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

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**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 is the potential to 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 as many as 69 species of medicinal plants belonging to 39 families were used by the local community of the Lampung Tribe around the TNWK area. Zingiberaceae was the family with the highest number of species. Leaves were the plant part that was mostly used 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 in the world (Kusuma et al. 2014). Specifically, as many as 940 species of medicinal plants from about 20,000 plant species have been used in Indonesia (Masyhud 2010). Medicinal plants are used in traditional medicine that 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 various 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 that have been 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 and 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. The use of medicinal plants is closely related to health needs in people's daily lives. The fulfillment of these needs is carried out independently and is hereditary. This practice is beneficial for 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 that are passed down orally from generation to generation is vulnerable to loss, 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 is an effort to document local communities' knowledge and conservation of biological resources. The study aims to the inventory of 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, the 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 specific between 40°37'-50°16' South Latitude and between 105°33'-105°54' East Longitude. This 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 August 26, 1999. Geographically, TNWK is at a position of 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, low in nutrients, easy to catch water (porous), and 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 north area. Mainly area around the river in the eastern part of the TNWK is a swamp forest ecosystem. This area is relatively close to the ancient village, a village where this study was conducted. In those ancient villages the Lampung Tribe communities are still preserve local customary 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 mostly 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.

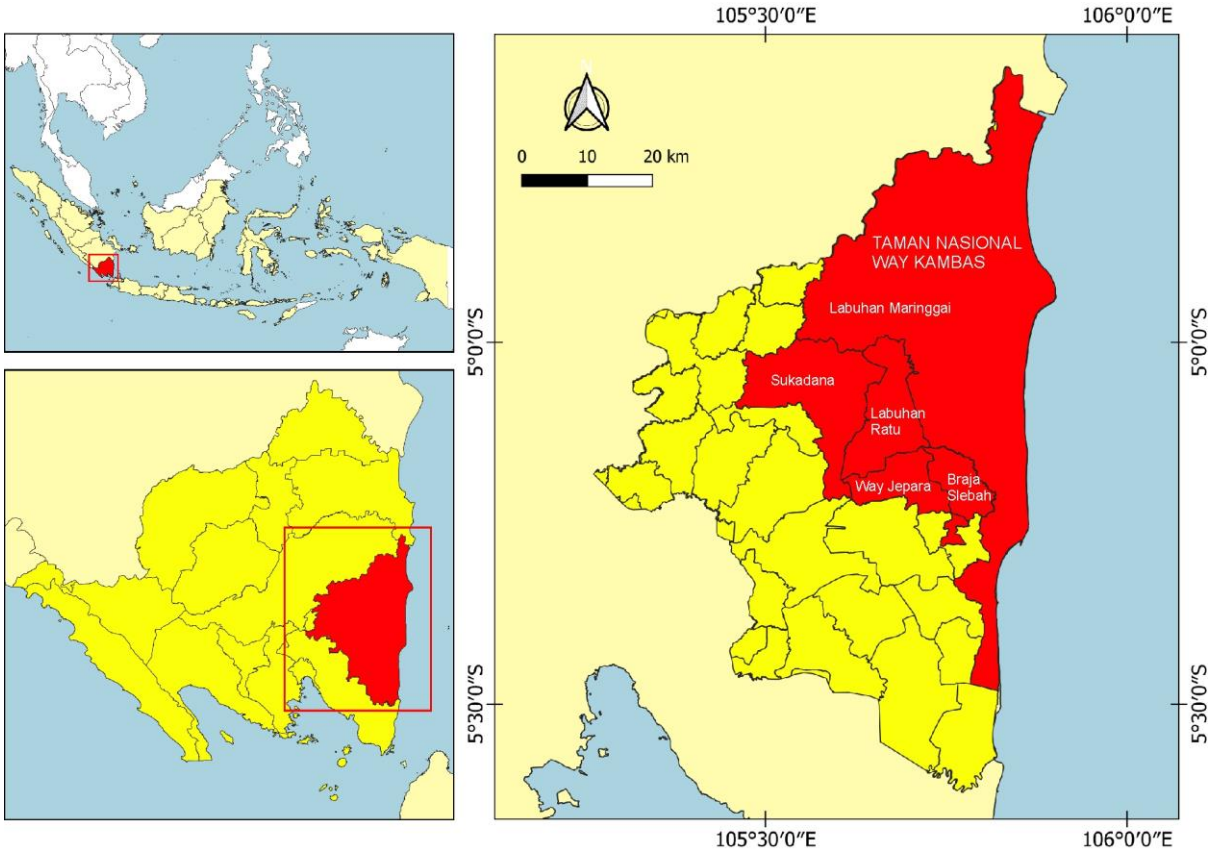


**Figure 1**. Map of the study area in the Way Kambas National Park, Lampung, Indonesia

**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 book 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 show the plants in question directly 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 species of 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 findings 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 9 species (Nasution et al. 2020). Other families that the Lampung Tribe widely uses were 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* Valeton, *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 Rachmadiyanto 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 the 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) (Lalthanpuii 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 | *Rhinacanthus nasutus* (L.) Kurz | Cucuk manuk, tuktuk bughung | Leaves | The leaves and flowers are cleaned, rubbed into the itchy part | Relieve itching |
| | *Andrographis paniculata* (Burm.f.) Nees | Sambiloto | Stem, leaves | The stems and leaves are washed, boiled, and boiled water is drunk | Relieve fever, aches, and pains |
| Amaryllidaceae | *Allium tuberosum* Rottler ex Spreng. | Kucai | Leaves, stem | Consumed as fresh vegetables. Boiled, and boiled water is drunk | Healthy bones and lowering cholesterol |
| Annonaceae | *Annona muricata* L. | Sirsak, bulung sisrsak | Leaves | The leaves are washed, boiled, and boiled water is drunk | Cancer, diabetes, and gout |
| Apiaceae | *Foeniculum vulgare* Mill. | Adas poluwaras | Root | Pounded, squeezed, and brewed with warm water | Digestive medicine, flatulence, constipation, anemia, and irregular menstruation |
| | *Coriandrum sativum* L. | Ketumbar | Seed | Roasted and eaten | Eliminate body odor and female genital organ |
| | *Apium graveolens* L. | Seledri | Root, stem, leaves | Blended finely, add lemon juice, filtered, and drink every day | Gout |
| Apocynaceae | *Catharanthus roseus* (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 | *Cocos nucifera* L. | Kelapa hijau | Coconut water | Burn the coconut and then drink the water | Lowering blood pressure and removing body toxins |
| Asteraceae | *Gynura procumbens* Merr. | Sambung nyawa | Leaves | As fresh vegetables or boiled leaves, strained, and drink the water | Stamina booster and malaria |
| | *Gynura divaricata* (L.) DC. | Tapak dewa, tapak limin | Leaves | Pounded leaves, then pasted to bruises. | Bruises |
| | | | | The leaves are boiled, the boiled water is drunk | Relieve kidney stones |
| | *Sonchus arvensis* L. | Tempuyung | Leaves | Fresh leaves or dried leaves are boiled, then boiled water is drunk | Fever, lowering high blood pressure, and shedding kidney stones |
| | *Blumea balsamifera* (L.) DC. | Capa, sembung, bulung capa | Leaves | Ten leaves, squeezed with a little water, compress all over the body, especially the soles of the feet | Febrifuge |
| Basellaceae | *Anredera cordifolia* (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 | *Crescentia cajute* L. | Bernung, maja | Fruit, flower | Fruit is made into syrup, the leaves are boiled, and the boiled water is drunk | Relieve stomach ache, facilitate digestion, asthma |
| Boraginaceae | *Heliotropium indicum* L. | Sangketan, buntut tikus | Leaves | 1. Boiled, and then boiled water is drunk; 2. The leaves are crushed, mixed with eucalyptus oil, rubbed on the body | 1. Shedding kidney stones, 2. Relieve fever in children |
| Cactaceae | *Hylocereus undatus* (Haw.) D.R.Hunt | Buah naga | Fruit | Peel and consume directly | Digestion, cardiovascular |
| Caricaceae | *Carica papaya* L. | Papaya | Fruit | Consumed directly or juice | Digestion, menstrual pain, cancer |

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| Cucurbitaceae | *Momordica charantia* 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 |
| | *Cucurbita moschata* (Duch.) Duch | Labu kuning, labu parang | Fruit | Fruit cut into pieces, boiled, eaten before bed without sugar | Relieve stomach ache |
| Euphorbiaceae | *Ricinus communis* L. | Pohon jarak ulung | Sap | Take a leaf stalk, break it, take the sap about 1 tablespoon, add salt, and drink | Vomiting blood, heartburn, and ulcer |
| Fabaceae | *Tamarindus indica* L. | Asam jawa | Fruit | Mixed with turmeric or ginger, cleaned in a tangerine, mixed with a little hot water, squeezed and filtered, add honey, and drink | Cough medicine, fever, rheumatism, stamina enhancer, and dysentery medicine |
| | *Parkia timoriana* (DC.) Merr. | Kedawung, kadawong | Seed | Add a little water, paste it on the sore spot | Itching, wound infection, and stomach disorders |
| | *Erythrina variegata* 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 |
| | *Senna alata* (L.) Roxb | Ketepeng | Flower | Leaves are boiled, filtered, then drunk | Overcoming intestinal worms, constipation, and treating sprue |
| Illiciaceae | *Illicium verum* Hook.f. | Kembang lawing | Flower | The flowers are washed, mashed, boiled, strained, and drink in the water | Sciatica, fever, flu, and stamina enhancer |
| Lamiaceae | *Orthosiphon aristatus* (Blume) Miq. | Kumis kucing | Leaves | The leaves are washed, boiled, and drunk | Shedding kidney stones and relieving cough |
| Lauraceae | *Persea americana* Mill. | Alpukat | Leaf and fruit | Five leaves were washed and boiled; Fruit was eaten or juiced | Ulcer, diarrhea, and constipation |
| | *Cinnamomum verum* J.Presl | Kayu manis | Bark | Boiled with other herbal mixtures | Stamina enhancer, lowering blood sugar, rheumatic pain |
| Liliaceae | *Allium sativum* L. | Bawang putih | Tuber | Grated, mixed with sugar and coconut oil, and then applied to the wound | Wound medicine |
| | *Allium cepa* L. | Bawang merah | Tuber | Grated, add coconut oil, and applied to the head, stomach (center), and body | Medicine for fever/high fever in children |
| Malvaceae | *Ceiba pentandra* (L.) Gaertn. | Golong gandu | Leaves | The leaves are grown, add water, squeezed, drink | Constipation |
| Meliaceae | *Lansium domesticum* Corrêa | Duku | Bark | Bark or teak bark, cleaned, washed, ground, boiled with water from 3 cups to 1 cup, then drunk | Diabetes |
| Menispermaceae | *Tinospora cordifolia* (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, preventing diabetes, cancer, and heart disease |
| Moringaceae | *Moringa oleifera* 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 | *Musa x paradisiaca* L. | Pisang | Leaves | The leaves are smeared with edible oil, heated over a fire, stick to the bruised area | Bruise |
| | *Musa acuminata* "Cavendish' | Sumbeng, jantung pisang ambon | Flower | Peel the flower, take the white part, boil it, let for a few minutes, and consumed | Stomachache |
| Myrtaceae | *Psidium guajava* 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 |
| | *Syzygium polyanthum* (Wight) Walp. | Daun salam | Leaves | Leaves are boiled, and boiled water is drunk | Gout, gastritis, lowering cholesterol |

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|---|---|---|---|---|---|
| Oxalidaceae | *Averrhoa carambola* 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 | *Pandanus amaryllifolius* 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 |
| Papilonaceae | *Erythrina subumbrans* (Hassk.) Merr. | Daun srep | Leaves | Boiled, and add honey | Lowering blood sugar, reduces miscarriage, increase breast milk |
| Piperaceae | *Peperomia pellucida* (L.) Kunth | Tumpang air, suruhan | Leaves, stem | A handful of leaves and stems, cleaned, boiled with boiling water, then drunk | Relieves aches and pains |
| | *Piper nigrum* L. | Lada, lado | Seed | Pounded, add coconut oil, smeared on the wound | Relieve pain, itching |
| | *Piper betle* L. | Sirih | Leaves | Boiled, drink the boiled water | Reduce the body odor, curing red eyes |
| Poaceae | *Imperata cylindrica* (L.) P.Beauv. | Alang-alang | Root | As a mixture of bitter herbs, dried and brewed | Heartburn, urination expediter, and shedding kidney stone |
| | *Cymbopogon citratus* (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 |
| | *Cymbopogon nardus* (L.) Rendle | Sereh merah, sereh minyak | Stem | Crush stem, boiled, the boiled water is drunk | Lowering blood sugar and blood pressure |
| | *Saccharum officinarum cv.* Badila | Tebu ireng, tebu hitam | Leaves | Squeezed | Flu, coughs, and fever |
| | *Zea mays* L. | Jagung | Fruit | Take young corn, grated, applied to the smallpox wound | Smallpox |
| Portulacaceae | *Talinum paniculatum* Gaertn. | Ginseng jawa | Root, leaves | Swallowed or cooked for stamina booster; placed on the wound | Stamina booster; wound |
| | *Portulaca oleracea* L. | Krokot madi | Stem, leaves | Boil the stems and leaves, filter and drink the water | Cardiovascular |
| Rubiaceae | *Morinda citrifolia* L. | Mengkudu, bentis pace | Fruit, leaves | Fruit made in juice, strain, add sugar, and honey, drink 2 times 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 | *Citrus aurantiifolia* (Christm.) Swingle | Jeruk nipis | Fruit | Squeeze lime, add soy sauce and salt to taste, drink 3 times a day | Cough |
| Sapotaceae | *Manilkara zapota* (L.) P.Royen | Sawo | Fruit | Young fruit peeled, grated, squeezed, and filtered | Indigestion, weight loss, fever, and inflammation |
| Solanaceae | *Brugmansia suaveolens* (Humb. & Bonpl. ex Willd.) Sweet | Daun kecubung | Leaves | Squeezed | Bloating |
| | *Physalis angulata* L. | Ciplukan, ketepuk | Leaves, stem, and root | The fruit can be eaten with the 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 | *Phaleria macrocarpa* (Scheff.) Boerl. | Mahkota dewa | Leaves | The leaves are crushed, affixed to the itchy skin | Itching, and coughing |

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|---|---|---|---|---|---|
| Verbenaceae | *Tectona grandis* 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 | *Aloe vera* (L.) Burm.f. | Lidah buaya | Leaves | Leaves, pandan leaf, honey and ice cubes, blend, and ready to drink | Cancer, and gastritis |
| Zingiberaceae | *Zingiber montanum* (J.Koenig) Link ex A. Dietr. | Bangle/balai | Rhizome | Grated, put hot water, stirred, apply on the itchy body | Itchy medicine, itching allergy |
| | *Alpinia galanga* (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 |
| | *Etlingera elatior* (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 |
| | *Kaempferia galanga* L. | Kencur | Rhizome | Grated, squeezed, add honey and lime juice, or grated and squeezed into an appetite-enhancing herb | Cough, stimulating the appetite |
| | *Curcuma aromatica* Salisb. | Temu putih, kepoh | Rhizome | The tubers are cleaned and consumed directly as fresh vegetables | Reduce or eliminate halitosis |
| | *Curcuma xanthorrhiza* Roxb | Temulawak | Rhizome | Grated, squeezed, mixed with chicken egg yolk, 1 tablespoon honey, stir, and drink | Internal disease, indigestion medicine, stimulating appetite, and maintaining liver health |
| | *Zingiber zerumbet* (L.) Roscoe ex Sm. | Lepoyang, lempuyang | Rhizome | Grated, squeezed, add half a glass of water and a little salt, 2. Grated, add 2 tablespoons of water and a little salt, squeezed, and drink, 3. Pounded, boiled with 3 cups of water to 1 cup, filtered, and drunk | 1. Ulcer, 2. Cough |
| | *Zingiber officinale* Roscoe | Jahe, jahik | Rhizome | Grated, add water, drink. Crush the red ginger, add the shallots, then wrap in banana leaves, spread 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 |
| | *Curcuma domestica* Valeton | 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 | Papilonaceae | 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 found 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 has a protective effect 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* is able to suppress the growth of *Plasmodium falciparum* 3D7 and *Plasmodium berghei* NK65. This proves that the plant can be used to cure malaria in accordance with the knowledge of the local community of Lampung.

**Plant parts used**

The plant parts used by the local community of Lampung in preparation of 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 an example of a medicinal plant that uses leaves. The plant is believed to be efficacious as a remedy for constipation. The leaves are mixed with a little 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 local people 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 Jayawiyaja 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* (*Etlingera 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**

There were eight modes of preparation 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. This 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 a medicinal plant 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, then 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 method 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 quite 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 Saibatin 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 types of diseases, grouped into three categories: external diseases, internal diseases, and internal or external diseases. The use of medicinal plants in traditional practice is mostly 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.) is used to 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. Similar to 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).

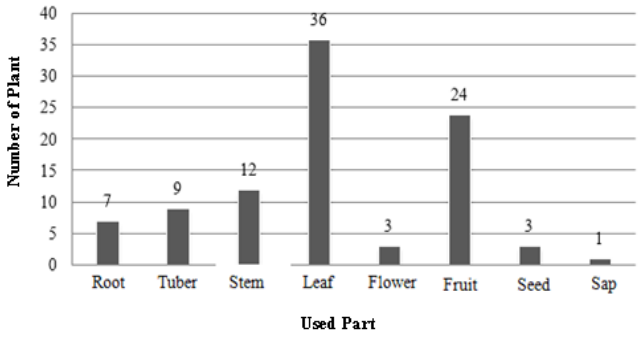


**Figure 2.** The used part of medicinal plants utilized by the local community of Lampung in Way Kambas Natural Park (TNWK), Lampung, Indonesia

**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 |
| Smeared | 2.7 |

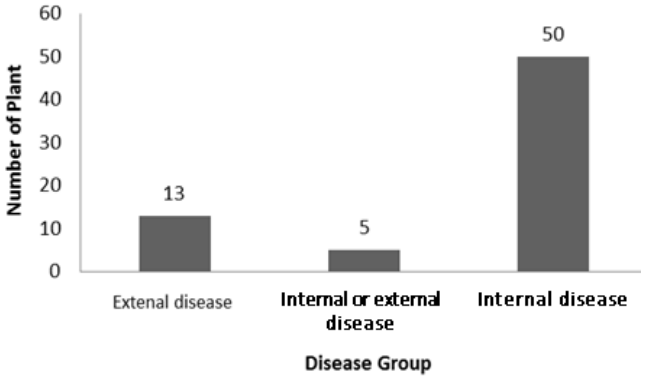


**Figure 3.** The number of medicinal plants classified into three groups of diseases by the Lampung Tribe in the area around TNWK

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 burn by increasing the thickness of the re-epithelialization layer in experimental mice that have been given burn (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 as an anti-inflammatory, so that it accelerates wound healing and reduces the effects of inflammation such as fever (Laksmitawati 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 the 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 the others are different. It depends on the various types of curable diseases. If the highest curable disease is an internal disease, the most preparation method may be by boiling. The local people of Lampung use plants to treat various types of diseases grouped into three categories, namely external diseases, internal diseases, and internal or external diseases. Internal diseases are the highest type of curable disease.

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