

Ethnobotany of semi-arid medicinal plants used by Bunaq Tribe in Lamaknen, Belu District, East Nusa Tenggara, Indonesia

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Abstract. Mela YJA, Bria EJ, Tnunay IMY. 2022. *Ethnobotany of semi-arid medicinal plants used by Bunaq Tribe in Lamaknen, Belu District, East Nusa Tenggara, Indonesia. Intl J Trop Drylands 6: 16-25.* The diversity of traditional medicinal plants of the Bunaq Tribe in Lamaknen, Belu District, East Nusa Tenggara, Indonesia, is a basic study of the development of local potential in supporting plant conservation in the border areas of Indonesia. This study aimed to determine the types of medicinal plants, the organs used, processing methods and ways of using plants as traditional medicines, and species use-values (SUV) by the Bunaq Tribe in Belu District, a semi-arid climatic area in Timor Island, Indonesia. This study uses a descriptive qualitative and quantitative approach. The research method used was semi-structured interviews with village shamans. The results showed that there were 26 families consisting of 63 species of plants used as medicine. Fabaceae had the highest number of species used in medicine. The most widely used growth form was a tree and the most frequently used plant part was the leaf (30%). The most widely applied processing method was boiling. Turmeric (*Curcuma longa* L.) showed the highest use-value, 0.57, compared to other species. In conclusion, the Bunaq Tribe still preserves traditional knowledge of medicinal plants through village shamans. This information can be used as the basis for developing the social and cultural values of the Bunaq Tribe in the border areas of Indonesia.

Keywords: Bunaq Tribe, Lamaknen, medicinal plants

INTRODUCTION

Lamaknen is a Sub-district in Belu District, East Nusa Tenggara, located at the border between Indonesia and East Timor. This sub-district consists of nine villages: Dirun, Duarato, Fullur, Kewar, Lamaksenu, Leowalu, Makir, Mauhitas, and Maudemu (Belu District Profile 2020). The community is dominated by the Bunaq Tribe, who still use natural resources to meet their daily needs. They also use plants for hereditary spiritual interests (Atok et al. 2010). Traditional medicinal practices have developed from generation to generation based on natural medicines, spiritual therapies, manual techniques, and exercises to diagnose, treat, and prevent disease (Bussmann et al. 2010). Traditional medicine is quite popular in this area and is accepted by the wider community even though there are modern health facilities (Yuliani et al. 2019). Besides being used as a first-aid system in the family, traditional medicine is considered cheaper and safer than modern drugs because of the low risk (Rahayu and Andini 2019; Nugroho et al. 2022).

Belu District has an average temperature of 27.6°C with a temperature interval of 21.5-33.7°C; the lowest temperature (21.5°C) in August and the highest temperature (33.7°C) in November. According to the climate classification by Schmidt and Ferguson, the climate type in this district is D (semi-arid climate), with two seasons, namely dry and rainy seasons. The average rainfall for 5 years (2011-2015) is 209 mm/month, with the number of rainy days being 8 days/month. The wind currents in June- September come from Australia with little water vapor, while the winds in December-March contain a lot of

water vapor from Asia and the Pacific Ocean. The district has four wet months (December-March) and eight dry months. Community life, including agricultural activities, adapts to this semi-arid climate condition (Belu District 2021).

One practice of traditional medicine is to use medicinal plants. The interaction between humans and plants is getting more intense with the times, resulting in the accumulation of human knowledge and expertise in herbal medicines (Yeung et al. 2020). However, knowledge about traditional medicine and medicinal plants is known only by certain people, and oral delivery has become a tradition in a community groups (Elfahmi et al. 2014; Silalahi and Nisyawati 2018). The ethnobotanical study can inventory, identify and evaluate the most important plant species for a given culture (Zenderland et al. 2019). In addition, this study is useful for uncovering community knowledge systems about biodiversity, conservation, and cultural resources (Albuquerque et al. 2006; Ledo and Seran 2019).

Several previous studies have revealed the distribution of medicinal plants in this area. For example, Atok et al. (2010) found that the Bunaq Tribe in Dirun Village, Belu District used sixty-nine species of medicinal plants. Furthermore, Yuliani et al. (2019) also revealed that the Bunaq Tribe in Kewar Village used twenty-nine traditional medicinal plants. However, these studies are very limited in area and scope even though this information is needed to conserve biodiversity in this region.

This study aimed to analyze the potential of naturally distributed medicinal plants and their use by the Bunaq Tribal community, especially by village shamans in Lamaknen Sub-district, Belu District, East Nusa Tenggara,

Indonesia. This information can enrich the database of medicinal plants and their processing by the Bunaq Tribe and be the basis for the sustainable management of biological resources in border areas.

MATERIALS AND METHODS

Study area

This research was conducted in the Lamaknen Sub-district of Belu District, East Nusa Tenggara Province, Indonesia, a tropical semi-arid area. The focus area was the villages of Furur, Makir, and Duarato (Figure 1). Lamaknen has an area of 105.90 km². This hilly through to mountainous area has a semi-arid climate with two seasons: the rainy season, from November to May, and the dry season, from June to October. Lamaknen has 9 villages with a population of 13,195 in 2020 (Belu District Profile 2020). Most people are of the Bunaq Tribe and speak the local Marae language.

Selection of participants

Key participants were selected purposively and systematically based on the recommendations of knowledgeable elders and development agents (Jima and Megersa, 2018). The selection of key participants was also based on the cured diseases, personal experience in self-medication, and quality of explanations that particular participants gave during an interview. As a result, seven key informants were village shamans in the three research villages. They consisted of 3 men and 4 women with traditional expertise in medicinal plants known and commonly used by the Bunaq Tribe and others.

Techniques employed for data collection were semi-structured interviews, guided field walks, and observations with participants. Interviews were undertaken using questionnaires on botanical names and local names, parts used, and preparation mode. The use reports, relative importance, and voucher numbers were tabulated for all reported plant species (Hussain et al. 2018).

Specimen collection and identification

Field observations were performed with the help of local guides to describe the morphological features and habitats of each medicinal plant species in the field.

Identification was done with the results of field descriptions and cross-checks using Flora of Java (Backer and Bakhuizen 1968) and integrated taxonomic information system report (itis.gov) and the plantlist.org to confirm the correct nomenclature of plant species.

Data analysis

Descriptive analysis was applied by tabulating the information into a specific table. That consisted 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. Then, the species use-value (SUV) was calculated to see the important plant species for the treatment of certain types of diseases in the study area using the following equation:

$$SUV = \frac{\sum UVi}{ni}$$

Where: UVi is the use-value of particular species, and ni is the total number of participants (Fathir et al. 2021).

RESULTS AND DISCUSSION

Medicinal plants used by the Bunaq Tribe

The Bunaq Tribal community in Lamaknen Sub-district used 26 families of plants consisting of 63 species (Table 1). Medicinal plants used by the Bunaq people vary greatly regarding species, locations, and organs used. The most widely used plant family was Fabaceae, consisting of 8 species, followed by Euphorbiaceae with 6 species, and Poaceae with 5 species, while others ranged from 1-4 species. Most Fabaceae in Lamaknen Sub-district is closely related to the location and environmental conditions. Atok et al. (2010) stated that Fabaceae is a family most widely used by the community in Dirun Village, Lamaknen Sub-district. Molares and Ladio (2012) also revealed that Fabaceae has an important role both as food and medicinal ingredients in Argentine-Chilean Patagonia. Napagoda et al. (2018) also found that Fabaceae is the community's most widely cited medicinal plant in Gampaha District, Western Province, Sri Lanka.

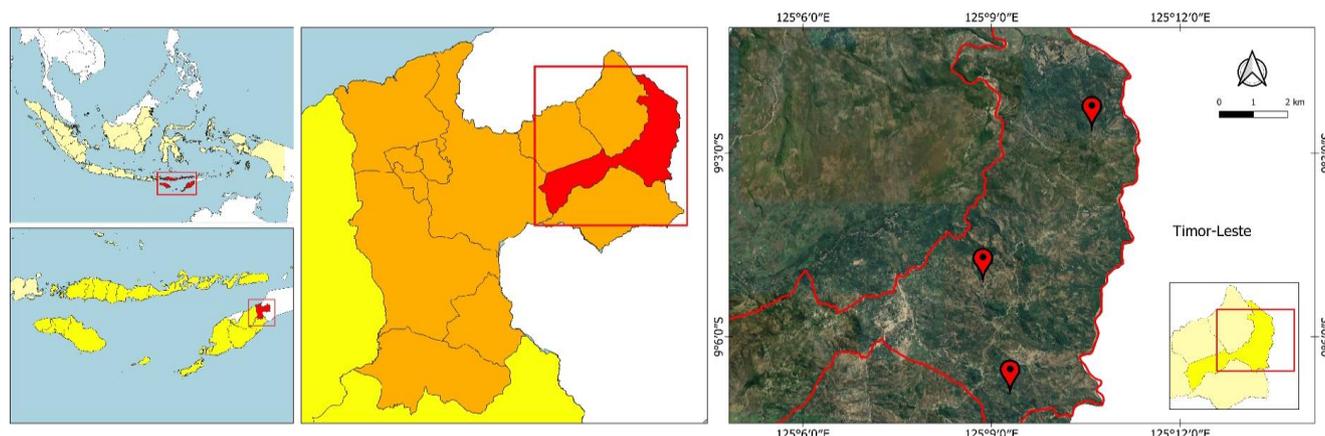


Figure 1. Map showing the study area in Lamaknen Sub-district, Belu District, East Nusa Tenggara, Indonesia

The presence of plants in each village also varies greatly among villages in Lamaknen Sub-district. For example, Fulur, which has the most medicinal plants, is strongly influenced by environmental conditions where this village has a mountainous topography and a large forest area. The informants said that most plants used as medicine are wild plants taken from forests. That is because the condition of the forest around the Lamaknen Sub-district is still relatively good, and the community only uses it for traditional gardening and farming. That is also supported by Nagaïke (2012), which states that if the condition of the forest is still good, the species found are also very diverse.

The most widely used medicinal plant habitus was a tree (41%) (Figure 2), which was followed by herb (36%), shrub (13%), liana (5%), grass (3%), and fern (2%). The tree was also the most widely used as a source of medicine by the Manobo tribe in the Philippines (Dapar et al. 2020) and by local communities around Lambung Mangkurat Education Forests, South Kalimantan, Indonesia (Nugroho et al. 2022).

The Bunaq Tribe uses plants' vegetative and generative organs as ingredients for traditional medicine. Roots, bark, stem, leaf, fruit, and tuber are used as medicine. The percentage of plant organs (Figure 3) shows that the most widely used plant organ in medicinal plants was the leaf (30%), followed by bark, root, rhizome, seed, fruit, and tuber. All vegetative organs of several plants, such as *Euphorbia heterophylla* L., *Euphorbia thymifolia* L., *Eleusine indica* (L.) Gaertn and *Equisetum debile* Roxb. ex-Vaucher were used as medicines.

Leaf was also the most widely used plant part of medicine by the people of Buwun Sejati Village, West Lombok District, Indonesia (Rahayu and Andini 2019), Batak Toba Tribe in Peadundung Village, North Sumatra, Indonesia (Silalahi et al. 2019), Tengger Tribe in Ngadisari Village, Indonesia (Jadid et al. 2020), Tengger Tribe in Ranu Pani Village, Indonesia (Bhagawan and Kusumawati 2021), local communities around Lambung Mangkurat Education Forests, South Kalimantan, Indonesia (Nugroho et al. 2022), Dayak Tribes, Borneo (Az-Zahra et al. 2021) Aya community, Philippines (Tantengco et al. 2018), indigenous communities in the Bandarban District of Bangladesh (Faruque et al. 2018) and rural communities of arid regions of Northern Punjab, Pakistan (Ashfaq et al. 2019).

Leaves are widely used because they are easy to obtain and mix due to their high-water content. In addition, as a place for photosynthetic accumulation, leaves contain essential oils, phenols, potassium compounds, and chlorophyll, which can cure diseases (Nahdi and Kurniawan 2019). Alvionita et al. (2020) also revealed that using leaves does not damage other plant parts because the leaves are easy to grow back and are almost always plentiful in wet tropical climates.

Preparation and use of traditional medicinal plants by the Bunaq Tribe

The preparation and consumption of plants as ingredients for traditional medicine by the Bunaq Tribal community in Lamaknen Sub-district, Belu District, is very simple and varies based on the disease suffered by the

patient. In this study, there were 34 prescription drugs, mostly a mixture of several plants (Table 2). The traditional treatment of the Bunaq Tribe consists of several methods: the material was boiled and then drunk (BO-DR), boiled and then washed (BO-WA), chewed and then lubricated (CH-LU), chewed and pasted (CH-PA), squeezed and drunk (SQ-DR), soaked with hot water and then drunk (SO-DR), and boiled and then eaten (BO-DA). Of the several methods, the most widely used is boiled and drunk (59%), and the lowest is squeezed and then drunk (3%) (Figure 4).

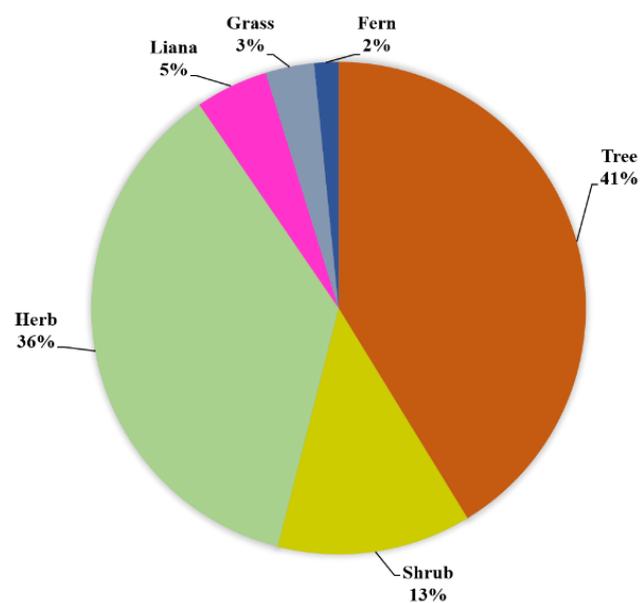


Figure 2. Percentage of medicinal plant habitus used by the Bunaq Tribe, Lamaknen Sub-district, Belu District, East Nusa Tenggara, Indonesia

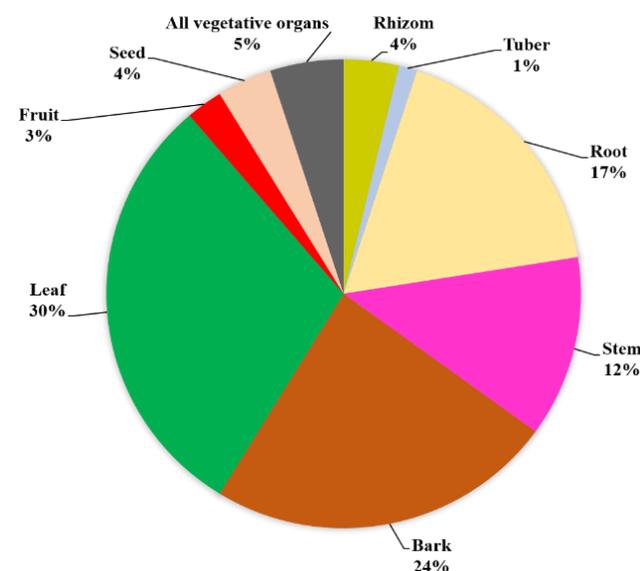


Figure 3. Percentage of plant parts/organs used as medicine by the Bunaq Tribe, Lamaknen Sub-district, Belu District, East Nusa Tenggara, Indonesia

Table 1. Medicinal plants record used by the Bunaq Tribe, Lamaknen Sub-district, Belu District, East Nusa Tenggara, Indonesia

Family	Botanical name	Common name	Local name	Use	Part of plant	Habitus	SUV
Fabaceae	<i>Cassia fistula</i> L.	golden shower	Arus norbeka	Bone fracture	Bark	Tree	0,14
	<i>Vachellia farnesiana</i> (L.) Wight & Arn	sweet acacia	Ailo'ok	HIV/AIDS	Root	Shrub	0,14
	<i>Flemingia strobilifera</i> (L.) W.T. Aiton	Wildhops	Ii	Indigestion /stomach ache, fever, snake peck	Root, bark	Shrub	0,29
	<i>Senna siamea</i> (Lam.) H.S. Irwin & Barneby	Siamese cassia	Tomol netel	HIV/AIDS	Root	Tree	0,14
	<i>Albizia procera</i> (Roxb) Benth	tall albizia	Jul geti	HIV/AIDS, fever, snake bite	Bark	Tree	0,29
	<i>Pterocarpus indicus</i> Willd.	Red sandalwood	Majo	Fluor albus/vaginal discharge	Bark	Tree	0,14
	<i>Vigna radiata</i> (L.) R.Wilczek	mung bean	Ho gapa	Appendix	Seed	Herb	0,14
Euphorbiaceae	<i>Arachis hypogaea</i> L.	peanut	Ho'í	Breast cancer	Seed	Herb	0,14
	<i>Euphorbia heterophylla</i> L.	Mexican fireplant	Uh suil	Appendix	Root, stem, leaf	Herb	0,14
	<i>Euphorbia tirucalli</i> L.	Indiantree spurge	Lawar geruk	Stroke, headache, fever, food poisoning, spiritual magic	Stem	Tree	0,14
	<i>Sauropus androgynus</i> (L.) Merr	chekurmanis, sweet leaf, star-gooseberry, katuk	Katuk	Breastfeeding production	Leaf	Shrub	0,14
	<i>Jatropha gossypifolia</i> L.	bellyache bush	Alul geti	Fracture, swollen body	Bark	Shrub	0,14
	<i>Euphorbia hirta</i> L.	pillpod sandmat	Mau meak	Indigestion, fracture, swollen body	Stem, root	Herb	0,29
	<i>Euphorbia thymifolia</i> L.	gulf sandmat	Upe gol	Appendix	Root, stem, leaf	Herb	0,14
Poaceae	<i>Imperata cylindrica</i> (L.) Rausch.	satintail	Hut	Indigestion /stomach ache, stroke, headache, fever, food poisoning	Root, leaf	Grass	0,29
	<i>Bambusa</i> sp.	Bamboo	Mah olas	HIV/AIDS, stroke, headache, fever, food poisoning	Leaf	Tree	0,29
	<i>Cymbopogon citratus</i> (DC.) Stapf	lemongrass	Anmami	Indigestion	Stem	Herb	0,14
	<i>Cymbopogon nardus</i> (L.) Rendle	citronella grass	Anmami bule'en	Hepatitis	Stem	Herb	0,14
Myrtaceae	<i>Eleusine indica</i> (L.) Gaertn	crowsfoot grass/Indian goose grass	Uh rikit	Kidney disease	Root, stem, leaf	Herb	0,14
	<i>Psidium guajava</i> L.	Guava	Goiga riki	Diarrhea and vomiting	Leaf	Tree	0,14
	<i>Syzygium aqueum</i> (Burm.f.) Alston	watery rose apple	Pilip pokoi	Stroke, headache, fever, food poisoning, spiritual magic	Bark	Tree	0,14
	<i>Eucalyptus urophylla</i> S.T. Blake	Ampupu/Timor white gum	Tal geti	Stroke, headache, fever, food poisoning, spiritual magic	Bark	Tree	0,14
	<i>Syzygium cumini</i> (L.) Skeels	Java plum	Sibal lebo	Stroke, headache, fever, food poisoning, spiritual magic	Bark	Tree	0,14

Malvaceae	<i>Sida rhombifolia</i> L.	Arrow leaf sida	Kibu	Inpartu, HIV/AIDS, stroke, headache, fever, food poisoning, fracture, swollen body, kidney disease	Leaf	Herb	0,43
	<i>Sterculia foetida</i> L.	hazel sterculia	Bane	Orchitis/swollen testicles	Bark	Tree	0,14
	<i>Ceiba pentandra</i> (L.) Gaertn.	white silk- cotton tree/ kapok tree	Gela jhon	Malnutrition	Bark	Tree	0,14
Asteraceae	<i>Elephantopus scaber</i> L.	Elephant foot	Apa sakan	Waist pain	Root	Herb	0,14
	<i>Pluchea indica</i> (L.) Less.	Indian camphorweed/ Indian pluchea	Beluntas	Kidney disease	Leaf	Herb	0,14
	<i>Ageratum conyzoides</i> L.	tropical whiteweed	Uh sino	Wound	Leaf	Herb	0,14
	<i>Chromolaena odorata</i> (L.) R.M. King & H. Rob.	Jack in the bush/ Siamweed/ Kirinyuh	Siekelen	Gout	Leaf	Shrub	0,14
Zingiberaceae	<i>Curcuma longa</i> L.	Turmeric	Kirun	Indigestion, kidney disease, hypertension, hepatitis	Rhizome	Herb	0,57
	<i>Zingiber officinale</i> Linn. Var Rubrum	Red Ginger	Inma bule'en	Stroke, headache, fever, food poisoning, spiritual magic	Rhizome	Herb	0,29
	<i>Curcuma xanthorrhiza</i> Roxb.	Javanese turmeric/ temulawak	Kirun belis	Indigestion, hypertension	Rhizome	Herb	0,29
Apocynaceae	<i>Calotropis gigantea</i> (L.) Dryand.	giant milkweed	Hot gie oe	Stroke, headache, fever, food poisoning, spiritual magic, gout	Stem, leaf	Tree	0,29
	<i>Plumeria rubra</i> L.	frangipani, temple tree	Antoni	Appendix, indigestion	Bark	Tree	0,14
	<i>Alstonia scholaris</i> (L.) R. Br.	blackboard tree/ devil's tree	Joil	Appendix, indigestion	Bark	Tree	0,14
Lamiaceae	<i>Orthosiphon aristatus</i> (Blume) Miq	Cats' Whiskers, Java Tea	Kumis kucing	Hypertension	Leaf	Herb	0,14
	<i>Scutellaria galericulata</i> L.	hooded skullcap, marsh skullcap	Bulis gigo	Diarrhea and vomiting	Root	Herb	0,14
	<i>Plectranthus amboinicus</i> (Lour.) Spreng.	Mexican mint	Hol si	Asthma	Leaf	Herb	0,14
Rubiaceae	<i>Coffea</i> sp	Coffee	Kopi jhon	Stroke, headache, fever, food poisoning, spiritual magic	Stem	Tree	0,14
	<i>Timonius sericeus</i> (Desf.) K.Schum.	Timo	Miel riki	Breast cancer, HIV/AIDS, Stroke, headache, fever, food poisoning, spiritual magic	Leaf	Tree	0,29
Annonaceae	<i>Morinda citrifolia</i> L.	Indian mulberry	Mengkudu	Kidney disease	Bark	Tree	0,14
	<i>Annona muricata</i> L.	Soursop	Kulo	Diarrhea and vomiting, cholesterol, diabetes	Bark	Tree	0,29
	<i>Annona squamosa</i> L.	sweet sop/ sugar apple	Anonak	Stomach ache	Bark	Tree	0,14

Apiaceae	<i>Apium graveolens</i> L.	wild celery	Sub	Hypertension	Leaf	Herb	0,14
	<i>Centella asiatica</i> (L.) Urb.	Spadeleaf	Pegagan	Hypertension	Leaf	Herb	0,14
Piperaceae	<i>Piper retrofractum</i> Vahl	Java chili	Patal muk	Hepatitis	Leaf	Liana	0,14
	<i>Piper betle</i> L.	betel pepper	Molo	Kidney disease	Leaf	Liana	0,43
Moraceae	<i>Ficus septica</i> Burm. F.	Awar-awar	Kaboke	Inpartu, HIV/AIDS, stroke, headache, fever, food poisoning	Leaf	Tree	0,43
	<i>Ficus benamina</i> L.	weeping fig	Pur geti	Fracture, swollen body	Bark	Tree	0,14
Acanthaceae	<i>Justicia gendarussa</i> Burm.f.	Gandarusa	Moruk belis	HIV/AIDS	Root	Shrub	0,14
	<i>Thunbergia grandiflora</i> (Rox b. ex Rottl.) Roxb.	Bengal trumpet	Bubuk belis	Fracture	Root	Liana	0,14
Simaroubaceae	<i>Brucea javanica</i> (L.) Merr.	Makasar fruit	Hotel mal	Malaria	Fruit	Shrub	0,14
Urticaceae	<i>Girardinia palmata</i> (Forsk.) Gaudich.	girardinia/ bedor	Mebu bule'en	Stroke, headache, fever, food poisoning, spiritual magic	Bark	Herb	0,14
Equisetaceae	<i>Equisetum debile</i> Roxb. ex Vaucher	Horsetail	Hura	Gout	Root, stem, leaf	Fern	0,14
Phyllanthaceae	<i>Phyllanthus niruri</i> L.	gale of the wind	Gololok	Hypertension	Leaf	Herb	0,14
Meliaceae	<i>Melia azedarach</i> L.	Chinaberry tree, chinaberry,	Kelu	HIV/AIDS	Bark	Tree	0,14
Cyperaceae	<i>Cyperus rotundus</i> L.	Nutgrass	Kebot apa	Waist pain	Root	Grass	0,14
Moringaceae	<i>Moringa oleifera</i> Lam.	Horseradish tree	Marungga	Gout	Leaf	Tree	0,14
Lythraceae	<i>Punica granatum</i> L.	Pomegranate	Rumau	Diarrhea and vomiting, breast cancer	Bark, young fruit	Shrub	0,29
Caricaceae	<i>Carica papaya</i> L.	Papaya	Dila	Postpartum	Leaf	Tree	0,14
Arecaceae	<i>Areca catechu</i> L.	betel palm	Pu	Stomach ache	Seed	Tree	0,43
Amaryllidaceae	<i>Allium sativum</i> L.	Garlic	In nuek	Appendix	Tuber	Herb	0,29

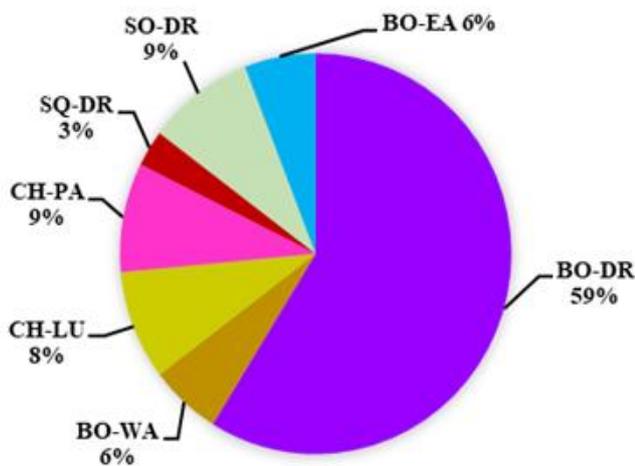


Figure 4. Percentage of processing and use of medicinal plants by the Bunaq Tribe, Lamaknen Sub-district, Belu District, East Nusa Tenggara, Indonesia

The way of processing and using traditional medicine by the Bunaq Tribe is based on diseases. Boiling is the most used method by the Bunaq people because most of the diseases in the community to be cured are internal diseases. According to key informants, consuming boiled water will speed up healing. That is also expressed by Efremila et al. (2015) that people use drugs more by drinking because most species of plants are found and used to treat internal diseases. The process of concocting drugs is closely related to the disease the patient suffered because it also has different effects. People use medicinal plants very diverse, including rubbing, eating, drinking, smearing, sprinkling, pasting, and dripping for external diseases, while the general treatment method for internal diseases is boiling and brewing. During the boiling process, plant substances will come out and dissolve into the water. The community considers this very easy and effective because it is directly processed in the body's metabolism after drinking boiled water (Husain 2015). If the processing of plants is carried out through the boiling process, the compounds in the plant organs will come out and be mixed with water or dissolved in water. The longer the boiling process is carried out, the more compounds present in the plant organs will experience evaporation so that the quality of the ingredients from the plant organs will be more efficacious (Nomleni et al. 2021).

Table 2. The recipes and how to use traditional medicinal plants

Diseases	Species	Organ	Preparation
Vomiting	<i>Psidium guajava</i> L.	Leaf (bud)	All ingredients are boiled and drunk 3 times a day
	<i>Punica granatum</i> L.	Bark	
	<i>Annona muricata</i> L.	Bark	
	<i>Scutellaria galericulata</i> L.	Root	
Inpartu	<i>Ficus septica</i> Burm. F.	Leaf (bud)	All ingredients are chewed and affixed to the stomach of pregnant women.
	<i>Sida rhombifolia</i> L.	Leaf (bud)	
Breast cancer	<i>Timonius sericeus</i> (Desf.) K.Schum.	Leaf (bud)	The leaves were chewed and pasted to the breast affected by cancer.
Vomiting	<i>Flemingia strobilifera</i> (L.) W.T. Aiton	Root	Wild hops and satintail roots are boiled with 7 areca nuts, and the water is drunk 3 times a day.
	<i>Areca catechu</i> L.	Seed	
	<i>Imperata cylindrica</i> (L.) Rausch.	Root	
HIV/AIDS	<i>Vachellia farnesiana</i> (L.) Wight & Arn	Root	All ingredients are boiled and drunk.
	<i>Justicia gendarussa</i> Burm.f.	Root	
	<i>Senna siamea</i> (Lam.) H.S. Irwin & Barneby	Root	
	<i>Albizia procera</i> (Roxb) Benth	Bark	
	<i>Melia azedarach</i> L.	Bark	
	<i>Ficus septica</i> Burm. F.	Leaf (bud)	
	<i>Bambusa</i> sp.	Leaf (bud)	
	<i>Timonius sericeus</i> (Desf.) K.Schum.	Leaf (bud)	
Orchitis/swollen testicles	<i>Sterculia foetida</i> L.	Bark	Bark of sterculia is chewed and pasted to the swollen part of the body.
Stroke, headache, fever, poisoning, and exorcised by evil spirits	<i>Zingiber officinale</i> Linn. Var Rubrum	Rhizome	All ingredients are cut into small pieces and soaked in hot water. The soaking water is drunk twice a day.
	<i>Timonius sericeus</i> (Desf.) K.Schum.	Leaf (bud)	
	<i>Girardinia palmata</i> (Forssk.) Gaudich.	Bark	
	<i>Calotropis gigantea</i> (L.) Dryand.	Stem	
	<i>Syzygium cumini</i> (L.) Skeels	Bark	
	<i>Coffea</i> sp.	Stem	
	<i>Eucalyptus urophylla</i> S.T. Blake	Bark	
	<i>Syzygium aqueum</i> (Burm.f.) Alston	Bark	
Malnutrition	<i>Euphorbia tirucalli</i> L.	Stem	Bark of the kapok tree was boiled and then used for washing/bathing.
	<i>Ceiba pentandra</i> (L.) Gaertn.	Bark	
Appendix, indigestion	<i>Plumeria rubra</i> L.	Bark	Both ingredients are boiled and drunk.
	<i>Alstonia scholaris</i> (L.) R. Br.	Bark	
Appendix	<i>Euphorbia heterophylla</i> L.	Root, stem and leaf	Root, stem, and leaves of Mexican fireplant are boiled with mung beans and 7 cloves garlic, and boiled water is drunk.
	<i>Allium sativum</i> L.	Rhizome	
Bone fracture	<i>Vigna radiata</i> (L.) R. Wilczek	Seeds	Golden shower bark and Bengal trumpet root are sliced, chewed with betel, and areca nut, then lubricated on broken bones.
	<i>Cassia fistula</i> L.	Bark	
	<i>Thunbergia grandiflora</i> (Roxb. ex Rottl.) Roxb.	Root	
	<i>Piper betle</i> L.	Fruit	
Vaginal discharge	<i>Areca catechu</i> L.	Seed	Bark of red sandalwood was boiled, and boiled water is drunk.
	<i>Pterocarpus indicus</i> Willd.	Bark	
Gout	<i>Equisetum debile</i> Roxb. ex Vaucher	Root, stem and leaf	All ingredients were boiled, and then boiled water was used for washing/bathing.
	<i>Calotropis gigantea</i> (L.) Dryand.	Leaf	
Waist pain	<i>Cyperus rotundus</i> L.	Root	Both ingredients are cut into small pieces and chewed, then lubricated on the sore waist.
	<i>Elephantopus scaber</i> L.	Root	
Stroke, fever, foot poison, and headache	<i>Imperata cylindrica</i> (L.) Rausch.	Leaf (bud)	All ingredients are boiled and eaten.
	<i>Ficus septica</i> Burm. F.	Leaf (bud)	
	<i>Bambusa</i> sp.	Leaf (bud)	
Vomiting	<i>Euphorbia hirta</i> L.	Stem	Rhizome of turmeric and temulawak and lemongrass stem are sliced and boiled. After boiling, the pillpod sandmat stem is inserted. Boiled water is drunk 3 times a day.
	<i>Curcuma longa</i> L.	Rhizome	
	<i>Curcuma zanthorrhiza</i> Roxb	Rhizome	
	<i>Cymbopogon citratus</i> (DC.) Stapf	Stem	
Kidney disease	<i>Pluchea indica</i> (L.) Less.	Leaf	Rhizomes of turmeric are sliced and boiled, and leaves of betel and pluchea are added. Boiled water is drunk twice a day
	<i>Piper betle</i> L.	Leaf	
	<i>Curcuma longa</i> L.	Rhizome	
Puerperium / post-partum recovery	<i>Carica papaya</i> L.	Leaf	Papaya leaves are cut and boiled with palm sugar and salt. Boiled water is drunk for two days after giving birth.

Breast milk production	<i>Sauropus androgynus</i> (L.) Merr	Leaf	Katuk leaves are boiled and then eaten
Headache	<i>Zingiber officinale</i> Linn. Var Rubrum	Rhizome	Rhizomes of red ginger are burned and pounded, then soaked in hot water. Soaked water is drunk
Hypertension	<i>Apium graveolens</i> L.	Leaf	After boiling the sliced ginger and turmeric, add the leaves of celery, spade leaf, cat's whiskers, and a gale of wind. Boiled water is drunk 2 two times a day.
	<i>Centella asiatica</i> (L.) Urb.	Leaf	
	<i>Orthosiphon aristatus</i> (Blume) Miq	Leaf	
	<i>Phyllanthus niruri</i> L.	Leaf	
	<i>Curcuma xanthorrhiza</i> Roxb.	Rhizome	
Cholesterol and diabetes	<i>Curcuma longa</i> L.	Rhizome	Soursop leaves are boiled then the boiled water is drunk.
	<i>Annona muricata</i> L.	Leaf	
Hepatitis	<i>Piper retrofractum</i> Vahl	Leaf	All ingredients are boiled, and the boiled water is drunk.
	<i>Cymbopogon nardus</i> (L.) Rendle	Stem	
	<i>Curcuma longa</i> L.	Rhizome	
Stomach ache	<i>Annona squamosa</i> L.	Bark	A bark of sugar apple is boiled, and the boiled water is drunk.
Malaria	<i>Brucea javanica</i> (L.) Merr.	Fruit	Makasar fruit is soaked in hot water, and the hot water is drunk
Appendix	<i>Euphorbia thymifolia</i> L.	Root, stem and leaf	All ingredients are boiled with 7 cloves of garlic until the water remains 1 cup, then the water is drunk
Wound	<i>Ageratum conyzoides</i> L.	Leaf	Whiteweed leaves are chewed and pasted to the wound of the body
Asthma	<i>Plectranthus amboinicus</i> (Lour.) Spreng.	Leaf	The Mexican mint leaves are squeezed and drunk
Bone fracture and swelling body	<i>Ficus benjamina</i> L.	Bark	All ingredients are chewed and lubricated on broken bones or swollen body
	<i>Euphorbia hirta</i> L.	Root	
	<i>Sida rhombifolia</i> L.	Root	
	<i>Jatropha gossypifolia</i> L.	Bark	
	<i>Piper betle</i> L.	Leaf	
Fever and green snake bite	<i>Areca catechu</i> L.	Fruit	All ingredients are boiled, and drink the boiled water
	<i>Albizia procera</i> (Roxb) Benth	Bark	
Urolithiasis	<i>Flemingia strobilifera</i> (L.) W.T. Aiton	Bark	All ingredients are boiled, and drink the boiled water
	<i>Sida rhombifolia</i> L.	Root, stem and leaf	
Gout	<i>Morinda citrifolia</i> L.	Bark	All ingredients are boiled, and drink the boiled water
	<i>Chromolaena odorata</i> (L.) R.M. King & H. Rob.	Leaf	
	<i>Moringa oleifera</i> Lam.	Leaf	
Breast cancer	<i>Punica granatum</i> L.	Fruit	Seven pieces of pomegranate fruit (juvenile) are boiled with red peanuts (single), then the water is drunk.
	<i>Arachis hypogaea</i> L.	Seed	
Kidney disease	<i>Eleusine indica</i> (L.) Gaertn	Root, stem and leaf	All vegetative organs of the crowsfoot grass are boiled, and then the boiled water is drunk

Species use-value (SUV)

The SUV ranged between 0.14 and 0.57, with an average of 0.20 (Table 1). *Curcuma longa* L. has the highest score (0.57), having 4 use reports, followed by *Sida rhombifolia* L., *Piper betle* L., *Ficus septica* Burm. F. and *Areca catechu* L., having a value of 0.43 and 3 use reports, while other plants are below it. High or low SUV may be due to extensive or minimum ethnobotanical uses of the reported species. The highest SUV represents the most exploited medicinal plants used to treat a specific ailment (Jadid et al. 2020). Previous research also revealed that turmeric has a fairly high UV value as a medicinal plant (Silalahi et al. 2019; Fathir et al. 2021). This study revealed that turmeric is a prescription ingredient in treating vomiting, kidney disease, hypertension, and hepatitis. Khotimah et al. (2018) revealed that turmeric is the most widely used plant species in traditional medicine by the Banyuwangi tribe. Another study also revealed that

turmeric could treat diarrhea, abdominal pain, cough, itching, and injury (Silalahi et al. 2019).

Ani et al. (2021) stated that turmeric has a pharmacological effect and can strengthen its efficacy of mixed with other drugs. In addition, this plant contains medicinal compounds called curcuminoids. Nasri et al. (2014) revealed that this plant has useful properties with antioxidant activities and is useful to treat inflammation, ulcer, and cancer. It also has antifungal, antimicrobial renal, and hepatoprotective activities. Its anti-inflammatory, anti-cancer, and antioxidant roles may be clinically exploited to control rheumatism, carcinogenesis, and oxidative stress-related pathogenesis. Therapeutic uses include AIDS/HIV, anemia, cancer, diabetes, digestion, food poisoning, gallstones, etc. (Rathaur et al. 2012).

In this study, *S. rhombifolia* was used as a prescription drug for childbirth, bone fracture and swelling of the body, and urolithiasis. Singh et al. (2018) revealed that this plant

is also used to help childbirths in Assam, India. However, the hot aqueous extract of the entire plant of *S. rhombifolia* is used as an abortifacient when it is taken orally by pregnant women. In addition, this plant has bioactivity as an anti-inflammatory, kidney disorder, hepatoprotective, anti-diabetic mellitus, and analgesic (Silalahi 2020). Furthermore, this plant treats fractures, wounds, fever (Silalahi et al. 2015), and kidney dysfunction (Thounaojam et al. 2010). In addition, in India, this plant, as one of the ayurvedic medicines, is used to cure pain and swelling caused by rheumatism, muscular weakness, and urinary tract wounds and treat tuberculosis, heart diseases, and neurological disorders (Abat et al. 2017).

This study, *F. septica* was used as a mixture of prescription drugs for childbirth, stroke, fever, food poisoning, headache, and HIV-AIDS. In the interview, the village healer who gave this prescription for HIV-AIDS said that this is his personal experience of being diagnosed with HIV-AIDS and declared cured. Furthermore, this plant is known to have the potential of folk medicine to treat colds, fever, and fungal and bacterial diseases (Damu et al. 2005) and as an anti-cancer, especially breast cancer (Nugroho et al. 2015). In addition, the Mamanwa tribe of Surigao del Norte and Agusan del Norte, Mindanao, Philippines, uses this plant as a remedy for headaches and stomach aches and cures skin diseases such as warts (Nuneza et al. 2021) and can treat scabies (Susilo et al. 2017) and burns (Rahman et al. 2013).

Betel (*P. betle*) and areca nut (*A. catechu*) are iconic plants of the tradition/culture of the people of Timor Island in their daily life. In this study, betel nut was used as a prescription mixture for bone fracture, kidney disease, and swollen body, while betel nut was used for vomiting, bone fracture, and swelling. Betel is known to have several pharmacologic effects such as antibacterial, antimicrobial, analgesic, anti-inflammatory, antioxidant, antiproliferative, anti-diabetic, and antiangiogenic (Sakinah et al. 2020; Nayaka et al. 2021; Nurhidayati et al. 2021). Areca nut is also known to have the potential to treat various diseases/disorders such as diabetes, gastrointestinal disorders, ulcer prevention, Heart diseases, and CNS disorder (depression, seizures), and also exhibits various pharmacological activities including anti-inflammatory, anti-protozoal, antioxidant, anti-allergic, wound healing activity, etc. and the extract of areca palm and its nuts are also useful for the preparation of many natural medicinal and cosmetic products (Tiwari and Talreja 2020; Ansari et al. 2021).

This study concluded that Bunaq Tribe used 63 medicinal plant species to treat many diseases using several preparation methods. The results of this study can be used as the basis for the conservation and sustainable use of medicinal plants in the Bunaq community.

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