medicinal plants can be found in the home garden and the local people use the parts or whole plants to keep their families well (Fakhrurrazi 2001). The livelihood of a farmer is tied to their pastime of preserving medicinal plants and using them to treat diseases and maintain family health (Karunamoorthi et al. 2013; Singh 2015; Shakya 2016). The rapid development of plantation, mining, tourism, agriculture, fishery, mining, and other public services sectors is expected not to override the forestry sector as an ecosystem buffer. This fact demands hard efforts in collaborative and systematic forest management to save the remaining forest ecosystems. Before losing the natural wealth in the heath forest and the local wisdom of the community in utilizing natural resources, it is important to study vegetation composition and the potential of medicinal plants. The community should be given the opportunity to be independent and develop its potential.

To sustain family health, it is important to strengthen the local knowledge of Belitung people in applying belief and understanding of medicinal plants as a traditional healing heritage. Other reasons for documenting medicinal plants in Belitung include: the medicinal plant potential is necessary as potential resources for bioprospecting, some locals still have knowledge of medicinal plants, and there is ecologically suitable land for medicinal plant cultivation, which will be a benefit for biodiversity conservation. We also consider that in poor-nutrient soil like heath forest, the potential of secondary metabolite in medicinal plants could

be more than in rich-nutrient habitat. For the reasons stated above, it is critical to do an ethnobotanical study on medicinal plants in Kelubi Village, East Belitung, Indonesia, to learn about local medicinal plant knowledge, plant parts used as medicines, and medicinal plant processing.

MATERIALS AND METHODS

Study area

The study was conducted in Kelubi Village, Manggar Sub-district, East Belitung District, Kepulauan Bangka Belitung Province, Indonesia (Figure 1). The local ethnicity is called Malayu Belitung. Kelubi village is surrounded by primary forest, secondary forest, oil palm plantation, rubber plantation, and pepper plantation. East Belitung District has a tropical and wet climate with monthly rainfall variations in 2008 between 70.0 mm to 401.3 mm with the number of rainy days between 9 to 26 days per month. Belitung Island is an island that has hilly geomorphology with an altitude ranging from 0-1400 meters above sea level. The hills are fed by a river with a dendritic pattern. The natural conditions of East Belitung District are mostly highlands with an altitude of 20-49 meters above sea level and the rest are lowlands and hills. The lowlands in East Belitung are divided into two, namely lowlands and coastal plains.

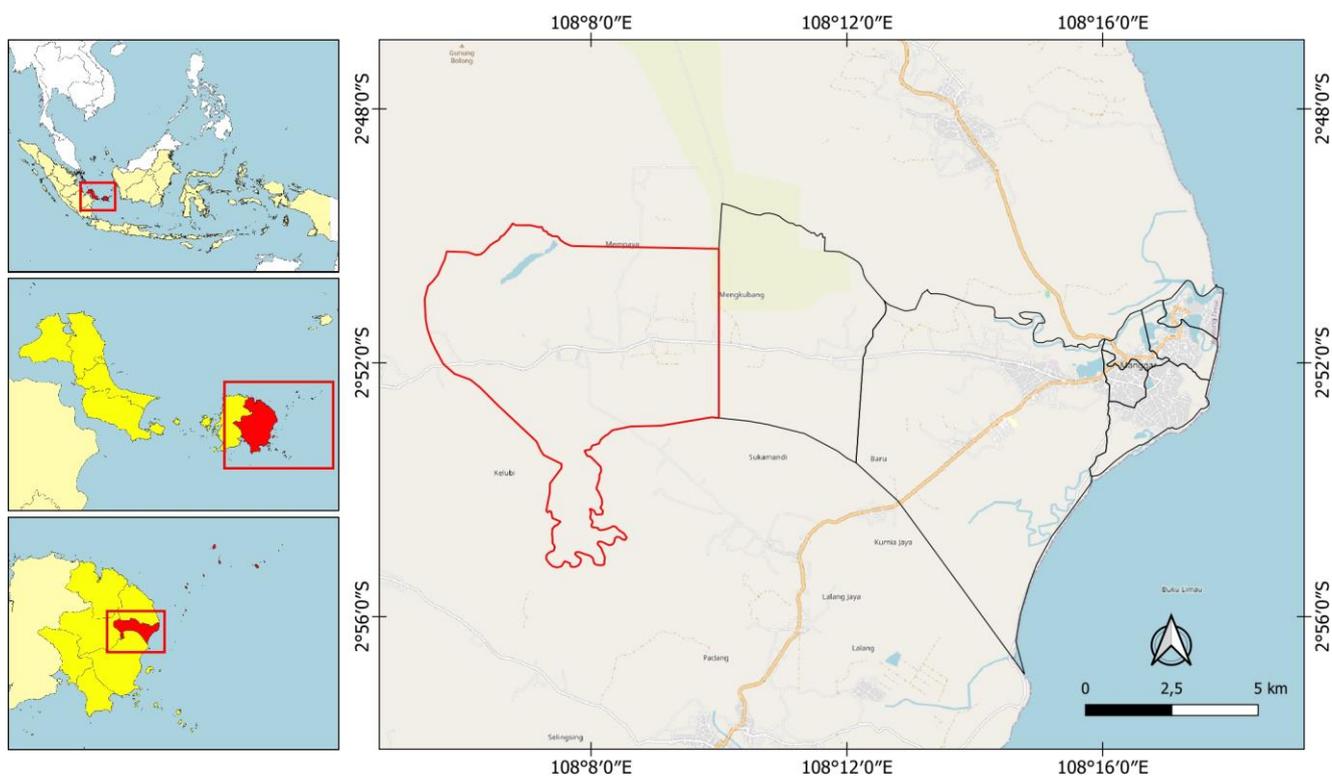


Figure 1. Location of Kelubi Village, Manggar Sub-district, East Belitung District, Kepulauan Bangka Belitung Province, Indonesia

Data collection

Data and information related to medicinal plants and their medicinal properties were obtained through interviews. We collected the data using in-depth interviews with the dwellers. The interviews were used to gather information on medicinal plants, namely the local names, parts of the plants, benefits of the plants, and how the plants are used (Cunningham 2014). Purposive sampling or selecting key informants was used to select the initial respondent, and the snowball technique was used to select other respondents with medicinal plant knowledge shown by the prior respondent (Tongco 2007), and can be branched into multiple sources of information (Sedgwick 2013). Informants were determined based on information from community leaders, village heads, heads of *kampung* (small villages), and others who are knowledgeable about medicinal plants. The total number of respondents was 25, and respondents were mostly males (68%) and females (32%). Interviews were stopped when there was no new information from the previous informants. The respondents were dominated by people over 50 years (68%). The educational background of the respondent was mainly an elementary school (84%), and 84% of the total respondent were day laborers. Some respondents who work as day laborers also have other jobs, such as village shamans and traditional medicinal plants gatherers. Such jobs are for social and voluntary purposes, not a livelihood. The people who gather traditional medicine still collect medicinal plants directly from the forest. Such work is carried out from generation to generation according to the traditional knowledge that has been passed down. Respondents who are classified as gatherers are those who sell traditional medicines by utilizing medicinal plants. In fact, respondents who work as daily laborers also had the ability to mix traditional medicine. Most of the respondents also work as laborers in oil palm and rubber plantations around the forest area.

Data analysis

Data were analyzed using qualitative and quantitative analysis. The qualitative analysis was performed by grouping plants in their botanical families, categorizing the plants by the disease they are used for, and summarizing how they are used. Quantitative analysis was done by calculating the percentage of plant parts used for medicine, and the percentage of the habitus of medicinal plants (Cunningham 2014).

RESULTS AND DISCUSSION

Composition of medicinal plants by family

In this study, we documented 86 medicinal plant species belonging to 48 families used by local people in Kelubi village (Figure 2). The four most abundant families were Rubiaceae (8 species), Myrtaceae (8 species), Euphorbiaceae (5 species), and Clusiaceae (5 species). Myrtaceae family is known to have a variety of plant species that can be used as medicinal plants, such as *jemang* (*Rhodammia cinerea*), *gelam* (*Malaleuca*

leucadendron), *keremuntingan* (*Rhodomyrtus tomentosa*), and *sekudong pelandok* (*Syzygium buxifolium*).

The plant species from the Myrtaceae family commonly can grow faster in critical areas. One of them is *keremuntingan* (*R. tomentosa*) which has medicinal benefits (to recover stomachache, lowering high blood pressure), and high ecological function. This species is well adapted to grow in ex-tin mining areas and is of high importance for ecosystem restoration. The resistance of *R. tomentosa* in ex-tin mining areas can be used as a pioneer to increase soil nutrients and prevent erosion. The species is also used by the community as medicine for stomachaches and lowering high blood pressure. *Rhodomyrtus tomentosa* has been identified to contain antioxidants that are useful for the human body. Other studies revealed that crushed leaves of *R. tomentosa* are useful for healing wounds (Sinulingga et al. 2018; Vo and Ngo 2019).

Species from the Rubiaceae are commonly known as coffees which have a characteristic fruit with a delicious aroma. Species from this family included *tenam* (*Psychotria malayana*), *akar rurutan* (*Gynochthodes coriacea*), *akar segendai* (*Coptosapelta tomentosa*), *tempala* (*Timonius flavescens*), and *sereting* (*Prismatomeris tetrandra*). The results of our study showed that there were 42 plants found in the heath forest, 38 of which were utilized as medicine by the people (90.48 %). Analgesic, antibacterial, antidiabetic, anti-plasmodium, and vitality are among the advantages obtained from the ten species in our study (Kissinger et al. 2016).

Diversity of medicinal plants based on habitus

Our study showed that the habitus of medicinal plants was dominated by trees (45%), followed by woody lianas (21%), small trees (13%), herbs (13%), and lianas (8%) (Figure 3). One of the tree species that has medicinal properties is *butun* (*Cratoxylum formosum*). This tree has thorns on its young trunk and the leave bud attached to the young trunk is efficacious as medicine for ulcers and scabs on the body. In Thailand, the young shoot, and the flower of *C. formosum* were used for cooking and fresh vegetables (Saisor et al. 2021). *Cratoxylum formosum* was consumed as a combination tea, to treat skin or wound healing, fever, cough, ulcer, diarrhea, internal bleeding, stomachic and diuretic effects, and food poisoning. Phytochemical investigations of this plant showed interesting secondary metabolites, comprising the main classes of xanthenes, anthraquinones, flavonoids, phenolics, and triterpenoids (Son 2020).

The woody lianas that are commonly used as medicine by the community include *akar kayu bau* (*Artabotrys suaveolens*) for colds, common cold (Kwan et al. 2016; Mohan et al. 2020), and as *jamu* after childbirth; *akar sariawan* (*Connarus semidecandrus*) as a thrush remedy (Reanmongkol et al. 2000); and *akar banar* (*Smilax barbata*) as an ulcer medicine, and *jamu* after childbirth. In accordance with the potential of lianas, which is the second-largest habitus after trees. The local people know both woody and non-woody lianas as *akar*. In herbaceous

habitus, small trees are used in less quantity than trees and lianas.

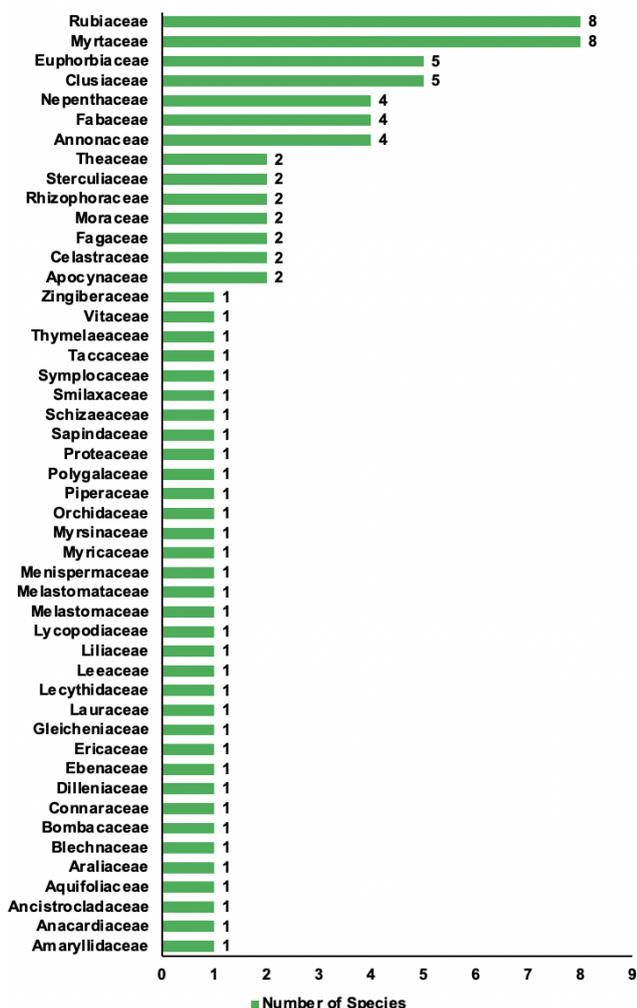


Figure 2. The plant families of medicinal plants

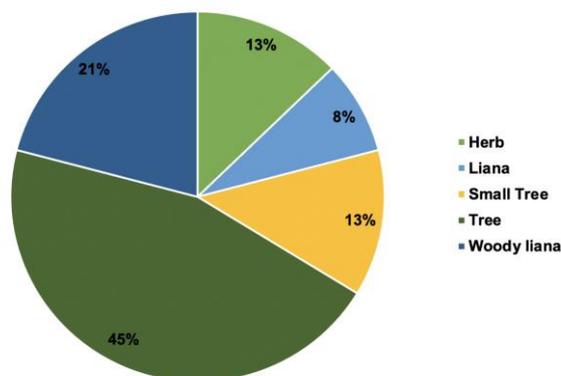


Figure 3. Habitus of medicinal plants

Medicinal plants based on the plant part used

Bioprospecting is a method of putting an economic value on biodiversity (Artuso 2002; Harvey and Gericke 2011). Identification of tree species' bioactivity is a crucial

step in calculating the economic value of the Kerangas forest. An ethnobotanical survey and qualitative phytochemical testing are used to document and investigate plant bioactivity. The phytochemistry of dried leaves and barks of selected trees from the Kerangas forest was investigated. The findings revealed that numerous phytochemistry substances are present in portions of selected trees from the Kerangas forest which is in line with the study conducted by Kissinger et al. (2016). The methanol extract of tree species from Kerangas forest can obtain many potential bioactivities (Abbasi et al. 2009; Abera 2014). Our results showed that parts of medicinal plants that are widely used were the stem and leaves.

This is in accordance with a potential habitus used as a medicinal plant, namely woody liana, where the part used is also called the stem. Several plant species whose stems are used as medicine were *akar banar* (*Smilax barbata*), *akar kayu bau* (*Artabotrys suaveolens*), and *akar ketumpu* (*Maesa ramentacea*). Local people commonly use the root of *akar kayu bau* (*A. suaveolens*) as a remedy for colds, and internal heat by drinking boiled water from the roots. Leaves are also part of the plant that is widely used in medicine. One of them is the leaves of *medang belilin* (*Cryptocarya densiflora*) (Othman et al. 2016; Ariani et al. 2017; Othman et al. 2017) as a headache medicine and fever reducer. A few leaves of *medang belilin* (*Cryptocarya densiflora*) are soaked in a bowl, then squeezed. Squeezing the leaves will produce mucus that is cold and not sticky, then rub it on the head or other body parts. This method is commonly known as *uras*.

There are eight plant parts used for medicine (Figure 4). The use of stem includes stem water, stem sap, and bark. Water obtained from the stem of *gelam* (*Melaleuca leucadendron*) can be used for internal fever or cough by drinking the stem water directly. The used parts of this species were leaves and flowers, which can be used as hair oil. The mode of preparation is soaking in water and smoking the leaves and flowers with frankincense (Heyne 1987). Another benefit of the stem is the sap of *betor padi* (*Calophyllum depressinervosum*) can be mixed with topical oil to relieve itching. All parts of the *Calophyllum* plant, including roots, fruits, leaves, stems, bark, and wood, are used in the treatment of several diseases, such as skin diseases and gout pain (Aminudin et al. 2015; Zamakshshari et al. 2019).

Medicinal plants by type of disease

The results of our interviews showed that 23 species of medicinal plants were used as a treatment after childbirth, and 10 species of plants were used to treat fever. There are five species to treat eye inflammation and sore eyes, such as *Glochidion celastroides*. Generally, medicinal plants can help the local people to solve some diseases related to the nervous system, circulatory system, reproductive system, respiratory system, digestive system, skeletal system, and muscle (Figure 5). One type of digestive disorder is the liver or commonly known as jaundice. *Sengkelut* (*Lycopodium cernuum*) is known that all parts of this plant

can be used to treat jaundice by boiling them and then drinking the water. Other types of diseases include antidote to animal poison, pinworms, eliminating the habit of urinating during sleep, large navel, scabies *gana*, and others. The diverse disease is in accordance with the local wisdom of the community in using medicinal plants from the forest. Several species of pitcher plant (*Nepenthes* spp.) are also used as eye drops, and to stop bedwetting in young children. *Keliangauan* (*Curculigo latifolia*) is commonly used to eliminate the bitter taste on the tongue when sick by eating the ripe fruit because it tastes sweet and can retain its sweet taste (Ishak et al. 2013; Nie et al. 2013; Mad Nasir et al. 2021).

Utilization of medicinal plants

The use of medicinal plants by the Kelubi Village community has been carried out for generations. This practice is still carried out by the community around the forest. Some ailments that are commonly experienced by villagers are aches, headaches, and the common cold. Some

of the medicinal plants used are collected directly from the forest and taken from the home garden.

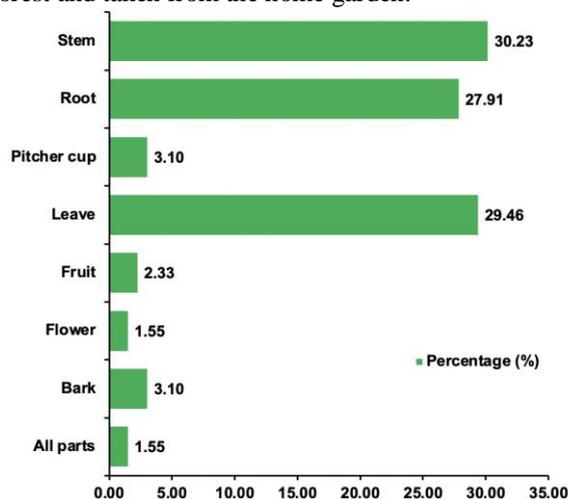


Figure 4. Percentage of plant parts used

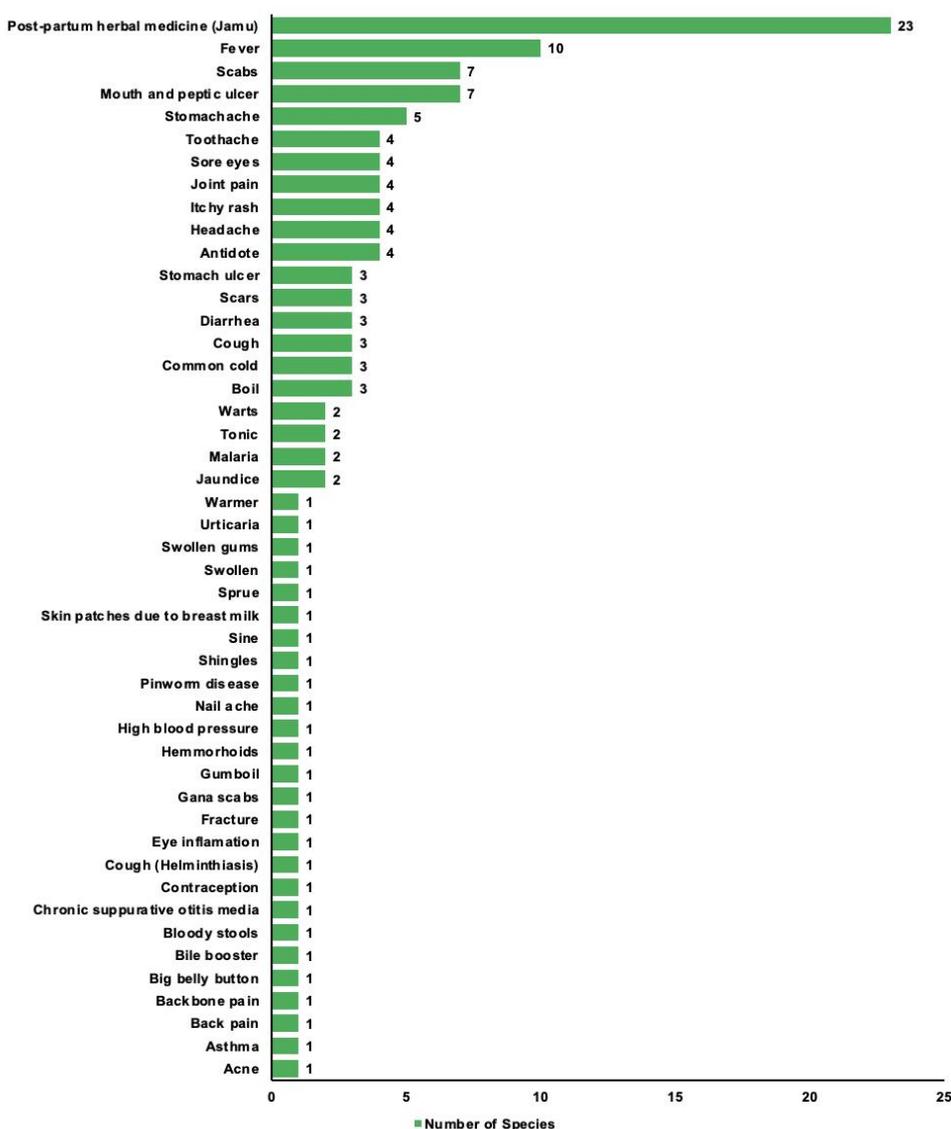


Figure 5. Number of species based on use category for disease

Table 1. Medicinal plant species from the top four families with uses, plant part used, and how to use the medicinal plant

Latin Name	Family	Uses	Plant Part Used	How to Use
<i>Coptosapelta tomentosa</i>	Rubiaceae	Common cold, Cough (Helminthiasis)	Stem	Brewed, and drink
<i>Gynochthodes coriacea</i>	Rubiaceae	Fever, Mouth and peptic ulcer, Scabs	Leaf	Squeeze, add water and drink
<i>Hemidiodia ocymifolia</i>	Rubiaceae	Boil	Leaf	Covered
<i>Prismatomeris tetrandra</i>	Rubiaceae	Backbone pain, <i>Jamu</i>	Root	Boiled, and drink
<i>Psychotria malayana</i>	Rubiaceae	Pinworm disease	Root	Brewed, and drink
<i>Psychotria sarmentosa</i>	Rubiaceae	Mouth and peptic ulcer	Whole part	Soak, and drink
<i>Psychotria viridiflora</i>	Rubiaceae	Swollen gums, <i>Jamu</i>	Root	Boiled, and drink
<i>Timonius flavescens</i>	Rubiaceae	Skin patches due to breast milk	Leaf	For bathing
<i>Melaleuca leucadendra</i>	Myrtaceae	Cough, Headache, Mouth and peptic ulcer	Leaf and water from stem	Directly drink
<i>Rhodamnia cinerea</i>	Myrtaceae	Cough, Scars, Toothache	Leaf	Chewed, smeared, brewed, and drink
<i>Rhodomyrtus tomentosa</i>	Myrtaceae	High blood pressure, Stomachache	Leaf	Brewed, and drink
<i>Syzygium euneuron</i>	Myrtaceae	Scars	Leaf	Smeared
<i>Syzygium buxifolium</i>	Myrtaceae	Stomachache, <i>Jamu</i>	Root, Leaf	Boiled, and drink
<i>Syzygium incarnatum</i>	Myrtaceae	<i>Jamu</i>	Leaf	Boiled, and drink
<i>Syzygium palembanicum</i>	Myrtaceae	Urticaria	Bark	Rubbed
<i>Tristaniopsis obovata</i>	Myrtaceae	Antidote	Root	Brewed, and drink
<i>Endospermum diadenum</i>	Euphorbiaceae	Chronic suppurative otitis media (<i>congek</i>)	Root	Grind wet on cotton and dripped into the ear
<i>Glochidion arborescens</i>	Euphorbiaceae	Shingles, Swollen	Leaf	Smeared
<i>Glochidion celastroides</i>	Euphorbiaceae	Eye inflammation, <i>Jamu</i>	Leaf	Covered, boiled, and drink
<i>Glochidion superbum</i>	Euphorbiaceae	<i>Jamu</i>	Leaf	Boiled, and drink
<i>Suregada glomerulata</i>	Euphorbiaceae	<i>Jamu</i>	Root	Boiled, and drink
<i>Calophyllum canum</i>	Clusiaceae	Malaria	Sap	Brewed, and drink
<i>Calophyllum depressinervosum</i>	Clusiaceae	Itchy rash	Stem sap	Make oil, and smeared
<i>Calophyllum lanigerum</i>	Clusiaceae	Mouth and peptic ulcer, Scabs	Water from stem	Drink, and smeared
<i>Cratoxylum formosum</i>	Clusiaceae	Boil	Leaf bud	For bathing and smeared
<i>Garcinia bancana</i>	Clusiaceae	Contraception	Root	Boiled, and drink

Note: *Jamu* is referring to herbal medicine for treatment after childbirth.



Figure 6. Simplicia of stem of *akar kayu bau* (*Artabotrys suaveolens*)

Medicinal plants can be used in the form of fresh or dried. The drying process is very important before storing used parts of medicinal plants. One of the parts of medicinal plants that are commonly stored in dry form is the root. Roots are preserved by cutting and drying them under the sun. After drying, the roots are stored in cardboard, plastic, sacks, or baskets made of *Pandanus furcatus* leaves. Natural ingredients used as drugs that have not undergone any processing, in the form of dried materials are called simplicia. According to Sulasmi et al. (2016) the more effective drying method to make simplicial is using a combination method of sun and blower, blower, oven, sun and wind. The use of medicinal plants is not only for personal needs but also for trade. Simplicia is sold by people who work as a seller of traditional medicines. All types of simplicia are sold at a price of IDR 10,000 (USD 0.68) per pack (Figure 6). Simplicia is commonly sold to people who have become customers, and some are kept for buyers who come to the seller's house.

Our study suggests that local people in the Kelubi village, Belitung Island have local wisdom to use and promote medicinal plants. The habitus of medicinal plants from the heath forest is dominated by trees and woody liana. This finding could initiate future studies on the bioprospecting and phytopharmacology of medicinal plants. Ecologically, the growth of medicinal plants in a stressful environment may contain more secondary metabolites which are essential for the development of potential drugs. To assure the resources of medicinal plants in the heath forest ecosystem, conservation of the heath forest ecosystem is inevitable and cultivation in the local people's home gardens is needed.

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