Traditional medicinal plants and their utilization by local communities around Lambung Mangkurat Education Forests, South Kalimantan, Indonesia

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Abstract. Nugroho Y, Soendjoto MA, Suyanto, Matatula J, Alam S, Wirabuana PYAP. 2021. Traditional medicinal plants and their utilization by local communities around Lambung Mangkurat Education Forests, South Kalimantan, Indonesia. Biodiversitas 23: 306-314. Lambung Mangkurat Education Forests (LMEF) is a unique forest area with high plant diversity, including medicinal plants. This study aimed to document the list of natural medicinal plant species in LMEF and analyze the community perceptions on utilizing them. Exploratory surveys collected data through field observation and interviews with people living in villages around LMEF. The inventory of medicinal plants was conducted by line transect method with 1,000 m long and 20 m wide. Meanwhile, indigenous communities' description of medicinal plant utilization was explored using an interview process on fifty respondents. The results showed that 56 medicinal plant species were naturally distributed in LMEF. Most plants have habitus as trees, wherein local communities commonly use their leaves as traditional medicine. Local people generally applied the extraction process using hot water to obtain the benefit of these plants. Interestingly, more than 70% of respondents prefer traditional medicine to drugs. These findings indicated that the sustainable management of LMEF can support the vital role of forest ecosystems for people's health.

Keywords: Forest ecosystems, local communities, people health, plant diversity, traditional medicine

INTRODUCTION

Lambung Mangkurat Education Forests (LMEF) is a special-purpose forest area in South Kalimantan. Universitas Lambung Mangkurat manages this area based on the Decree of the Ministry of Environment and Forestry Number SK. 900/MenLHK/Setjen/PLA.0/12/2016. According to the type of ecosystems, LMEF is classified as a tropical rain forest with a high diversity of flora and fauna. Besides managing as education and training forest, this site is also a conservation area. Therefore, the activity of natural resources utilization is relatively limited to protect this area from various disturbances and threats.

Various potential resources have been identified from LMEF. Some have been reported and published, such as birds (Purbaya et al. 2020), trees (Rusida et al. 2019; Wibisono et al. 2020), as well as local wisdom of the community (Firdaus et al. 2018; Andiani et al. 2019; Ariokta et al. 2020). However, other potentials have not been revealed, and among those potential resources, the existence of medicinal plants has become one of the essential information that should be investigated.

Medicinal plants are essential resources because many people require them for healing diseases. Moreover, these plants are safer for consumption than chemical drugs due to the low risk of side effects. The Duyaks as the main inhabitants of the interior of Kalimantan use plants as traditional medicine since ancient time. Knowledge of traditional medicine from plants has been obtained from their ancestors and passed down from generation to generation (Az-Zahra et al. 2021).

Several previous studies from different locations have also reported the distribution of medicinal plants in a special-purpose forest area. For example, a study conducted in Rantau found forty-one species from various plant habitats (Suryanto and Syaifuluddin 2017). Another similar study in Samboja found approximately thirty-seven medicinal plants naturally distributed in the special purpose forest area (Wibisono and Azham 2017). However, the data of medicinal plants from LMEF are still unavailable even though this information is required to preserve biodiversity in this area.

This study aimed to analyze the potential of medicinal plants naturally distributed in LMEF and their utilization by the local community living around this area. This information is not only a complement to the report on the database of many special-purpose forest areas of Indonesia. However, it can be used as materials for socializing the sustainability of these biological resources to the community around LMEF and as research material to enrich pharmaceutical science and technology for academic
MATERIALS AND METHODS

Study area
The medicinal plants’ inventory was conducted at the northern area of LMEF. The geographic coordinates for this site are located in E114°54'00" to 114°58'00" and S3°30'00" 3°34'00". This area is in East Mandiangin and Kiram Village, Karang Intan District, Banjar Regency, South Kalimantan, Indonesia (Figure 1). Meanwhile, the data about community perception for medicinal plants utilization were collected from the local people in the East Mandiangin Village. This village is the closest rural to the LMEF and can be accessed using a motorcycle or car.

Data collection
The process of data collection was undertaken from June to August 2020. Medicinal plants were recorded using the cruise method in about 20,000 m² and this rectangular area is formed from a straight cruising path of one-kilometer-long and 20 m wide. Plants are grouped into five habitus: grasses, herbs, shrubs, lianas, and trees. Grasses belong to the Poaceae and Cyperaceae families (Soendjoto et al. 2014), while herbs or shrubs refer to non-woody plants. Shrubs refer to woody plants with many branches but a maximum height of about 3 m. Meanwhile, liana is a climber who needs other plants (hosts) to stand upright to propagate or climb. Tree is a general term for woody plants with three or four growth stages: seedlings, saplings, poles, and trees. Seedlings are woody plants whose height is <1.5 m above the ground. Saplings are woody plants with a height of 1.5 m and a diameter at breast height (at the height of 1.3 m from ground level) <10 cm. Poles are woody plants whose diameter is in the range of 10 <20 cm, while trees are those with a diameter of 20 cm (Soendjoto et al. 2014). For woody plants with three growth stages by excluding the pole growth stage, a diameter of 10 cm is categorized as a tree.

Interviews were conducted with fifty respondents considered healers and the public directly using medicinal plants to identify the components that functioned as medicine and their utilization. The respondents consisted of 40 men and 10 women with more than 40 years of age. All of these respondents are residents of East Mandiangin Village, whose total population is 496 households. From this interview, specific information can be obtained, including plant species and how to use them as medicinal plants and people’s perceptions of these plants.

Data analysis
Descriptive analysis was applied to demonstrate the results by tabulating the information into a specific table. This consists of a family name, scientific name, and local name of the plant, plant habitus, plant part used as medicine, the name of the disease or disorder that is cured, and the method of processing that part of the plant. Public perception consists of positive, negative, and no opinion. All three are expressed in percentage, which is the ratio of the answers to the questionnaire submitted.

Figure 1. Map of study site in Lambung Mangkurat Education Forest, South Kalimantan, Indonesia
RESULTS AND DISCUSSION

Medicinal plants species in Lambung Mangkurat Education Forest

Fifty-six species belonging to 37 medicinal plant families were found in LMFE (Table 1). As mentioned above, this number is higher than the plant species reported from several KDHTKs in Indonesia. However, based on the following two situations, that number is relatively small.

First, medicinal plant species were obtained from an area of 2 hectares or only 0.12% of the total area of LMFE. This is classified as very small considering LMFE reaches 1,627 hectares. Second, other species are categorized as medicinal plants in LMFE but were not found in the data collection area. Four of these species are balik angin (Alphitonia excelsa) (Rusida et al. 2019), kimalaka (Phyllanthus emblica) (Matnasir et al. 2020), pulantan (Alstonia scholaris) (Wibisono et al. 2020), and tikusan (Claussenia excavata) (Paradika et al. 2021). Balik angin known as the soap tree (Thompson et al. 2019), has the potential, among others, for chemical therapy for the prevention and treatment of urinary infections, autoimmune diseases, and gastrointestinal bleeding (Cock 2020). Kimalaka has potential as a treatment for diarrhea, inflammation (Krishnaveni and Mirunalini 2010), sore throat and as a refreshing drink (Rahman et al. 2013), antioxidant (Suzery et al. 2013), and anti-obesity (Ardiansyah et al. 2018). Pulantan has potential as an antitoxoplasma (Abraham et al. 2014), antidiabetic (Tambunan et al. 2016), antioxidant (Zuraida et al. 2017; Thahira et al. 2021), and antimicrobial. Finally, tikusan has the potential as antioxidants (Arbab et al. 2011), anticancer, wound healing (Albaayit et al. 2015), as well as antioxidants and anti-diabetic (Thant et al. 2019).

The habitus of medicinal plants that are most often used were trees (50%). The next habitus were lianas, herbs or shrubs, and grasses (Figure 2A). Trees are also the most widely used as a source of medicine by the Manobo Tribe, Philippines (Dapar et al. 2020).

The plant with the highest utilization ratio (33%) was the leaf, and other parts that were used (respectively from high to low ratio) were stems, roots, fruit, flowers, and sap (Figure 2B). Leaves are more widely used because their secondary metabolite content is more diverse (Assi et al. 2017; Jain et al. 2019; Fatmawati et al. 2020; Gurning and Sinaga 2020), the content of medicinal ingredients is strong or high (Malini et al. 2017), the availability are more abundant (Mustofa et al. 2020), harvesting is easier (Malini et al. 2017; Mustofa et al. 2020). Furthermore, leaves do not directly impact plant death (Qamariah et al. 2020), and after harvesting, they can quickly grow back (Qamariah et al. 2020).

Leaves are part of medicinal plants with the highest utilization ratio by various ethnic groups. However, the level of utilization ratio for each ethnic group is different. In Indonesia, such a situation is found in the Karo ethnicity in North Sumatra (Affandi and Batubara 2019), the Kaili ethnic group, Central Sulawesi (Ifandi et al. 2016), the Tengger ethnic group in East Java (Jadid et al. 2020), the community of Karangwangi Village, Cianjur, West Java (Malini et al. 2017), three ethnic groups (Banjar, Bugis, Dayak) in Tanah Bumho Regency, Kalimantan Selatan (Radam et al. 2016), Ethnic Mamuju, Sulawesi West (Syamsiah et al. 2016), and four Dayak sub-ethnicities in West Kalimantan (Yusro et al. 2014). Outside Indonesia, ethnic groups or communities that use leaves as the main part of plants in medicine include the Tolai community, Papua New Guinea (Bureng et al. 2016), the Manobo Tribe, the Philippines (Dapar et al. 2020), the Bilaspur Village community, India (Patel 2014), the Ayta community, Philippines (Tantengco et al. 2018), and Sheikhpura, Pakistan (Zahoor et al. 2017).

Preparation of plants in medicine

The plant parts are eaten (including chewing), swallowed, drunk, or gargled to treat diseases or cure disorders from within the body. Outside the body, the medicinal plant is attached, smeared, washed, splashed or used as a washing agent, rubbed, inhaled, or left in the air to repel nuisance animals. However, the plant should be prepared by additional ingredients, crushing, or burning. The medicinal plant parts are chewed, kneaded, pulverized, pounded, or boiled to crush it, depending on the hardness of the parts.

There are four boiling records identified from this study. First, two forms are used after boiling: (1) solids from medicinal plants are eaten, or (2) boiled liquids are drunk. Second, boiling refers to the process of putting plant parts into a container filled with water with a specific volume and cooking over a fire until the water boils or the volume decreases. Suhrjito et al. (2014) revealed that the boiling carried out in two ways depends on the part of the medicinal plant used: (1) boiling the water in which there are medicinal plant parts or (2) soaking the medicinal plant part in hot water. Third, no specific data were obtained regarding the container and stirrer. In a study in Semarang, Central Java, Sumarni et al. (2019) mentions that the container used to boil the medicinal plant parts is Kuali (a clay cauldron/pot/kettle), and the stirrer is made of wood or stone. The clay cauldron reduces the efficacy of medicinal herbs. It was reported that the people of Kalimantan Selatan are not familiar with the boiling and stirring tools commonly used in Central Java. Fourth, there are no data related to the drying of medicinal plants before being served or given treatment. Sumarni et al. (2019) noted that drying is an initial process before parts of the plants are boiled, and the aim is to prevent the absorption of sap in the body when drunk.

Boiling is the process most often conducted in the preparation of drugs, and the frequency reaches more than 43% (Figure 3). For example, the Kayanat Dayak Ethnic in West Kalimantan boils medicinal plants to dissolve the active ingredients quickly in water and heal faster after drinking the boiled water (Sari et al. 2021).
Diabetes medication. The bark of 5 cm wide is boiled, and the boiled water is drunk.
**Lauraceae**

*Eusideroxylon zwageri*; ulin

- **Tree**
- **Leaves**
- Blackening hair or anti grey hair. Leaves (shoots) are washed on the hair.

*Litsea sp.; madang telur*

- **Tree**
- **Stem (bark)**
- Mosquito repellent, for example, when in the forest. The bark is burned, and the smoke is used to repel mosquitoes.

**Marantaceae**

*Donax cenniformis; bamban batu*

- **Shrub**
- **Stem**
- Cough medicine. The stem is cut, and the water that drips or comes out of the cut stem is then drunk directly.

**Melastomaceae**

*Melastoma malabathricum; senduduk*

- **Shrub**
- **Flowers**
- Cough medicine. Flowers are pulverized or crushed until smooth and then eaten or swallowed.

**Meliaceae**

*Aglaia sp.; kilayu*

- **Tree**
- **Leaves**
- Medication for chickenpox or herpes. The leaves are ground and then applied to the body parts, especially those affected by chickenpox.

*Lansium domesticum; langsat*

- **Tree**
- **Stem (bark)**
- Medication for diarrhea or stomach problems. The bark is boiled, and the boiled water is drunk.

*Svetenia mahagoni; mahoni*

- **Tree**
- **Stem (bark)**
- Medication for wet wounds or scabs. Bark measuring about 10 cm x 10 cm is cut into small pieces and boiled. Boiling water is used to wash scabs.

**Menispermaceae**

*Arcangelicia flava; akar kuning*

- **Liana**
- **Root**
- Liver or hepatitis drugs. The roots are boiled, and the boiled water is then drunk.

**Moraceae**

*Artocarpus dadah; tampang*

- **Tree**
- **Leaves**
- Stomach problem medicine. The young leaves are boiled, and the boiled water is drunk.

**Myrtaceae**

*Tristaniopsis sp.; jawaling*

- **Tree**
- **Leaves**
- Insect repellent (such as mosquitoes). The leaves are burned, and the smoke is insect repellent.

*Syzygium polyanthum; salam*

- **Tree**
- **Leaves**
- Hypertension medication. Five leaves are boiled, and the water is drunk.

*Tristaniopsis merguensis; pelawan*

- **Tree**
- **Stem**
- Liver medicine. The stem is cut, and the dripping liquid is drunk.

**Oxalidaceae**

*Averrhoa bilimbi; belimbing wuluh/tunjuk*

- **Tree**
- **Flowers or fruits**
- 1. Drugs for tinea versicolor. The flowers or fruit are ground and rubbed on the affected body parts.
   2. Sprue medication. Flowers or fruit are boiled, and the boiled water is used for gargling.

**Passifloraceae**

*Passiflora foetida; permot, bilaran kusam*

- **Liana**
- **Stem**
- Diabetes medication or blood-glucose-lowering. The 40 cm long stem is boiled, and the boiled water is drunk.

**Phyllanthaceae**

*Baccaurea javanica; limpasu*

- **Tree**
- **Root**
- Fever medicine. The roots are boiled, and the boiled water is drunk.

*Phyllanthus debilis; ambin-ambin buah, meniran*

- **Herb**
- **Root**
- Back pain medicine. The roots are boiled, and the boiled water is drunk.

**Poaceae**

*Imperata cylindrica; alang-alang*

- **Grasses**
- **Root**
- Back pain medicine. The roots of about ten clumps are tied up and then boiled. The boiled water is drunk.

**Primulaceae**

*Labisia pumila; rumput fatimah*

- **Herb**
- **Root**
- Natural contraceptives. The roots are boiled, and the boiled water is drunk every day.

**Rhamnaceae**

*Ziziphus sp.; teja*

- **Tree**
- **Root**
- Post-partum recovery. The roots are boiled, and the boiled water is drunk.

**Rubiaceae**

*Morinda citrifolia; carikan, mengkudu*

- **Tree**
- **Stem**
- Bloody stool medicine. The stems are chopped and boiled. Finally, the boiled water is drunk.

*Luvunga eleutheandra; seluang belum*

- **Liana**
- **Root**
- Stamina-boosting drug. The roots are boiled, and the boiled water is drunk.

*Euodia aromatic; wangi gunung*

- **Tree**
- **Leaves**
- Remedy for itching and hives. The young leaves are ground and then applied to the itching area.

**Salicaceae**

*Flacourtia rukam; rukam*

- **Tree**
- **Leaves**
- Eye pain medicine. Young leaves (7 pieces) crushed by pounding and mixed with water. The obtained liquid is filtered. The filtered liquid is used to clean the eye.
Santalaceae  
*Santalum album*; cendana  
Tree  
Stem (bark)  
Internal medicine (gastric ulcers, stomach pain, stomach acid). The bark is boiled, and the boiled water is then drunk.

Sapotaceae  
*Mimusops elengi*; tanjung  
Tree  
Stem (bark)  
Drugs for insomnia (difficulty sleeping). The bark measuring about 5 cm x 5 cm is boiled with a glass of water until it boils. Boiled water that has been cooled and then drunk.

Simaroubaceae  
*Brucea javanica*; marsihung  
Shrub  
Fruits  
Malaria drugs. Ripe fruit is pounded and then swallowed directly.

Eurycoma longifolia; pasak bumi  
Tree  
Root  
Back pain medicine and stamina-boosting drug. The roots are boiled, and the boiled water is drunk. Roots can still be reused at least three times of use.

Tiliaceae  
*Muntingia calabura*; kersen  
Tree  
Leaves  
Diabetes medication. The leaves are boiled, and the boiled water is drunk.

Urticaceae  
*La*portea macrostac*hy*a; jelatang  
Shrub  
Root  
Medicine for itching and swelling due to touching or being touched by jelatang leaves. The root is applied to the itchy or swollen part.

Verbenaceae  
*Peronema canescens*; sungkai  
Tree  
Leaves  
Malaria drugs. The tops of the leaves are crushed and swallowed immediately. Stamina-boosting drug. The leaves are boiled, and the boiled water is then drunk.

Vitaceae  
*Tetrastigma* sp.; ulur-ulur  
Liana  
Stem  
Medication for vomiting blood, internal bleeding, or ambient. The stems are cut, and the water that drips from the stems is then drunk.

*Leea indica*; mali-mali  
Shrub  
Fruits  
Wart remover. Ripe fruit (blackish color) pounded until crushed. This fruit mash is applied to the wart site for several repetitions.

Zingiberaceae  
*Zingiber cassumunar*; banglai warik  
Herb  
Root (rhizome)  
Medicine for itching or allergies. The rhizomes are cleaned, peeled, and then grated. Grated rhizome attached to the itchy parts.

**Figure 2.** The ratio of utilization of plant habitus (A) and plant parts as a source of medicine (B)

**People perception of medicinal plants**  
The people of Mandiangin Timur Village have been touched by modern culture. For example, they can go back and forth to the nearest town (Banjarbaru), only about 15 km away by 2-wheeled or 4-wheeled vehicles via asphalt roads. Subsequently, all respondents have used mobile phones to communicate because the internet network has been operated in this village. With this tool, people can communicate faster and get or access knowledge about modern medicines more efficiently. However, most people (74.0%) positively perceive traditional medicine that uses medicinal plants (Table 2).
This constitutes hisaler's health condition at the time of
cinical plants. First, the dose
decide by heal,
cinal plants are applied with or without a mixture of other ingredients
Peninsular Malaysia (Zaki et al. 2019); Asian continents, such as the
and treatm
h is mostly by boiling.

The positive perception is in line with the condition that
treatment is still applied by almost 80% of the
world's population (Mbuni et al. 2020). This constitutes
people on the African continent, such as communities around Cherangani Hills, Western Kenya (Mbuni et al.
Asian continents, such as the Temiar Tribe in Kelantan, Peninsular Malaysia (Zaki et al. 2019); Americas, such as Mexico, Central America, and the
Caribbean (Alonso-Castro et al. 2016); Australian
century, such as Dharawal Aboriginal people, Australia (Akhbar et al. 2016); European countries, such as Belgium,
France, Germany, and the Netherlands (Hoareau and Da Silva 1999). In this perspective, the positive trend of
returning to nature may increase since the pandemic spread
worldwide, and treatment has not been found. Plants that
can prevent or treat Covid-19 were studied, among others,
by Khan et al. (2021) and Lim et al. (2021).

In conclusion, the study identified 56 medicinal plant
species of 37 families found in all habitus (underplants,
shrubs, lianas, and trees) in LMFE. These identified species
can be used to treat 28 types of diseases; the part widely
used for treatment is the leaves, and the processing method
is mostly by boiling.

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