

## Ethnobotany of medicinal plants from Lampung Tribe around Way Kambas National Park, Indonesia

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Manuscript received: 15 January 2022. Revision accepted: 25 April 2022.

**Abstract.** *Yudiyanto, Hakim N, Wakhidah AZ. 2022. Ethnobotany of medicinal plants from Lampung Tribe around Way Kambas National Park, Indonesia. Nusantara Bioscience 14: 84-94.* The local communities of the Lampung Tribe around Way Kambas National Park (TNWK), Lampung, Indonesia, utilize forest resources through local community knowledge. However, cultural modernization can potentially lead to the erosion of people's traditional knowledge. Therefore, this study is essential to be conducted. This study aimed to inventory medicinal plant species and describe local communities' knowledge of the use of medicinal plants. Semi-structured interviews and observations collected ethnobotanical data. The results were presented in a table and diagram and then analyzed qualitatively. The results showed that the local community of the Lampung Tribe around the TNWK area used as many as 69 species of medicinal plants belonging to 39 families. Zingiberaceae was the family with the highest number of species. Leaves were the plant part that was used mainly by the local community. Boiling was the most widely used mode of preparation. The Lampung Tribe uses plants to treat various diseases grouped into external and internal diseases. The local community frequently experiences external diseases.

**Keywords:** Ethnobotany, herbal medicine, local knowledge, Way Kambas National Park

### INTRODUCTION

The plant diversity of Indonesia is very promising to be developed as raw material for traditional medicines. The local knowledge has been passed down from generation to generation (Nahdi et al. 2016). About 80% of the total plant species in Indonesia have medicinal properties for diseases that exist worldwide (Kusuma et al. 2014). Specifically, as many as 940 medicinal plants from about 20,000 plant species have been used in Indonesia (Masyhud 2010). Medicinal plants are used in traditional medicine, which is understandable as an ancient and culture-bound method of healing that humans have used to cope and deal with various diseases that have threatened their existence and survival (Abdullahi 2011). Traditional medicine is a mixture made from multiple parts of plant species that have properties to cure various diseases and have been practiced from generation to generation since ancient times (Sada and Tanjung 2010). Traditional medicinal plants are natural ingredients used as medicines based on a community experience. This kind of medicine is usually processed using a simple technology based on recipes inherited from generation to generation, following local traditions and beliefs. Even some are based on supernatural power (Nahdi et al. 2016).

The use of medicinal plants is also regulated in the Indonesian Constitution. One of the government policies is Constitution No. 23 of 1992 concerning traditional medicine, which explains an effort outside of medicine or nursing science, including methods, drugs, and treatment,

which refers to knowledge, experience, and skills that are passed down from generation to generation, both original as well as those from outside Indonesia, which applied according to the prevailing norms in local society. The law also states that as part of health service efforts, traditional medicine is the responsibility of the government and the community to participate in realizing public health status.

Way Kambas National Park (TNWK) has very high biodiversity. The local communities, i.e., the Lampung tribe, around TNWK use forest resources for local community knowledge. One of the uses of forest resources is medicinal plants, which are closely related to health needs in people's daily lives. The fulfillment of these needs is carried out independently and is hereditary. This practice benefits the community to create a healthy and prosperous society.

The transformation in traditional culture and the environment often occurs due to modernization. Therefore, cultural modernization potentially leads to the erosion of people's traditional knowledge. Likewise, the practice of plant use and management as traditional medicines by the community may be lost (Giddens 2013). Moreover, the local knowledge about traditional medicinal plants is not well documented since older adults or local experts only orally transmit the information. In other words, knowledge about medicinal plants passed down orally from generation to generation is vulnerable to lose, especially with the current modernizations.

Considering such backgrounds, ethnobotanical studies of medicinal plants that the Lampung Tribe around TNWK

uses are essential to be carried out. This study aims to document local communities' knowledge and conservation of biological resources. The study aims to inventory medicinal plant species used by the Lampung Tribe around TNWK and to describe the knowledge of local communities in terms of the use of medicinal plants. Therefore, local knowledge can be well preserved and be a future legacy for the next generation.

## MATERIALS AND METHODS

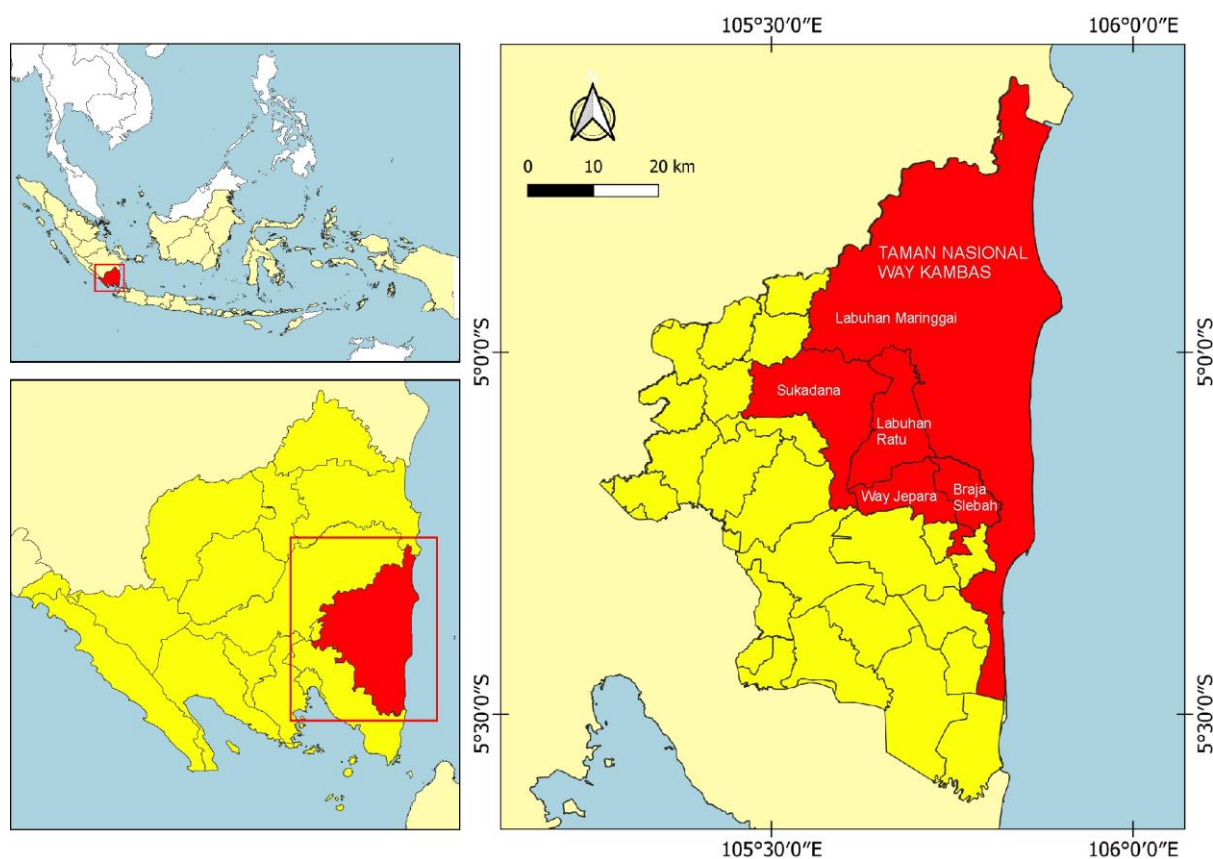
### Study area

The study was carried out in five sub-districts around Way Kambas National Park, Lampung, Indonesia, namely Sukadana, Labuhan Ratu, Braja Slebah, Way Jepara, and Labuhan Maringgai. These sub-districts are directly adjacent to the national park area and have long been inhabited by the Lampung Tribe (Figure 1). The study was conducted from April to September 2020. The TNWK is located in East Lampung Regency, more specifically between 40°37'-50°16' South Latitude and between 105°33'-105°54' East Longitude. That is a tropical forest area sized approximately 125,631 hectares. The TNWK is a conservation area in the form of a national park established based on the Decree of the Indonesian Minister of Forestry No. 670/Kpts-II/1999 dated 26 August 1999.

Geographically, TNWK is positioned at 40,37'-50,16' LS and 105,33'-105,54' BT.

The topography of TNWK is relatively flat to slightly bumpy, with a height range from 0 to 50 meters above sea level. The soil is generally podzolic, has high light content, acid soil reaction, is low in nutrients, is easy to catch water (porous), and has relatively high soil binding capacity. The TNWK has three major river sub-groups which flow into the Java Sea coast in the eastern area, i.e., Way Penet in the south area, Way Kanan and Wako in the middle area, and Pegadungan river in the northern area. A swamp forest ecosystem is mainly around the river in the eastern part of the TNWK. This area is relatively close to the ancient village where this study was conducted. In those ancient villages, the Lampung Tribe communities still preserve customary local culture, including Sukadana, Labuhan Ratu, Braja Slebah, Way Jepara, and Labuhan Maringgai still exist.

Sukadana, Labuhan Ratu, Braja Slebah, Way Jepara, and Labuhan Maringgai Sub-districts are directly adjacent to the Way Kambas National Park area. The Lampung Tribe primarily inhabits these sub-districts. The ancient villages in these sub-districts still maintain their knowledge of traditional medicine. Traditional medicine uses many plants as ingredients for an herbal drink (*jamu*), consumed as fresh vegetables or applied smeared.



**Figure 1.** Map of the study area in the Way Kambas National Park, Lampung, Indonesia

### Data collection

Semi-structured interviews and observations collected ethnobotanical data. Semi-structured interviews were carried out with key respondents using questionnaires prepared on a particular topic, completed with in-depth and open direct discussion. The snowball sampling technique was employed to determine key respondents (Vogl et al. 2004). The key respondents were local people who are more knowledgeable in medicinal plants than others, including village heads, traditional leaders, community leaders, or people accustomed to using medicinal plants.

Observations were made to verify plant species obtained from the interviews. The unidentified plant species were taken in a photo, made into herbarium, and identified following plant identification books such as Flora of Java (Spermatophytes only) (Backer and Van Den Brink 1963), Flora Pegunungan Jawa (Steenis 2013), Identifikasi dan Klasifikasi Tumbuhan (Ahmad 2020). The scientific names were validated using online sources, namely <https://powo.science.kew.org/> and <https://www.nparks.gov.sg/>. In addition, observations were made by finding the presence of medicinal plants around the TNWK. Observations were carried out with respondents' assistance to directly show the plants in question and then documented.

### Data analysis

The data were presented in a table and diagram and analyzed by qualitative descriptive method to describe plant species used as medicine by the community, curable diseases, plant parts used, mode of preparation, and comparison with scientific data of medicinal plants from the other area of Indonesia. We also discussed the local wisdom of the Lampung Tribe around the TNWK about their conservation action toward medicinal plants.

## RESULTS AND DISCUSSION

### The use of medicinal plants

This study showed that as many as 69 medicinal plants belonging to 39 families were used by the Lampung Tribe around TNWK (Table 1). This result indicates that the knowledge of the local people about medicinal plants is well maintained. This finding showed that Zingiberaceae had the highest species (9 species). The same results were also reported in other Indonesian areas, such as Wakhidah (2020), where 11 plant species of the Zingiberaceae family are used as medicinal plants by the Lampung Saibatin in the western part of Lampung Province. The Colo community in Kudus, Central Java, also uses a lot of plant species from the Zingiberaceae family (14 species) (Wahidah et al. 2021). Likewise, the Toba Batak ethnicity

in North Sumatra also often uses the Zingiberaceae family as medicinal ingredients with nine species (Nasution et al. 2020). Other families that the Lampung Tribe widely uses are Poaceae (5 species), Musaceae, Piperaceae, Fabaceae, and Asteraceae (4 species each) (Table 2).

The Zingiberaceae family has been reported to have various biological activities, such as antioxidant, anti-cancer, anti-inflammatory (Tushar et al. 2010), and antibacterial (Saad et al. 2014). Plant species of the Zingiberaceae family used by the Lampung Tribe were *Alpinia galanga* (L.) Willd., *Curcuma domestica* Valetton, *Curcuma xanthorrhiza* Roxb, *Curcuma zedoaria* (Christm.) Roscoe, and *Zingiber officinale* Roscoe. These species contain essential oils that might have different bioactivity. For example, the bioactivity of the essential oil in *Z. officinale* is antiglycation (Batubara et al. 2016), while the essential oil content in *C. xanthorrhiza* acts as antihyperglycemic and anti-inflammatory (Rajkumari and Santombi 2018). Apart from the hereditary belief of the Lampung tribe, plant species of the Zingiberaceae family have been proven to contain compounds that are beneficial to health.

The second highest family used as medicine by the Lampung Tribe was Poaceae (5 species), consisting of *Imperata cylindrica* (L.) P.Beauv., *Cymbopogon citratus* (DC.) Stapf, *Zea mays* L., *Cymbopogon nardus* (L.) Rendle, and *Saccharum officinarum* cv. Badila. The leaves of *alang-alang* (*I. cylindrica*) were mixed with *Andrographis paniculata* (Burm.f.) Nees are used as herbs by drying and then brewing. The plant is believed to treat heartburn, urinary incontinence, and kidney disease. The *I. cylindrica* is also used by the Dani Tribe in Jayawijaya, Papua, as medicine for influenza and tinea versicolor (Mabel et al. 2016). The Sunda tribe in Cirebon uses the roots of *alang-alang* mixed with the leaves of avocado and *Orthosiphon aristatus* (Blume) Miq. to cure kidney disease (Hidayat and Rachmadiyahanto 2017). Phytochemicals in *I. cylindrica* include alkaloids, triterpenoids, flavonoids, saponins, and tannins (Padma et al. 2013). These phytochemical compounds have various biological activities, such as analgesic abilities (Razafindrakoto et al. 2021), an antibacterial effect that can inhibit bacterial growth, such as *Pseudomonas aeruginosa*, *Klebsiella pneumoniae*, and *Bacillus subtilis*, also effective against two avian intestinal worms such as *Raillietina echinobothrida* (Megnin, 1881), and *Ascaridia galli* (Schrank, 1788) (Lalthanpuui et al. 2019), and the extract can ameliorate disturbance in hematological profile due to liver damage (Dahlan et al. 2020). There is a possibility that kidney disease can be treated in line with ethnobotanical knowledge because of the analgesic activity in the roots extract of *I. cylindrica*.

**Table 1.** The list of medicinal plants used by the Lampung Tribe around the Way Kambas National Park, Lampung, Indonesia

Family	Scientific name	Local name	Used part	Mode of preparation	Curable disease/ efficacy
Acanthaceae	<i>Rhinacanthus nasutus</i> (L.) Kurz	Cucuk manuk, tuktuk bughung	Leaves	The leaves and flowers are cleaned, rubbed into the itchy part	Relieve itching
	<i>Andrographis paniculata</i> (Burm.f.) Nees	Sambiloto	Stem, leaves	The stems and leaves are washed, boiled, and boiled water is drunk	Relieve fever, aches, and pains
Amaryllidaceae	<i>Allium tuberosum</i> Rottler ex Spreng.	Kuca	Leaves, stem	Consumed as fresh vegetables. Boiled and boiled water is drunk	Healthy bones and lowering cholesterol
Annonaceae	<i>Annona muricata</i> L.	Sirsak, bulung sisrsak	Leaves	The leaves are washed, boiled, and boiled water is drunk	Cancer, diabetes, and gout
Apiaceae	<i>Foeniculum vulgare</i> Mill.	Adas poluwaras	Root	Pounded, squeezed, and brewed with warm water	Digestive medicine, flatulence, constipation, anemia, and irregular menstruation
	<i>Coriandrum sativum</i> L.	Ketumbar	Seed	Roasted and eaten	Eliminate body odor and female genital organ
	<i>Apium graveolens</i> L.	Seledri	Root, stem, leaves	Blended finely, add lemon juice, filtered, and drink every day	Gout
Apocynaceae	<i>Catharanthus roseus</i> (L.) G.Don	Tapak dara, serdadu	Root, stem, leaves	The roots and the leaves are washed, boiled, and boiled water is drunk. The leaves are washed, boiled, and boiled water is drunk	Ulcer and internal diseases, diabetes, lowering high blood pressure, tumors, and leukemia
Arecaceae	<i>Cocos nucifera</i> L.	Kelapa hijau	Coconut water	Burn the coconut and then drink the water	Lowering blood pressure and removing body toxins
Asteraceae	<i>Gynura procumbens</i> Merr.	Sambung nyawa	Leaves	As fresh vegetables or boiled leaves, strained, and drink the water	Stamina booster and malaria
	<i>Gynura divaricata</i> (L.) DC.	Tapak dewa, tapak limin	Leaves	Pounded leaves, then pasted to bruises.	Bruises
	<i>Sonchus arvensis</i> L.	Tempuyung	Leaves	The leaves are boiled, and the boiled water is drunk	Relieve kidney stones
	<i>Blumea balsamifera</i> (L.) DC.	Capa, sembung, bulung capa	Leaves	Fresh leaves or dried leaves are boiled, then boiled water is drunk	Fever, lowering high blood pressure, and shedding kidney stones
Basellaceae	<i>Anredera cordifolia</i> (Tenore.) Steenis	Binahong	Leaves	Ten leaves, squeezed with a bit of water, compress all over the body, especially the soles of the feet	Febrifuge
Bignoniaceae	<i>Anredera cordifolia</i> (Tenore.) Steenis	Binahong	Leaves	Boiled and boiled water is drunk. The leaves are crushed and then placed on the burn	Ulcers, fever, and burn
Bignoniaceae	<i>Crescentia cajute</i> L.	Bernung, maja	Fruit, flower	Fruit is made into syrup, the leaves are boiled, and the boiled water is drunk	Relieve stomach aches, facilitate digestion, asthma
Boraginaceae	<i>Heliotropium indicum</i> L.	Sangketan, buntut tikus	Leaves	1. Boiled, and then boiled water is drunk; 2. The leaves are crushed, mixed with eucalyptus oil, and rubbed on the body	1. Shedding kidney stones, 2. Relieve fever in children

Cactaceae	<i>Hylocereus undatus</i> (Haw.) D.R.Hunt	Buah naga	Fruit	Peel and consume directly	Digestion, cardiovascular
Caricaceae	<i>Carica papaya</i> L.	Papaya	Fruit	Consumed directly or in juice	Digestion, menstrual pain, cancer
Cucurbitaceae	<i>Momordica charantia</i> L.	Pare, bulung pria	Leaves	Five leaves washed, add salt, then put into the mouth of the child/toddler with a spoon	Stimulating the appetite of children
	<i>Cucurbita moschata</i> (Duch.) Duch	Labu kuning, labu parang	Fruit	Fruit cut into pieces, boiled, and eaten before bed without sugar	Relieve stomach ache
Euphorbiaceae	<i>Ricinus communis</i> L.	Pohon jarak ulung	Sap	Take a leaf stalk, break it, take the sap about one tablespoon, add salt, and drink	Vomiting blood, heartburn, and ulcer
Fabaceae	<i>Tamarindus indica</i> L.	Asam jawa	Fruit	Mixed with turmeric or ginger, cleaned in a tangerine, combined with a bit of hot water, squeezed and filtered, add honey, and drink	Cough medicine, fever, rheumatism, stamina enhancer, and dysentery medicine
	<i>Parkia timoriana</i> (DC.) Merr.	Kedawung, kadawong	Seed	Add a little water, and paste it on the sore spot	Itching, wound infection, and stomach disorders
	<i>Erythrina variegata</i> L.	Dadap, khedak minyak	Leaves	Mix the leaves of the oil with hot water and then drink. Crushed leaves, add a little water, compress on the head, stomach, and chest	Fever, gout medication, launch menstruation, postpartum after giving birth
	<i>Senna alata</i> (L.) Roxb	Ketepeng	Flower	Leaves are boiled, filtered, then drunk	Overcoming intestinal worms, constipation, and treating sprue
Illiciaceae	<i>Illicium verum</i> Hook.f.	Kembang lawing	Flower	The flowers are washed, mashed, boiled, strained, and drunk in the water	Sciatica, fever, flu, and stamina enhancer
Lamiaceae	<i>Orthosiphon aristatus</i> (Blume) Miq.	Kumis kucing	Leaves	The leaves are washed, boiled, and drunk	Shedding kidney stones and relieving cough
Lauraceae	<i>Persea americana</i> Mill.	Alpukat	Leaf and fruit	Five leaves were washed and boiled; Fruit was eaten or juiced	Ulcer, diarrhea, and constipation
	<i>Cinnamomum verum</i> J.Presl	Kayu manis	Bark	Boiled with other herbal mixtures	Stamina enhancer, lowering blood sugar, rheumatic pain
Liliaceae	<i>Allium sativum</i> L.	Bawang putih	Tuber	Grated, mixed with sugar and coconut oil, and then applied to the wound	Wound medicine
	<i>Allium cepa</i> L.	Bawang merah	Tuber	Grated, add coconut oil, and apply to the head, stomach (center), and body	Medicine for fever/high fever in children
Malvaceae	<i>Ceiba pentandra</i> (L.) Gaertn.	Golong gandu	Leaves	The leaves are grown, add water, squeeze, drink	Constipation
Meliaceae	<i>Lansium domesticum</i> Corrêa	Duku	Bark	Bark or teak bark, cleaned, washed, ground, boiled with water from 3 cups to 1 cup, then drunk	Diabetes
Menispermaceae	<i>Tinospora cordifolia</i> (Willd.) Hook.f. & Thomson	Brotowali, bratawali	Stem	The stems are consumed directly or boiled; the water is drunk	Febrifuge antidote to toxins in the body, treating gout and preventing diabetes, cancer, and heart disease
Moringaceae	<i>Moringa oleifera</i> Lam.	Kelor	Leaves	The leaves are cooked as "sayur bening." Boil, and drink the boiled water	Maintain a healthy body, diabetes, asthma, and breast milk booster
Musaceae	<i>Musa x paradisiaca</i> L.	Pisang	Leaves	The leaves are smeared with edible oil, heated over a fire, and stick to the bruised area	Bruise
	<i>Musa acuminata</i> "Cavendish"	Sumbeng, jantung pisang ambon	Flower	Peel the flower, take the white part, boil it, let for a few minutes, and consume	Stomachache
Myrtaceae	<i>Psidium guajava</i> L.	Jambu biji, bulung jambew biji	Leaves	Take 20 leaves, wash, boil in 2 cups until boiling, add rice flour, stir, strain, and drink	Diarrhea
	<i>Syzygium polyanthum</i> (Wight) Walp.	Daun salam	Leaves	Leaves are boiled, and boiled water is drunk	Gout, gastritis, lowering cholesterol

Oxalidaceae	<i>Averrhoa carambola</i> L.	Belimbing wuluh, belimbing sayur	Fruit, flower	Cut into pieces, boiled with 3 cups of water into 1 cup, cooled, and drunk on an empty stomach before breakfast. Star fruit flowers, boiled with water from 3 cups to 1 cup, drunk when warm before going to bed or in the morning	Cholesterol medication, lowering blood pressure, and stomach acid
Pandanaceae	<i>Pandanus amaryllifolius</i> Roxb. ex. Lindl.	Bulung pandan, daun pandan	Leaves	The leaves are boiled in 3 cups of water; after 1 cup is left, add sugar and salt to taste	Nausea and stomach aches
Papilionaceae	<i>Erythrina subumbrans</i> (Hassk.) Merr.	Daun srep	Leaves	Boiled, and add honey	Lowering blood sugar reduces miscarriage, increases breast milk
Piperaceae	<i>Peperomia pellucida</i> (L.) Kunth	Tumpang air, suruhan	Leaves, stem	A handful of leaves and stems, cleaned, boiled with boiling water, then drunk	Relieves aches and pains
Poaceae	<i>Piper nigrum</i> L.	Lada, lado	Seed	Pounded, add coconut oil, smear on the wound	Relieve pain, itching
	<i>Piper betle</i> L.	Sirih	Leaves	Boiled, drink the boiled water	Reduce body odor, curing red eyes
	<i>Imperata cylindrica</i> (L.) P.Beauv.	Alang-alang	Root	As a mixture of bitter herbs, dried and brewed	Heartburn, urination expediter, and shedding kidney stone
	<i>Cymbopogon citratus</i> (DC.) Stapf	Sereh	Stem	Three stems crushed, put in a glass filled with drinking water, let for one night, then drink. To repelling mosquitoes, put lemongrass in the room	Menstrual pain, digestion expediter, and mosquito repellent
	<i>Cymbopogon nardus</i> (L.) Rendle	Sereh merah, sereh minyak	Stem	Crush stem, boiled, the boiled water is drunk	Lowering blood sugar and blood pressure
	<i>Saccharum officinarum</i> cv. Badila	Tebu ireng, tebu hitam	Leaves	Squeezed	Flu, coughs, and fever
	<i>Zea mays</i> L.	Jagung	Fruit	Take young corn, grated, applied to the smallpox wound	Smallpox
Portulacaceae	<i>Talinum paniculatum</i> Gaertn.	Ginseng jawa	Root, leaves	Swallowed or cooked for stamina booster; placed on the wound	Stamina booster; wound
	<i>Portulaca oleracea</i> L.	Krokot madi	Stem, leaves	Boil the stems and leaves, filter and drink the water	Cardiovascular
Rubiaceae	<i>Morinda citrifolia</i> L.	Mengkudu, bentis pace	Fruit, leaves	Fruit made in juice, strain, add sugar and honey and drink twice a day after meals. The leaves are washed, withered over the fire, squeezed until the water comes out, stick the leaves on the chest	Medicines for heart, liver and asthma, cough, preventing cancer
Rutaceae	<i>Citrus aurantiifolia</i> (Christm.) Swingle	Jeruk nipis	Fruit	Squeeze lime, add soy sauce and salt to taste, and drink three times a day	Cough
Sapotaceae	<i>Manilkara zapota</i> (L.) P.Royen	Sawo	Fruit	Young fruit peeled, grated, squeezed, and filtered	Indigestion, weight loss, fever, and inflammation
Solanaceae	<i>Brugmansia suaveolens</i> (Humb. & Bonpl. ex Willd.) Sweet	Daun kecubung	Leaves	Squeezed	Bloating
	<i>Physalis angulata</i> L.	Ciplukan, ketepuk	Leaves, stem, and root	The fruit can be eaten with a wrapper. Leaves, stems, and roots are boiled with water from 3 cups to 1 cup; drink regularly in the morning and evening	Lowering blood pressure
Thymelaeaceae	<i>Phaleria macrocarpa</i> (Scheff.) Boerl.	Mahkota dewa	Leaves	The leaves are crushed, affixed to the itchy skin	Itching and coughing

Verbenaceae	<i>Tectona grandis</i> L.f.	Jati	Bark	The bark is cleaned, washed, crushed, and boiled with water from 3 cups to 1 cup, ready to drink	Diabetes
Xanthorrhoeaceae	<i>Aloe vera</i> (L.) Burm.f.	Lidah buaya	Leaves	Leaves, pandan leaf, honey, and ice cubes, blend, and ready to drink	Cancer and gastritis
Zingiberaceae	<i>Zingiber montanum</i> (J.Koenig) Link ex A. Dietr.	Bangle/balai	Rhizome	Grated, put hot water, stir, and apply on the itchy body	Itchy medicine, itching allergy
	<i>Alpinia galanga</i> (L.) Willd.	Bulung lengkuas, lawas	Leaves	Five pieces of leaves, pounded, add 1 cup of water, squeeze and drink, also add a little salt and honey	Stimulating the appetite-, stamina enhancer, lowering cholesterol
	<i>Etingera elatior</i> (Jack) R.M.Sm.	Kecombrang, tanaman honje	Stem, leaves, flower	1. The stems and leaves are crushed, then affixed to the forehead, 2. Crushed, soaked in warm water, and then drunk, 3. Young flowers and stems are cooked as vegetables	1,2. Febrifuge
	<i>Kaempferia galanga</i> L.	Kencur	Rhizome	Grated, squeezed, add honey and lime juice, or grated and squeezed into an appetite-enhancing herb	Cough, stimulating the appetite
	<i>Curcuma aromatica</i> Salisb.	Temu putih, kepoh	Rhizome	The tubers are cleaned and consumed directly as fresh vegetables	Reduce or eliminate halitosis
	<i>Curcuma xanthorrhiza</i> Roxb	Temulawak	Rhizome	Grated, squeezed, mixed with chicken egg yolk, one tablespoon honey, stir, and drink	Internal disease, indigestion medicine, stimulating appetite, and maintaining liver health
	<i>Zingiber zerumbet</i> (L.) Roscoe ex Sm.	Lepoyang, lempuyang	Rhizome	Grated, squeezed, add half a glass of water and a little salt, 2. Grated, add two tablespoons of water and a little salt, squeeze, and drink 3. Pounded, boiled with 3 cups of water to 1 cup, filtered, and drunk	1. Ulcer, 2. Cough
	<i>Zingiber officinale</i> Roscoe	Jahe, jahik	Rhizome	Grated, add water, and drink. Crush the red ginger, add the shallots, wrap them in banana leaves, and spread them over the fire. After the heat is evenly distributed, remove it, place it on the part of the body that is sick with rheumatism	Ulcer, flu, rheumatism
	<i>Curcuma domestica</i> Valetton	Kunyit	Rhizome	Grated turmeric, poured water, and drunk	Fever relief, stomachache, and ulcer

**Table 2.** The family of medicinal plants used by the Lampung Tribe in the villages around Way Kambas National Park, along with the number of used species

Family	Number	Family	Number
Apiaceae	3	Meliaceae	1
Acanthaceae	2	Menispermaceae	1
Amaryllidaceae	1	Moringaceae	1
Annonaceae	1	Musaceae	4
Apocynaceae	1	Myrtaceae	2
Arecaceae	1	Oxalidaceae	1
Asteraceae	4	Pandanaceae	1
Basellaceae	1	Papilionaceae	1
Bignoniaceae	1	Piperaceae	4
Boraginaceae	1	Poaceae	5
Cactaceae	1	Portulacaceae	2
Caricaceae	1	Rubiaceae	1
Cucurbitaceae	1	Rutaceae	1
Euphorbiaceae	1	Sapotaceae	1
Fabaceae	4	Solanaceae	2
Illiciaceae	1	Thymelaeaceae	1
Lamiaceae	1	Verbenaceae	1
Lauraceae	2	Xanthorrhoeaceae	1
Liliaceae	2	Zingiberaceae	7
Malvaceae	1		

In the families of Musaceae, Piperaceae, Fabaceae, and Asteraceae were only found four species each. Furthermore, plant species from Fabaceae or Asteraceae were also widely used as drugs and stamina boosters, as seen in the Tunjung Dayak community in East Kalimantan (Setyowati 2010), Lampung Saibatin (Wakhidah 2020), and Madura (Fathir et al. 2021). *Kedawung* (*Parkia timoriana* (DC.) Merr.) is an example of a species from Fabaceae whose seeds are trusted by the local people of Lampung as a remedy for itching, wound infections, and stomach disorders. The *P. timoriana* seeds have antibacterial activity (Angami et al. 2018). The activity can be used to treat itching and infection because it can inhibit the bacteria originating from wounds, according to the belief of the Lampung tribe.

*Sambung nyawa* (*Gynura procumbens* Merr.) is one of the species of the Asteraceae family whose leaves are used as a stamina booster and to cure malaria. The species also protects against tissue damage (Mahmood et al. 2008). In addition, antioxidant activity is also found in the extract of *G. procumbens*, especially in the roots, due to its high phenolic content (Rosidah et al. 2008). The phenolic content is likely to act as a stamina booster. Jarikasem et al. (2013) showed that *G. procumbens* could suppress the growth of *Plasmodium falciparum* 3D7 and *Plasmodium berghei* NK65. That proves that the plant can cure malaria following the knowledge of the local community of Lampung.

### Plant parts used

The plant parts used by the local community of Lampung in preparation for traditional medicine included roots (7 species), tubers (9 species), stems (12 species), leaves (36 species), flowers (3 species), fruit (24 species), seeds (3 species), and sap (1 species) (Figure 2). The most used plant part was the leaf. Leaves are commonly used as the main ingredient of traditional medicine in many local communities, for example, Madurese (Purwanti et al. 2020) and the Osing Tribe of Banyuwangi (Ardiyansyah and Nurchayati 2018). The reason behind this is that the leaves can be obtained over time, not limited by season (Handayani 2015); also, the use of leaves is relatively sustainable in terms of conservation aspects (Setyowati 2010). *Golong gandu*, also called *kapok* tree (*Ceiba pentandra* (L.) Gaertn.), is a medicinal plant that uses leaves. The plant is believed to be efficacious as a remedy for constipation. The leaves are mixed with a bit of water and then squeezed. The use of the leaves of *C. pentandra* for medicine is also carried out by sub-ethnic Batak Simalungun of North Sumatra. The leaves are cleaned and boiled with water. The locals of Batak Simalungun believe that the concoction of *kapok* leaves can relieve fever (Silalahi et al. 2015).

The fruit was the most widely used plant part after leaves. This result was also reported in other regions in Indonesia, such as the Dani tribe in Jayawijaya Regency (Mabel et al. 2016) and the Madurese in Sumenep Regency (Purwanti et al. 2020). Fruit stores products from photosynthesis and secondary metabolites of a plant. The content of phytochemicals in fruit is higher than in other plant parts (Pott et al. 2019). Therefore, it is strongly suspected that many medicinal properties are contained in the fruit that can be used as medicine. For example, the fruit of *ketepuk* (*Physalis angulata* L.) is believed to treat high blood pressure by eating the ripened fruit directly. *Kecombrang* (*Etligeria elatior* (Jack) R.M.Sm.), soldiers (*Catharanthus roseus* (L.) G. Don), and celery (*Apium graveolens* L.) are an example of some medicinal plants that all their parts can be used as medicine.

### The preparation of medicinal herbs

Eight modes of preparation were commonly practiced by the Lampung Tribe (Table 3). As many as 40.5% of the preparation mode were boiling, filtering, and taking the boiled water. That was the most widely used mode of preparation, followed by pounding or grating and then squeezing it (22.7%), pounding/bruising, then adding a little water (10.8%), and engulfing it (9.4%) (Table 3). Although local people mix medicinal plants can vary, such as *lempuyang* (*Zingiber zerumbet* (L.) Roscoe ex Sm.), there are at least three methods to mix this medicinal plant. The first method was grated, squeezed, given a little extra drinking water, and ready to be consumed. The second method was to pound it, boil it until it boils and take the boiled water to drink, and the last was pounded, heated over a fire, and consumed or smeared.

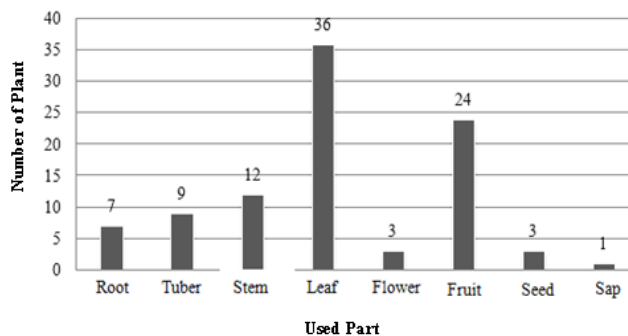
Table 3 shows various modes of preparation for extraction to obtain phytochemical content that is useful as a medicine. The medical efficacy of medicinal plants depends on the extraction or preparation of the material (Odey et al. 2012). For example, extracts of medicinal plants obtained from the oven-drying method have lower phytochemical content than those obtained by freeze-drying (Mahanom et al. 1999). Thus, the various form of medicinal plant preparation by the Lampung Tribe resulted in different concentrations of phytochemicals and possible doses according to curable diseases. Boiling and filtering techniques were the highest percentages of preparation mode (40.5%). In the boiling technique, the chemical compounds of medicinal plants can be easily extracted since some phytochemical compounds can be dissolved in hot water (Syah et al. 2014). In addition, the boiling technique is reasonably practical compared to other techniques, such as pounding or grating (Mabel et al. 2016). The percentage of medicinal plants prepared by boiling was also highest in the Saibatun community of Tanggamus Regency in Lampung Province and the Tengger tribe of Ngadisari village in East Java (Jadid et al. 2020; Wakhidah and Hayati 2021).

**The curable disease**

The local people of Lampung use plants to treat various diseases, grouped into three categories: external, internal, and internal or external diseases. The use of medicinal plants in traditional practice is mainly used to treat internal diseases (50 species), followed by external diseases (13 species), and both internal and external diseases (5 species) (Figure 3). The number of plants used to cure internal disease is directly proportional to the highest preparation mode, namely boiling. The boiling technique allows phytochemical compounds to dissolve in water, increasing their bioactivity and being absorbed quickly by the body through metabolic processes (Jadid et al. 2020). As a result, this technique is suitable for extracting important compounds in internal medicine. For example, *adas pulowaras* (*Foeniculum vulgare* Mill.) treat digestive problems, flatulence, and constipation.

For example, the use of plants for external medicine in the Tane'olen community in East Kalimantan is the highest in number (Karmilasanti and Supartini 2011). The method for treating external diseases mostly comes from a single plant by heating and then wrapping, smearing, or pounding and then smearing it. Like the Malays in Seponti District, North Kayong Regency, the external treatment method generally uses a single plant by pounding and then placing it on the affected part (Wulandara et al. 2018). External treatment is usually carried out to treat diseases that appear on the skin or are related to the skin, such as itching, fever, bloating, and scratches. One example is *the bangle* (*Zingiber montanum* (J. Koenig) Link ex A. Dietr.) used to treat itching on the skin due to fungus or allergies. The rhizomes of the plant have antioxidant activity. The concentrations of alkaloids, phenolics, flavonoids, saponins, and triterpenoids of *Z. montanum* effectively

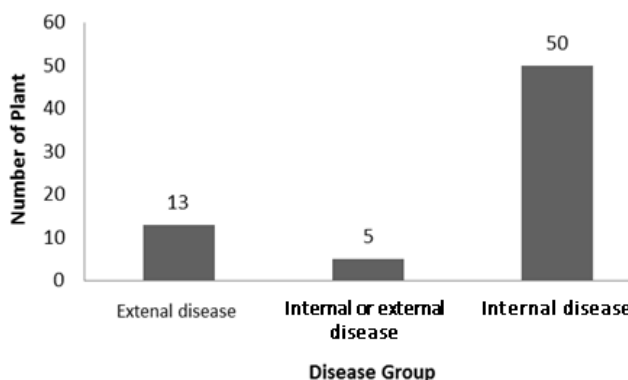
inhibit the growth of *Escherichia coli* and *Streptococcus sobrinus* (Setyani et al. 2021). Therefore, to the scientific study, the phytochemical content of *Z. montanum* is efficacious for treating itching and rashes due to bacterial activity (add references here).



**Figure 2.** The used part of medicinal plants utilized by the local community of Lampung in Way Kambas Natural Park (TNWK), Lampung, Indonesia

**Table 3.** The mode of preparation employed by the Lampung Tribe, Indonesia, along with local citation in percent

Mode of preparation	Citation (%)
Boiled then filtered	40.5
Heated/putting on fire	5.4
Mash/grated and squeezed	22.7
Brewed with hot water	5.4
Consumed as vegetable	9.4
Pounded/bruised and add the water	10.8
Take the sap	2.7
Smearred	2.7



**Figure 3.** The number of medicinal plants classified into three groups of diseases by the Lampung Tribe in the area around TNWK

Binahong (*Anredera cordifolia* (Tenore.) Steenis) is an example of plant species used to treat internal and external diseases. The community commonly uses the plant to treat stomach ailments, i.e., stomachache, fever, and burn. The leaf extract of *A. cordifolia* has been scientifically proven to treat burns by increasing the thickness of the re-epithelialization layer in experimental mice that have been given burns (Shrivastav et al. 2018). This plant also shows antibacterial activity. The extract can inhibit the growth activities of *Staphylococcus aureus*, MRSA, *B. subtilis*, *P. aeruginosa*, and *E. coli* (Leliqia et al. 2017). Furthermore, its leaf extract has the potential to be an anti-inflammatory, so it accelerates wound healing and reduces the effects of inflammation, such as fever (Laksmiawati et al. 2017).

In conclusion, the Lampung Tribe community around the TNWK area utilizes 69 species of medicinal plants belonging to 39 families. Zingiberaceae is the highest number of used species (9 species). This result is similar to the other ethnobotanical studies in Indonesia, where Zingiberaceae is the most used plant family. The part of medicinal plants most used by the local community is leaves as many as 36 species. The leaf is the most used part of medicinal plants due to its abundance, ease of accessibility, and phytochemistry content. This finding is also reported in other regions.

Furthermore, the boiling method is the most widely used preparation mode (40.5%) in the Lampung Tribe. Some studies in Indonesia report similar findings, while others are different. It depends on the various types of curable diseases. If the highest curable disease is internal, the most preparation method may be by boiling. The local people of Lampung use plants to treat various diseases grouped into three categories: external diseases, internal diseases, and internal or external diseases. Internal diseases are the highest type of curable disease.

## ACKNOWLEDGEMENTS

We want to thank the local people of the Lampung Tribe who live around the Way Kambas National Park, Lampung, Indonesia, for their hospitality and assistance during the data collection.

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