

# Diversity of medicinal plants utilized by To Manui ethnic of Central Sulawesi, Indonesia

NUNING RAHMAWATI\*, FANIE INDRIAN MUSTOFA, SARI HARYANTI

Medicinal Plant and Traditional Medicine Research and Development Center. Jl. Raya Lawu 11, Tawangmangu, Karanganyar 57792, Central Java, Indonesia. Tel./fax.: +62-271-697010, \*email: nunrahmawati@gmail.com

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**Abstract.** Rahmawati N, Mustofa FI, Haryanti S. 2020. Diversity of medicinal plants utilized by To Manui ethnic of Central Sulawesi, Indonesia. *Biodiversitas* 21: 375-392. The present study reports the utilization of medicinal plants as medicines for the treatment of various diseases among the people of To Manui tribe in Central Sulawesi Province of Indonesia. Data collecting was conducted based on purposive random sampling to five selected traditional healers who fulfilled some inclusion criteria. The results showed as of 89 species of medicinal plants distributed in 50 families and 80 genera have been documented to have any pharmacological effects against 37 diseases and illnesses. *Curcuma longa* L. was determined as the most frequent medicinal plant used by traditional healers in To Manui for treating diabetes mellitus as well as after-birth treatment. However, conservation of some medicinal plants needs to be initiated in the study area especially *Alstonia scholaris* (L.) R. Br. as it is recognized in International Union for Conservation of Nature (IUCN) Red List as Least Concern (LC) of conservation status.

**Keywords:** Medicinal plants, To Manui ethnic, traditional healers

## INTRODUCTION

Medicinal plants have been used by generations as traditional medicine for therapeutic uses for thousands of years in many parts of the world. As defined by World Health Organization (WHO), traditional medicine is a comprehensive term used to refer to both various forms of indigenous medicine and to traditional medicine systems such as traditional Chinese medicine, Indian Ayurveda, and Arabic Unani medicine (Anon 2019). Based on current information, 88% WHO member states have acknowledged their use of traditional medicine which corresponds to 170 member states (Anon 2019). According to WHO data, the developing countries populations utilized medicinal plants for treating ailments and diseases as of 65 to 80% and tend to quickly expand across the world (Megersa et al. 2019). Basic health research conducted by the Ministry of Health of Republic of Indonesia in 2018 reported that as many as 48% of Indonesia's population in all age categories used traditional health services in the form of traditional medicines (Anon 2019).

To Manui (derived from the word Manu means chicken) is one of the ethnic groups in Central Sulawesi Province located in Menui Islands Subdistrict, one of the exotic islands in Morowali District which is directly adjacent to the Banda Sea with a population of 13,316 in 2017. Menui Islands is the smallest sub-district (4.07%; 223.63 km<sup>2</sup>) of 9 sub-districts in Morowali District. Administratively, the west and south of Menui Islands are bordered by the Southeast Sulawesi Province, east of the Banda Sea and bordering the north by South Bungku and Banda sea (Anonim 2018b). Although administratively Menui included the Morowali District area, Menui's

accessibility was closer to Kendari City, Southeast Sulawesi Province. With a distance of 99 nautical miles from the capital city of Morowali Subdistrict, it takes more than 14 hours to reach Menui Islands by ship and about 5 hours if taken from Kendari harbor. The topography of Menui islands is hilly with more than eighty percent of karst (limestone) land composition with limitation of clean water sources.

The health facilities available at Menui Kepulauan are a health center and sixteen rural polyclinics with a medical doctor, fifteen nursing staff, thirty-four midwifery staff, and pharmacy staff. While health facilities including hospitals, midwife practices, pharmacies, and drug stores are not yet available in Menui Islands sub-district (Anonim 2017). The limitations of health facilities availability and accessibility tend to encourage people to optimize natural resources in the area including the utilization of medicinal plants for self-medication. The most common reasons for the continued use of herbal medicine are that they are more accessible, more affordable, and more acceptable to local populations and can, therefore, be a tool to help in achieving universal health coverage (Zhang and Africa 2018).

The trend of medicinal plant utilization for treatment and prevention of disease is increasing over time. Local knowledge on the utilization of medicinal plants for health owned by communities and traditional healers is feared to be eroded and disappear when data collection and documentation in the form of databases were not available. Poverty is one of the main reasons for this rapid loss of indigenous knowledge systems as well as biodiversity. Poverty increases the pressure on natural resources and converts people from complex indigenous knowledge

systems to simple and easy techniques such as chemical agriculture (Anon 2015). Manuel and Muller (2013) reported whether copyrights, patents, breeder's rights categorized as classic IP instruments are considered unsuitable to protect indigenous people's intellectual interests, both for technical reasons and often ideological reasons.

Therefore it is necessary to conduct research on documenting the utilization of medicinal plants and traditional knowledge of ethnobotany in Central Sulawesi, especially within To Manui ethnic. This study is part of the national research on medicinal plant and Jammu (called Ristoja) carried out by National Institute Health Research and Development c.q. Medicinal Plant and Traditional Medicine Research and Development Center among 34 provinces in Indonesia including 405 ethnicities and involved 2,354 traditional healers as informants during 2012, 2015 and 2017.

## MATERIALS AND METHODS

### Study area

The study was carried out in Menui Islands sub-district of Morowali District, Central Sulawesi Province with the latitude and longitude-3.607323 and 123.149150 respectively (Figure 1). This sub-district is located 99 nautical miles further towards the capital city of Morowali District. Considering the location of this area directly surrounded by the ocean, the major source of livelihood

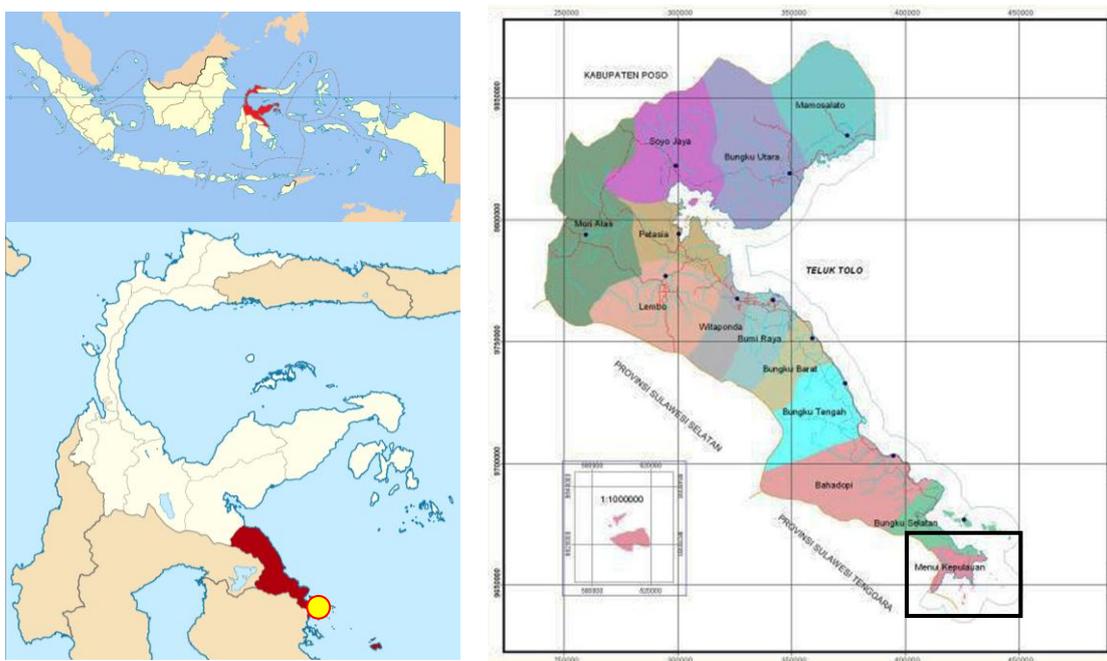
was in fishery sector. The present study was taking place from August 23 to September 15 of 2015.

### Procedures

#### Data collecting

Data collecting was carried out based on purposive sampling method. Data was collected through a survey based on structured questionnaire to five selected traditional healers. They are traditional healers who have the knowledge and skill of curing any ailments using medicinal plants, indigenous people of To Manui ethnic or acculturated people, the most well-known healer whom recognized by communities, and do practice of medication. The interviews were conducted by the research team with health education, anthropology and biology background.

The questionnaire was providing data on vernacular plant names, parts used, plant habitat, the dosage used, preparation method and route of administration. Furthermore, the traditional healers were also asked about the ailments treated, the definition of each ailment treated based on the perception of traditional healers and the symptoms that followed. The interviews were supplemented by direct observation as well as sample plant collection under the supervision of traditional healers. The plant voucher specimens were collected and deposited at Herbarium Tawangmanguensis of MPTMRDC. Ethical approval of this study was obtained from Health Research Ethics Commission of National Institute Health Research and Development, Ministry of Health.



**Figure 1.** Location of To Manui ethnic in Menui Island sub-district of Morowali District, Central Sulawesi, Indonesia with the latitude and longitude-3.607323 and 123.149150 respectively.

**Data analysis**

Quantification of data was conducted throughout the determination of use-value (UV) of each medicinal plant obtained. UV describes the use-value of a plant that is used as a medicine by traditional healers in To Manui ethnic of Central Sulawesi.

$$UV = U_i/n$$

(Ayyanar and Ignacimuthu 2011; Musa et al. 2011)

Note:

UV : Use Value;

$U_i$  : The number of use reports cited by each informant for a given species

$n$  : The total number of informants interviewed

**RESULTS AND DISCUSSION**

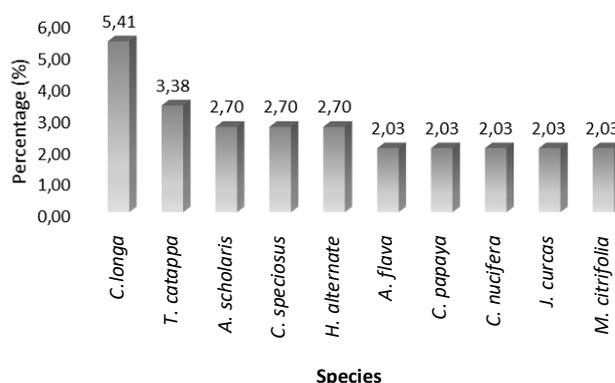
**Medicinal plants used by traditional healers**

This current research addresses the existence of traditional indigenous knowledge in To Manui ethnic on utilizing medicinal plants for therapeutic uses. Therefore, it is urgently to preserve this indigenous knowledge on traditional medicines by proper documentation, identification of plant species, genera, family, parts used, herbal preparation, dosage and route of administration. The present study deals with 89 species of medicinal plants representing the local biodiversity of To Manui ethnic (Table 1). Among all species identified, there were several plants showing higher utilization rates, they are *C.longa*, *T. catappa*, *A. scholaris*, *C. speciosus*, *H. alternate*, *A. flava*, *C. papaya*, *C. nucifera*, *J. curcas* and *M. citrifolia* (Figure 2).

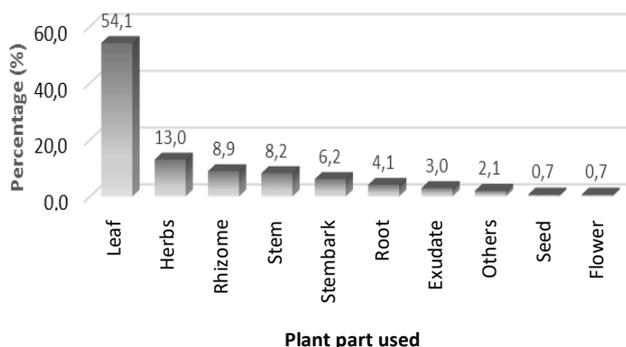
Traditional healers in To Manui ethnic used ten kinds of medicinal plant parts for many indications. Among them, leaf was recognized as the most frequently used (Figure 3) followed by herbaceous parts, rhizome, stem, stem bark, root, exudate, and other materials. From Table 1, it can be summarized the preparation steps of medicinal plant formula prescribed by traditional healers in order to cure any diseases. Firstly, the collecting of fresh materials rather than the dried one, continued with the sortation as well as washing and changing materials size by cutting, hand-crushing, grinding, powdering, pounding, and mashing. The second one was the formula preparation. Each species has its own preparation way depending on administration route and medication goals both for preventing or curing any symptoms and diseases (Sambara et al. 2016). Route of administration and dosage determining became the last step of formula preparation by traditional healers. This last step was influenced by many factors as described by informant i.e kind of disease, patient number of age and the severity of disease.

Of eighty-nine medicinal plant species utilized by all informants distributed in 50 families, 80 genera and various vernacular names commonly used by traditional healers and local communities. The importance of a plant that is utilized in this study is stated by use-value. The use-value

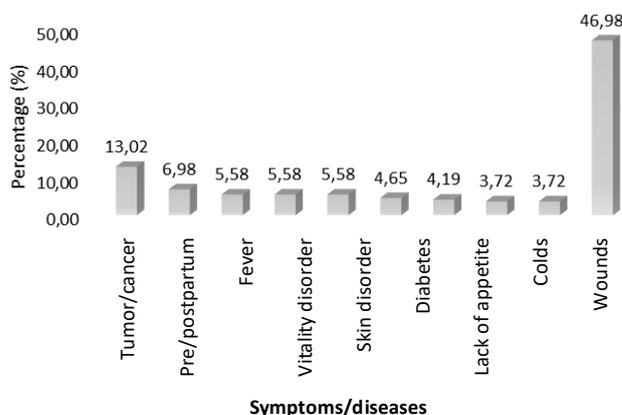
among all species are varying starting from 0.2 to 1.6 in which *C. longa* of Zingiberaceae family shown the highest use value (UV=1.6) followed by *A. scholaris*, *T. catappa* and *P. betle* with use-value as of 1.0, 0.8 and 0.8 respectively.



**Figure 2.** The top ten of medicinal plants used by traditional healers



**Figure 3.** Percentage of plant parts used by traditional healers



**Figure 4.** Percentage of traditional healers-treated diseases

**Table 1.** Ethno-medicinal plants used in To Manui ethnic in Menui Islands, Morowali District, Central Sulawesi, Indonesia

Family	Plant species	Local name	Use value	Part used	Ailment treated	Preparation and administration	Adverse reaction
Annonaceae	<i>Annona muricata</i> L.	Nangka, srikaya	0.2	Leaf	Hypertension	Take <i>A. muricata</i> leaf, be washed, boiled and drink as much as one glass a day for a week.	Doses greater than 5 g/kg of aqueous extract might cause kidney damage (Coria-Tellez et al. 2018)
Apocynaceae	<i>Alstonia scholaris</i> (L.) R. Br.(LC/LR/Ic)	Kompanga, parasuli	1.2	Cortex, others	Fever, Tumor/Cancer, Fertility disorder, Cosmetics, heart disease, malaria	Take a half of a glass <i>A. scholaris</i> cortex, cut into smaller size, be washed, boil with adequate water, drink three times a day. Add Java chilli and an egg yolk into formula before drinking. Formula could also be ground into powder form and apply topically.	Long term treatment at dose 500 and 1000 mg/kg bb showed toxic effect on hepar (Bello et al. 2016)
	<i>Voacanga foetida</i> (Blume) Rolfe	Kantudu	0.2	Exudate	Wounds healing	Take some <i>V. foetida</i> stems, break and collect the exudate than apply topically to the injury skin as often as possible.	28 days of aqueous extract provision caused bodyweight decrease of female Wistar rats (Igbe et al. 2015)
Araceae	<i>Aglaonema commutatum</i> Schott	Ka asso-asso tonuana	0.2	Leaf	Hemorrhoids	Take one leaf of <i>A. commutatum</i> , cleaned, laid down the leaf, put on hemorrhoid while being pushed in. When taking this plant, do not let the shadow of our body fall on the plant.	The crude methanolic extract of <i>Aglaonema sp</i> exhibit LD50 less than 1000 mg/kg bb on brine shrimp lethality test (Arnob 2011)
Bromeliaceae	<i>Ananas comosus</i> (L.) Merr.	Nanasi	0.2	Fruits	Pre and postpartum treatments	Take young <i>A.comosus</i> fruits, peeled and shredded, filtered and then taken the juice to drunk	The aqueous leaf extract oral provision did not induce any toxicity in rats of acute and sub-acute doses (Dutta and Bhattacharyya 2013)
Compositae	<i>Bidens pilosa</i> L.	Sompa hoalu	0.2	Leaf	Sore eyes	Take <i>B. pilosa</i> leaf and then cleaned, pounded until smooth and then wrapped and squeezed the juice, the juice/liquid produced, then dropped on the eyes	4 weeks oral administration of aqueous extract exhibit significant variation of ALT and creatinine (p<0.001) (Bopda et al. 2016)
Menispermaceae	<i>Arcangelisia flava</i> (L.) Merr.	Kamama, oeo mokuni	0.6	Stems	Wounds healing, Jaundice, Tumor/Cancer, heart disease, malaria	Take <i>A. flava</i> leaf and stems then thinly sliced, washing plant parts, boiled and drink of 1 cup 3 times a day	Oral administration of 250, 500 and 750 mg/kg bw caused liver congestion (Rachmawati and Ulfa 2018)
Myrtaceae	<i>Syzygium aqueum</i> (Burm.f.) Alston	Mongu padahu	0.2	Leaf	Antidiabetic	Take the <i>S. aqueum</i> leaf, boil with enough water, drink as much as 2 times a day, patients should drink the concoction every week, patients are advised to check the glucose blood levels.	Fatty liver and necrosis were observed in female rats of ethanol extract provision (Sumiwi et al. 2019)

Oxalidaceae	<i>Averrhoa bilimbi</i> L.	Takule	0.2	Leaf	Hypertension	Take approximately 30 leaves of <i>A. bilimbi</i> , cleaned then boiled with enough water, the ingredients are taken 3 times a day.	<i>A. bilimbi</i> fruit contains the same neurotoxin caramboxin isolated from the star fruit (Caetano et al. 2017)
Acanthaceae	<i>Graptophyllum pictum</i> (L.) Griff.	Keu jin	0.2	Leaf	Tumor/Cancer	Take <i>G. pictum</i> leaf, cleaned, pounded and pasted on the edge of the swollen part 3-4 times a day.	Aqueous leaf extract of <i>G. pictum</i> showed no hematological profile changes on white mice (Hilmarni et al. 2016)
	<i>Hemigraphis alternata</i> (Burm.f.) T.Anderson	Tonto memea, tontorada memea	0.8	Leaf	Fever, Cough, Ulcer, Appetite booster	When taking this plant, do not let the shadow of our body fall on the plant. Take 5, 7 or 9 leaves of <i>H. alternata</i> , cleaned then brewed with hot water or boiled, then cool and drink 3 times a day. Other ways to use by taking 5 leaves, cleaned and crushed by hand (kneaded) and then placed on the ulcer. Do it once a day and the effect will be seen on usage less than 1 week.	Leaves extract of <i>H. alternata</i> up to the dose of 4000 mg/kg in mice were nontoxic and showed no mortality, behavioral changes or sign of any toxicity (Rahman et al. 2019)
	<i>Sericocalyx crispus</i> (L.) Bremek	Pecah beling	0.2	Leaf	Low back pain	Take <i>S. crispus</i> and <i>O. aristatus</i> leaf, boil with enough water, strain, wait for cold, then drink 1 cup twice a day.	Not yet available
Amaranthaceae	<i>Achyranthes aspera</i> L.	No name	0.2	Herbs	Tonsillitis	Take all parts of the plant <i>A. aspera</i> except the roots, clean, boil with enough water, chill and drink twice a day. The effects will be seen after drinking the first time.	Methanol extract of <i>A. aspera</i> up to dose of 500 mg/kg bb found to be nontoxic on both acute and sub-chronic toxicity test (Reddy and Kamble 2017)
Amaryllidaceae	<i>Crinum asiaticum</i> L.	Pupu	0.2	Leaf	Appetite booster	Take leaf of <i>C. asiaticum</i> , <i>Cordia sp.</i> , and <i>C. verticillata</i> , wash, finely mash all ingredients and distribute to the child's body after the child has finished showering twice a day.	<i>C. asiaticum</i> leaves and bulbs methanol extract showed toxicity against BSLT with LD50 as of 243.331 and 507.838 respectively (Riris et al. 2018).
Anacardiaceae	<i>Anacardium occidentale</i> L.	Jampu	0.2	Leaf	Gastritis	Take <i>A. occidentale</i> leaf, clean, mash finely, take the juice and drink three times a day.	The administration of leaves extract of 500 mg/kg bb for 90 consecutive days caused reduction of white blood cell and platelet of Wistar rats (Wattanathorn et al. 2019)
	<i>Bouea macrophylla</i> Griff.	Ovola	0.6	Cortex	Tumor/Cancer, Heart disease, Malaria	The material is washed clean, the stem is cut first so it is easy when boiling, then drink boiled water after getting cold.	Not yet available
	<i>Lansea coromandelica</i> (Houtt.) Merr.	Keu Jawa, kayu Jawa	0.4	Leaf, cortex	Fertility disorder, Antidiabetic	Take the leaf of <i>L. coromandelica</i> and the roots of <i>A. catechu</i> which are cut into small pieces. All ingredients are boiled with enough water to boil. cool and drink one glass 2 times a day.	The provision of hydroalcoholic extract of <i>Lansea</i> sp. up to dose 5000 mg/kg bb for 28 days did not cause mortality and toxicity signs
Arecaceae	<i>Cocos nucifera</i> L.	Ni'i memea, nii	0.6	Fruits	HIV/AIDS,	Take the young fruit of <i>C. nucifera</i> which	Petroleum ether, chloroform, and

					Tonsilitis, Cough	grows only one fruit per stem, hole the fruit in the middle, mix the contents with water, boil <i>C. nucifera</i> with its throat for 10 minutes then rubbed while reading the prayer life. Fruit can only be taken on Friday. Another method is to take a <i>C. nucifera</i> fruit, beat it until the water comes out and drink one glass immediately 2 times a day. The effect will be seen in usage of less than 1 week.	methanol leaves extracts provision of 200 mg/kg bw for 28 days showed no detectable alterations in hematological, biochemical and histological parameters (Paul et al. 2012)
	<i>Metroxylon sago</i> Rottb.	Haka rombia	0.2	Roots	Vitality disorders	Take <i>M. sago</i> herbs, ( <i>M. sago</i> is used with roots growing upward), wash, boil with enough water, drink after cold.	edible coated from sago shown no antiseptic effect against <i>Escherichia coli</i> (Nisah 2017)
Bignoniaceae	<i>Crescentia cujete</i> L.	Takung keu	0.4	Leaf	Rheumatics and gout, Hyperlipidemia	Take the leaf of <i>C. cujete</i> and leaf <i>O. aristatus</i> , wash and boil with enough water, drink one glass 3 times a day.	The provision of 50% ethanol extract caused toxic effect against <i>Artemia salina</i> during 24 hours of treatment (Sagrin et al. 2019)
Boraginaceae	<i>Cordia</i> sp.	Oreo, oreo mohallo	0.2	Leaf	Appetite booster	Take <i>Cordia sp</i> leaf, wash and mash finely, mix with rice that has been finely ground into flour, strain, and smear on the child's body after the child has finished showering two times a day.	90 consecutive daily oral provision of saline solution of extracts up to dose of 400 mg/kg did not induce any toxicological effects on mice (Caparroz-assef et al. 2005).
Caricaceae	<i>Carica papaya</i> L.	Pepaya	0.6	Leaf	Pre and postpartum treatments, Wounds healing, Jaundice	Take the old yellowing leaf of <i>C. papaya</i> , the rhizome of <i>C. longa</i> and the fruit of <i>C. citratus</i> , wash all ingredients, mix, boil with water, drink after cold. When taking this plant, do not let the shadow of our body fall on the plant.	Ethanol leaf extract up to dose 5 g/kg bw administration increased AST and BUN of sub-acute toxicological against Wistar rats (Tarkang et al. 2012)
Combretaceae	<i>Terminalia catappa</i> L.	Tolihe	1.0	Roots, cortex, fruits, leaf	Anti-toxic, wounds healing, Skin disease	For anti-toxic, take the stembark and roots of <i>T. catappa</i> that are visible or grown on the ground, cut into pieces, boil with enough water to boil, cool and then drink three times a glass a day. For other uses, take <i>T. catappa</i> leaf, clean, fry, pound until formed like powder, add coconut oil to taste, ready for use on the skin or wound. If the fruit is used, then take the fruit of <i>T. catappa</i> , crush the fruit skin, take the contents, boil with leaf of <i>C. papaya</i> , drink three times a day as much as one glass.	1100 ppm administration of leaf extract showed juvenile behavior changes at 96 hours against <i>Oreochromis niloticus</i> (Yunus et al. 2019)
Asteraceae	<i>Adenostemma lavenia</i> (L.) Kuntze	Don tailaro	0.2	Herbs	Fever	Take <i>A. lavenia</i> herb, clean it, then brew with hot water, leave it for a few moments then the water is put in / moved into the glass and taken one glass three times a day.	Not yet available

	<i>Ageratum conyzoides</i> L.	Evo bonto	0.4	Leaf	Fever, Flu	Take the leaf of <i>A. conyzoides</i> , clean, mash finely, add one glass of water and use it to be applied to the stomach and chest of the sick child. When taking this plant, do not let the shadow of our body fall on the plant.	28 days provision of 500 mg/kg bw lowering urea levels of Wistar rats (Diallo et al. 2010a)
	<i>Blumea riparia</i> (Blume) DC.	Tole tindi	0.2	Leaf	Wounds healing	Take <i>B. riparia</i> leaf, crush and paste on the baby's umbilical cord to dry quickly, use as often as possible until the umbilical cord is loose, usually used for three to four days.	Phenolics compound in this plant might contribute to hemostatic properties (Huang et al. 2010)
	<i>Chromolaena odorata</i> (L.) R.M.King & H.Rob.	Komba-komba	0.2	Leaf	Flu	Take the leaf of <i>C. odorata</i> , the number of leaves taken according to age and the size of the patient's body, clean the leaf, mash and add rice flour to taste to make it look like powder, apply it to the body.	Oral administration of methanol extract induced sedation, loss of appetite, enteritis and decreased weight gain in treated mice (Paulose et al. 2016)
	<i>Vernonia amygdalina</i> Delile	klorovil	0.4	Leaf	Rheumatics and gout, Hyperlipidemia	Take leaf of <i>V. amygdalina</i> and <i>O. aristatus</i> , wash and boil with enough water, drink 3 cups a day.	Aqueous extract administration tend to decrease red blood cell and hemoglobin against African catfish (Olowolafe and Mo 2018)
Convolvulaceae	<i>Ipomoea triloba</i> L.	Luvuentahi	0.2	Roots	Other internal diseases	Take <i>I. triloba</i> roots, then wrap it around the patient's hand.	Not yet available
Costaceae	<i>Cheilocostus speciosus</i> (J.Koenig) C.D.Specht	Tovu-tovu, palopalo	0.8	Stems	Fever, Tonsillitis	Take the stem of <i>C. speciosus</i> , split it in half and take them inside, grated and add enough water and drink the water. Another way is to brew the inside of the stem that has been taken with hot water, let stand a few minutes then drink three times a day as one glass. When taking this plant, do not let the shadow of our body fall on the plant.	Acute toxicity test showed no toxicology signs ((Specht et al. 2014)
Crassulaceae	<i>Bryophyllum pinnatum</i> (Lam.) Oken	Pomapu	0.4	Leaf	Fever, Antidiabetic	Take the leaf of <i>B. pinnatum</i> , boil, take the water and drink after it is cold. Another way is to finely pulverize the leaf and put them directly on the patient's body. When taking this plant, do not let the shadow of our body fall on the plant.	Aqueous leaves extract up to dose 5000 mg/kg bb exhibited no mortality and hematological alterations against Sprague-Dawley rats (Ozolua et al. 2010)
Cyperaceae	<i>Scleria</i> sp.	Kila-kilala	0.2	Fruits	Ulcer	Take the <i>Scleria sp</i> fruit, mash and paste it on the ulcer. Sticking is done around the ulcer twice a day. The effect will be seen at less than 1 week.	Not yet available
	<i>Scleria sumatrensis</i> Retz.	Kila-kilala	0.2	Leaf	Wounds healing	Take <i>S. sumatrensis</i> leaf, clean, soak in warm water for five minutes. Immersion water is distributed to the injured body part. When taking this plant, do not let the shadow of our body fall on the plant.	Not yet available

Davalliaceae	<i>Nephrolepis acutifolia</i> (Desv.) H. Christ	Ato-ato	0.2	Others	Diarrhea	Take young leaf of <i>N. acutifolia</i> , clean, boil with water, drink 1 cup of boiled water three times a day.	Not yet available
	<i>Nephrolepis biserrata</i> (Sw.) Schott	Ato-ato	0.4	Leaf, herbs	Wounds healing, Pre and postpartum treatments	Take the curved <i>N. biserrata</i> young leaf, mash and apply on the wound. For Pre and postpartum treatments, take herbs of <i>N. biserrata</i> with <i>Tamarindus indica</i> , brew with hot water, drink after cold.	Not yet available
Euphorbiaceae	<i>Euphorbia hirta</i> L.	Pulu-pulu tumpu, pulum-pulu tumpu inia	0.4	Exudate, herbs	Wounds healing, Appendicitis	Take <i>E. hirta</i> stems, break it and take the sap and apply directly to the wound. Other uses by taking <i>E. hirta</i> herbs, clean, boil with enough water, chill and, drink three glasses a day.	Acute and sub-acute toxicity test revealed the giving of methanol extract caused no toxicological signs against SD rats (Ping et al. 2013)
	<i>Jatropha curcas</i> L.	Beau dava	0.6	Cortex, leaf, exudate	Cough, Hemorrhoid, Gastritis	Take <i>J. curcas</i> stembarks, boil with enough water, wait until cool. For serving, add egg yolks. Other uses by taking five leaves of <i>J. curcas</i> , cleaning and reheating, after that the leaf is arranged and used to wrap the river stone to be placed on hemorrhoid. To treat gastritis, take the sap of <i>J. curcas</i> sap and drink it.	Case study reported the seed to consume of <i>J. curcas</i> caused vomiting and diarrhea (Shah 2010).
	<i>Macaranga peltata</i> (Roxb.) Müll.Arg.	Soso nana	0.2	Leaf	Ulcer	Take <i>M. peltata</i> leaf with the amount depending on the size of the ulcer. The leaf is pounded and pasted on or around the ulcer. The attachment is not comprehensive on the ulcer only at the edge.	Leaf and stem bark extract of <i>M. peltata</i> exhibited cytotoxic effect against liver cancer cell line (Verma et al. 2009)
Goodeniaceae	<i>Scaevola taccada</i> (Gaertn.) Roxb.	Pado-pado	0.6	Stems, leaf, fruits	Anti-toxic, Fever, Sore eyes	Take leaf and stems <i>S. taccada</i> by dredged then boiled with water until it changes color. Potions taken three times a day. Drink in warm or cold conditions. Another way is by taking the fruit juices and drop it on the affected eye.	n-butanol fraction showed toxic effect against <i>Artemia salina</i> with LC50 as of 12.16 µg/ml (Santi and Nurbaezurah 2013)
Lamiaceae	<i>Hyptis capitata</i> Jacq.	Komba kau	0.2	Leaf	Flu	Take the leaf of <i>H. capitata</i> , mash finely, add a little water then take the juice and drop it into the nose which is clogged three times a day. When taking this plant, don't let the body fall on the plant.	<i>Hyptis</i> sp. leaves infusion shown no toxicity signs against <i>Drosophila melanogaster</i> and <i>Artemia salina</i> (Bezerra et al. 2017)
	<i>Orthosiphon aristatus</i> (Bl.) Miq.	Kumis kucing	0.8	Leaf, herbs	Rheumatics and gout, Hyperlipidemia, Appendicitis, Low back pain	Take the leaf of <i>O. aristatus</i> and <i>V. amygdalina</i> , wash, boil with enough water, drink three glasses a day.	Standardized ethanol extract of <i>O. aristatus</i> decrease AST and ALT of athymic nude mice model (Yehya et al. 2019)
Fabaceae	<i>Flemingia macrophylla</i> (Willd.) Merr.	Polita	0.2	Leaf	Ulcer	Take <i>F. macrophylla</i> leaf, wash, lay and then apply to the ulcer.	Root ethanol extract up to dose 600 mg/kg bw prolonged sleeping time of pentobarbitone effect (Gahlot et al. 2013)

	<i>Abrus precatorius</i> L.	Kabuti	0.6	Herbs	Tumor/Cancer, Heart disease, Malaria	Take <i>A. precatorius</i> herbs, cut into smaller parts to make it easier for boiling, washing, boiling, drinking after cold.	Orally consume of <i>A. precatorius</i> seed induced drowsiness, staggering gait, coma, convulsion and death in severe cases (Kafle et al. 2018)
	<i>Flemingia strobilifera</i> (L.) W.T.Aiton	Polita	0.2	Cortex	Fever	Take <i>F. strobilifera</i> stems, scrape and take the bark, brew with hot water, drink one glass twice a day.	Roots ethanol and ethyl acetate fraction showed depressant effect on central nervous system (Mahajon 2019) Not yet available
	<i>Senna alata</i> (L.) Roxb.	Tamba palang singa, tamba palan singa	0.6	Leaf, roots	Skin disease, Anti-toxic, antidiabetic	Take <i>D. alata</i> leaf, clean, add salt, then leaf directly rubbed on the skin, do it twice a day and the effect will be seen on the third day of use. The other way is to take the root of <i>S. alata</i> , wash it, boil it with enough water to boil, chill and drink 2 times a day as glass and the effect will be seen in use less than 1 week.	
	<i>Tamarindus indica</i> L.	Sampalu/asam Jawa	0.2	Fruits	Pre and postpartum treatments	Take <i>T. indica</i> fruits, add it with hot water, stir, strain, and drink by mother after giving birth.	Long-term used (6 months) of <i>T. indica</i> pulps induce no hematology and blood biochemistry parameters alterations (Iskandar et al. 2017)
	<i>Tamarindus</i> sp.	Asam Jawa	0.2	Fruits	Pre and postpartum treatments	Take one or more <i>T. indica</i> fruits, add with hot water, stir, strain, then drink it to the mother after giving birth. The concoction is taken only once after giving birth.	
	<i>Vigna marina</i> (Burm.) Merr.	Komba-komba	0.2	Leaf	Tonsillitis	Take leaf <i>V. marina</i> , wash, mash, take the juice and drink once a day.	Acute toxicity test showed no mortality found up to dose 1000 mg/kg bw of <i>Vigna sp</i> (Battu et al. 2011)
Linderniaceae	<i>Picria fel-terrae</i> Lour.	Bantiala	0.2	Herbs	Low back pain	Take one or more (the amount must be odd) <i>P. fel-terrae</i> fruits, clean, boil, drink 3 times a day. Effects begin to appear after the use of the fifth day.	500 and 1000 mg/kg bw ethanol extract administration of sample cause reversible toxicity on sub-chronic toxicity (Harahap et al. 2018)
Malvaceae	<i>Gossypium arboreum</i> L.	Kapa	0.2	Leaf	Skin disease	Take the leaf of <i>G. arboreum</i> , clean it, then rub it immediately on the affected skin.	Gossypol induced toxic effects that were the impairment of male and female reproduction (Gadelha et al. 2014)
	<i>Hibiscus tiliaceus</i> L.	Bontu	0.2	Leaf	Constipation	Take <i>H. tiliaceus</i> leaf, clean, boil with enough water to boil, cool, drink 3 times a day as much as 1 cup and the effect will be seen in use less than 1 week.	The ethanol leaf and bark extract lowering onset as well as total sleeping time (Awal et al. 2016)
	<i>Sida rhombifolia</i> L.	Kukuni	0.2	Herbs	Tumor/Cancer	When taking this plant, don't let the body fall on the plant	Water root extract up to dose 5000 mg/kg bw did not cause acute and sub-chronic toxicity of rats (Sireeratawong et al. 2008)

	<i>Urena lobata</i> L.	Kapu-kapu	0.4	Leaf	Goiter, sore eyes	Take <i>U. lobata</i> leaf, clean, mash until the juice comes out, drop it on the affected part of the body 3 times a day. When taking this plant, don't let the body fall on the plant	Aqueous roots extract of <i>U. lobata</i> given to normal rabbit for 24 weeks caused reversible increase of cholestasis, alkaline phosphatase, bilirubin, AST and ALT (Omonkhua and Onoagbe 2011)
Marantaceae	<i>Donax canniformis</i> (G.Forst.) K.Schum.	Nene	0.2	Herbs	Tonsillitis	Take the <i>D. canniformis</i> herbs, clean it, cut it into smaller portions, boil, after boiling, waiting for cold and drink three times a day.	Not yet available
Moraceae	<i>Ficus septica</i> Burm.f.	Libonu	0.2	Leaf	Fever	Take one or more <i>F. septica</i> leaf (depending on the surface area of the child's body), leaf on a clean cloth and immediately attach to the child's body. If it has begun to wilt, the leaf is replaced with new leaf and so on until the heat of the child begins to fall.	Methanol stem extracts of 2 mg/ml of <i>F. septica</i> induced moderate damage to the duck embryo livers (Gamallo and Gallego 2017)
	<i>Ficus</i> sp.	Taimanu	0.2	Leaf	Dysentery	Take the leaf of <i>Ficus</i> sp, clean, boil with enough water to boil, chill and drink one glass three times a day	Methanol leaf extract lowering VEBs and the incidence and duration of Rev VF (Allahyari et al. 2014)
Moringaceae	<i>Moringa oleifera</i> Lam.	Inahung keu	0.2	Leaf	Sore eyes	Take one handful of <i>M. oleifera</i> leaf, clean it, mash it until smooth, put it in a dish and add it with one glass of water. Then the eyes are soaked by directing the face into the dish.	Methanol leaf and seed extract administration up to dose of 1000 mg/kg bw significantly increase neutrophil, white blood cell and platelet (Olayemi et al. 2016)
Musaceae	<i>Musa × paradisiaca</i> L.	Pohon pisang, punti manuru, punti	0.6	stems, fruits, leaf	Antidiabetic, Gastritis, Stroke, Paralyzed	Take three old <i>M. x paradisiaca</i> leaf and 3 rhizome <i>C. longa</i> , clean, grate and mix with brown sugar then mash	Aqueous fermented extract dose 5000 mg/kg bw induced significant alteration on white blood cells, eosinophil, platelets, urea, creatinine, alanine aminotransferase and high-density lipoprotein levels of rats (Ugbogu et al. 2018)
Myristicaceae	<i>Myristica fragrans</i> Houtt.	Pala	0.2	Fruits	Cough	Take <i>M. fragrans</i> fruits, clean and eat it three times a day to deal with itching in the throat. The effect will be seen in usage of less than 1 week.	Consume as of 5 g of ground nutmeg shown to cause hallucinogenic effects (Rahman et al. 2015)
Myrtaceae	<i>Psidium guajava</i> L.	Jambu biji	0.2	Leaf	Diarrhea	Take young <i>P. guajava</i> leaf, clean, boil with enough water and drink one glass three times a day. When taking this plant, don't let the body fall on the plant	Ethanol leaves extract provision of <i>P. guajava</i> at dose of 750 mg/kg bw for 28 days caused soft and mucous feces, and 20-40% animal death (Utami et al. 2018)
Passifloraceae	<i>Passiflora foetida</i> L.	Gola-gola	0.4	Leaf	Antidiabetic, Pre and postpartum treatments	Take <i>P. foetida</i> leaf, boil with enough water, drink during the puerperium.	The provision of the extract of 1600 mg/kg bw for 6 months induced fatty infiltration in the cortex of adrenal glands of Wistar rats (Chivapat et al. 2011)

Phyllanthaceae	<i>Breynia oblongifolia</i> (Müll.Arg.)	Hilale	0.4	Stems	Cough, Stomach ache	Take the stems of <i>B. oblongifolia</i> , wash and for making cough concoctions and stomach aches, the ingredients are drunk. When taking this plant, don't let the body fall on the plant	Not yet available
	<i>Breynia</i> sp.	Hilale	0.8	Leaf	Cough, Tumor/Cancer, heart disease, malaria	Take the leaf of <i>Breynia</i> sp, wash, chew, swallow the water and pulp used as often as possible until the cough heals. When taking this plant, don't let the body fall on the plant.	Not yet available
	<i>Phyllanthus niruri</i> L.	Pae-pae	0.2	Herbs	Appendicitis	Take all parts of the plant <i>P. niruri</i> except roots, clean, boil with enough water, chill and drink three times a day.	Acute oral toxicity test showed the given of aqueous extract more than 2500 mg/kg bb elevated urea serum level of mice (Singh et al. 2016)
	<i>Phyllanthus urinaria</i> L.	Evo bokori	0.2	Herbs	Pre and postpartum treatments	Take <i>P. urinary</i> herbs, wash, add hot water, stir, strain and drink to the mother after giving birth.	<i>P. urinaria</i> extracts showed to inhibit glucose diffusion across the plasma membrane into blood vessels (Du et al. 2018)
Piperaceae	<i>Peperomia pellucida</i> (L.) Kunth	Evo mongura	0.2	Herbs	Tumor/Cancer	Take <i>P. pellucida</i> herbs, clean, boil with three cups of water, bring to the boil until the remaining 1.5 cups, cool and drink three times a day.	Ethanol extract of <i>P. pellucida</i> leaves had depressant effect on mice (Khan et al. 2008)
	<i>Piper betle</i> L.	Levenseua	1.0	Leaf	Tumor/Cancer, Fertility disorder, Sore eyes, heart disease, malaria	Take <i>P. betle</i> leaf, <i>L. coromandelica</i> stems and roots of <i>A. catechu</i> , wash, cut into smaller pieces, boil all ingredients with enough water to boil, cool and drink. Other ways to use the leaf of <i>P. betle</i> , clean, mash, place it on a plate and add water, for the treatment of the eyes soaked into the liquid (plate) and open, soak for about 5 minutes.	<i>P. betle</i> ethanol extract showed no toxicity against brine shrimps (Sequete et al. 2016)
	<i>Piper nigrum</i> L.	Rica Jawa	0.6	Biji	Tumor/Cancer, Heart disease, Malaria	Take <i>P. nigrum</i> seeds, wash, mash, brew with hot water, strain, drink.	<i>P. nigrum</i> administration caused architectural distortions as evident in the kidneys, liver and testes (Omorodion and Ajanwachuku 2018)
	<i>Piper sarmentosum</i> Roxb.	Luasi	0.2	Leaf	Flu	Take leaf of <i>P. sarmentosum</i> and <i>C. longa</i> , mash until smooth, add a little water, the extract obtained is deposited into the nose.	
Poaceae	<i>Cymbopogon citratus</i> (DC.) Stapf	Loyale	0.8	Herbs	Pre and postpartum treatments, Tumor/Cancer, heart disease, malaria	Take as many as five <i>C. citratus</i> , one leaf of old <i>C. papaya</i> and three Rhizome of <i>C. longa</i> , wash all ingredients, boil, strain, chill, drink. When taking this plant, don't let the body fall on the plant.	Chemical fractions of <i>C. citratus</i> indicated to possess cytotoxic and genotoxic properties (Fuentes-Leon et al. 2017)
	<i>Imperata cylindrica</i> (L.) Rausch.	Alang-alang, le	0.4	Roots, herbs	Tonsillitis, Vitality disorders	Take <i>I. cylindrica</i> roots, clean it from the soil, boil with enough water, strain, cool, drink.	Aqueous extract of <i>I. cylindrica</i> does not cause acute and subchronic toxicities in rats (Chunlaratthanaphom et al. 2014)

	<i>Zea mays</i> L.	Jagung	0.2	Fruits	Anti-toxic	Take young <i>Z. Mays</i> fruits, grate, add a little water, drink once a day. The effect will be seen in usage of less than 1 week.	Corn silk extract provision up to dose 2000 mg/kg bw reported showing no abnormalities and toxicity signs (Ha et al. 2018)
Polygalaceae	<i>Polygala paniculata</i> L.	Evo bokori	0.4	Herbs	Tonsillitis, Pre and postpartum treatments	Take <i>P. paniculata</i> herbs, clean, boil with enough water, chill, drink 2 times a glass a day. Effects begin to appear on the use of the second day. You can also take one of the herbs <i>P. paniculata</i> , <i>C. longa</i> rhizome as many as 3 segments or more, then grated. Each plant is then cleaned and brewed with hot water.	<i>P. paniculata</i> hydroalcoholic extract produced an antidepressant-like effect (Bettio et al. 2011)
Polypodiaceae	<i>Drynaria quercifolia</i> (L.) J. Sm.	Kokapi	0.2	Others	Sore eyes	Take part in the white stem of <i>D. quercifolia</i> leaf, wash, grate, mix with a bowl of water, the water will be purplish, then the affected eye is immersed in the solution.	The methanol rhizome extract up to dose 2000 mg/kg bw found to be practically non-toxic (Padhy et al. 2017)
	<i>Phymatosorus scolopendria</i> (Burm. f.) Pic. Serm.	Kondovatu	0.2	Rhizome	Tumor/Cancer	Take the leaf of <i>C. aurantifolia</i> dry, clean, boil with enough water to boil, cool then drink.	Not yet available
Rubiaceae	<i>Morinda citrifolia</i> L.	Mengkudu, libonu	0.4	Leaf, cortex	Vitality disorder, Fever	Take the leaf of <i>M. citrifolia</i> , cleaned and immediately placed on the child's body. The frequency of usage depends on the level of leaf wilt. If the leaf got wilt, then replaced immediately with the new leaf until the child's heat drops. Another way is to boil leaf with enough water and drink 2 cups a day.	Methanol leaves extract up to dose 2000 mg/kg bw for 28 days showed no significant changes in body weight, hematological and biochemical parameters (Nagarjuna et al. 2015)
Rutaceae	<i>Citrus aurantiifolia</i> (Christm.) Swingle	Susua ntomi	0.2	Leaf	Tumor/Cancer	Take the dry eaves of <i>C. aurantifolia</i> , clean, boil with enough water, wait until cold then drink.	Root aqueous extract administration up to dose 1200 mg/kg bw/day for 90 days exhibited no signs of abnormalities (Chunlaratthanaphorn et al. 2007)
Solanaceae	<i>Physalis peruviana</i> L.	Bengki-bengki	0.2	Herbs	Hypertension	Take <i>P. peruviana</i> herbs, clean, boil with enough water, drink twice a day in the morning and evening.	Lyophilized fruit juice of <i>P. peruviana</i> was known to induce cardiac toxicity only at high doses and in male gender (Perk et al. 2013)
Urticaceae	<i>Laportea interrupta</i> (L.) Chew	Karu karu mansi	0.2	Stems	Fever	Take <i>L. interrupta</i> leaf, clean, brew with hot water and drink the water. When taking this plant, don't let our bodies fall on the plant.	The ethanol extract of <i>Laportea</i> sp. showed toxicity against BSLT with LC50 as of 285 µg/mL (Simaremare et al. 2018)
Verbenaceae	<i>Lantana camara</i> L.	Katange	0.2	Leaf	Hypertension	Take <i>L. camara</i> and chlorophyll leaf, clean, boil with enough water, chill and drink one glass three times a day	Root extract was shown to have more toxic effect in comparison with other plant parts of <i>L. camara</i> (Pour and Sasidharan 2011)

	<i>Stachytarpheta jamaicensis</i> (L.) Vahl	Kambabula	0.2	Leaf	Wounds healing	Take the leaf of <i>S. jamaicensis</i> , wash, squeeze the leaf using hands and attach them directly to the injured part.	Leaves powder up to dose 75 g/kg bw caused mild histopathological lesion of kidney, liver and lung (JE et al. 2006)
Vitaceae	<i>Cissus verticillata</i> (L.) Nicolson & C.E.Jarvis	Terevu	0.2	Leaf	Appetite booster	Take leaf of <i>C. verticillata</i> , mix with leaf of <i>C. asiaticum</i> . All ingredients are finely grounded and distributed to the child's body after bathing twice a day.	Hydroalcoholic <i>Cissus</i> sp. leaves extract up to dose of 40.5 mg/kg bw of chronic toxicity showed reversible increase in albumin, erythrocytes, and hemoglobin of Wistar rats (Diniz et al. 2018)
	<i>Leea indica</i> (Burm.f.) Merr.	Ule mali	0.4	Leaf	Antidiabetic, Wounds healing	Take leaf of <i>L. indica</i> and Rhizome <i>C. longa</i> , cleaned, mashed until smooth, apply to the wound.	Leaf ethanol extract showed cytotoxic compared to vincristine sulfate (Rahman et al. 2013)
Zingiberaceae	<i>Alpinia galanga</i> (L.) Willd.	Lo'ia, liku	0.4	Rhizome	Low back pain, Pre and postpartum treatments	Take the <i>A. galanga</i> rhizome, cleaned, mashed, take the juice, add the chicken egg yolk, sugar and honey, stir and ready to drink once a day. The effect will be seen on day 2.	Intraperitoneal administration of hexane extract dose of 2000 mg/kg bw was highly toxic against Wistar rats (Karunarathne et al. 2018)
	<i>Curcuma longa</i> L.	Kunyit, kuni bula	1.6	Rhizome	Antidiabetic, Pre and postpartum treatments, Flu	Take the <i>C. longa</i> rhizome, clean it, grate it, mix it with <i>L.indica</i> leaf, boil with water and drink it every day for 40 days after giving birth. When taking this plant, don't let our bodies fall on the plant.	Six months provision of 2,5 and 5 gr/kg bw/day turmeric implied on body weight, food consumption, clinical signs, blood chemistry, hematological and histopathological changes (Sittisomwong et al. n.d.)
	<i>Zingiber officinale</i> Roscoe	Lo'iale, lo'ia	0.6	Herbs, rhizome	Stroke, Paralyzed, Vitality disorders	Take the leaf of an old <i>Z. officinale</i> , cut it into smaller parts, grow smooth, brew with hot water, drink after it has cooled.	Long-term use of root oil extract indicate to cause some unexpected adverse event like oxidative stress (Idang et al. 2019)
	<i>Zingiber zerumbet</i> (L.) Roscoe ex Sm.	Bangule	0.2	Rhizome	Skin disease	Take the <i>Z. zerumbet</i> rhizome, clean it, grate and apply to the skin. When taking this plant, don't let our body fall on the plant.	Rhizome ethanol extract use for 28 days showing no toxicity signs on Wistar rats (Chang et al. 2012)

Traditional healers utilized the cortex and other parts of *A. scholaris* for treating fever, tumor/cancer, fertility disorder, cosmetics, heart disease, and malaria with peroral route of administration. For *T. catappa*, almost all plant parts (leaf, fruits, cortex, root) were used for treating such conditions as anti-toxic, wounds healing and solving skin disease with vary of provision ways. While *P. betle* was generally collected its leaves in order to resolve cases of tumor/cancer, fertility disorder, sore eyes, heart disease as well as malaria. *Z. zerumbet*, *C. verticillata*, *D. quercifolia*, *Z. mays*, and some other species exhibited to have the lowest of use-value as of 0.2. The species revealing the higher index of use-value means having a greater potency for utilizing by communities (Mayo et al. 2015).

Table 1 show that there are many plants used for only one indicator and the other plants utilized to overcome some symptoms of the disease. The percentage ratio between the single and multiple usage plants was slightly different, whereas 52 of 89 species of plants were used by traditional healers to treat one type of ailment while the remains plants revealed more than one indication.

### The treated diseases

The phytotherapy traditional knowledge of this ethnic provides excellent results in the treatment of 37 different types of ailments and diseases in humans (Table 1). The choice of therapy was influenced by educational level and having health insurance (health insurance does not cover traditional treatment). The main reasons for attending a traditional healer were linked to educational level, the type of dwelling and the patients residence place (Agbor and Naidoo 2016). These ailments were complained of by the patients, the diagnosis was made by traditional healers and submitted treatment solutions to traditional healers in the To Manui ethnic. Of all the types of diseases, it is known as many as ten types of diseases that are the most common and most widely complained by patients including tumor/cancer, pre, and postpartum treatments, fever, vitality disorder, skin disorder, diabetes, lack of appetite, colds, wounds and other disease groups as shown in Figure 4.

### Discussion

This study demonstrated the importance of well documenting of indigenous local knowledge on medicinal plants and traditional medicine utilized and locally distributed in Central Sulawesi Province especially in To Manui ethnic. Medicinal plants are vital source to combat human diseases and play an important role in healing many serious diseases all over the world due to the presence of active phytochemical compounds (Sharma 2017). The utilization of traditional medicine tends to be more profitable because it is relatively more easily available, cheaper and the raw material can be planted in the yard both for decorate garden and healing usage (Tambaru 2016).

From 89 species of medicinal plants used by traditional healers in To Manui ethnic and relevance with previous research (Subositi and Wahyono 2019), it was reported whether *Curcuma longa* L is the most widely used

medicinal plant and has the highest use value index (1.6) (as shown in Figure 1 and Table 1). The species with the highest use value index are actually great importance to the local communities in the case of native species and also very pivotal to be one of the considerations in local biological conservation strategies (Mayo et al. 2015). *C. longa* is used by traditional healers in To Manui ethnic to treat various symptoms/diseases such as diabetes, pre, and post-natal care and flu/colds. Curcumin contained in *C. longa* and most species of the Zingiberaceae family are the main components responsible for various pharmacological effects including antidiabetic, anticancer, anti-inflammatory, antimicrobial, antifungal, anti-HIV and as hepato- and nephroprotector (Kurapati and Samikkannu 2012; Ayyadurai et al. 2013; Rafieian-Kopaei et al. 2014; Hamidpour et al. n.d.; Schmidt et al. 2015; Shukla et al. 2016). Olatunde et al. (2014) reported oral administration of water extract *C. longa* 200 mg/kg bw for 28 days had an antihyperglycemic effect in diabetic rats induced by alloxan. The rhizome of *C. longa* positively exhibited the mechanism of maintaining blood glucose levels of alloxan-induced hyperglycemic rats (Aizman et al. 2014). When compared to water and n-hexane extract, the provision of *C. longa* methanol extract at dose of 400 mg/kg bw for 28 days revealed a higher hypoglycemic effect (Mohammed 2017). A decrease in blood sugar levels after administration of curcumin may be caused by a lowering in the rate of absorption of carbohydrates due to the Na<sup>+</sup> glucose co-transporter. The activation of Na<sup>+</sup> glucose co-transporter may result in an increase in glucose absorption rate of hyperglycemic rats compared to the normal one (Aizman et al. 2014).

The most frequently used plant parts for treatment by traditional healers in To Manui ethnic is leaf followed by herbaceous parts and rhizome, while flower is recognized as the least common used plant part. This result is in agreement with the previous study conducted by (Dhal et al. 2015) whereas leaf, root, bark, herbaceous parts and seed are the five highest utilization parts of plants by traditional healers and people in Odisha, India. A similar result was also reported by Karthiyayini 2012; Mabel et al. 2016; Sambara et al. 2016; Mustofa and Rahmawati 2018; Town 2018) in which leaf was the highest frequently plant part used. When compared to other plant parts, leaf is the easiest part to obtain and to be managed (Sambara et al. 2016). Leaf becomes the accumulation place of organic compounds of photosynthesis which has the possibility of curing a disease (Tambaru et al. 2016). However, (Ngarivhume et al. 2015) reported that root and bark were the most widely used plant part by healers in Zimbabwe, especially for treatment and prevention of malaria. Nevertheless, the use of both types of plant parts in a sustainable manner will disrupt the survival of the plant itself.

A tumor/cancer was reported as the most frequent disease treated by traditional healers in To Menui ethnic. In this current study, tumor/ cancer is defined as abnormal lumps in the body characterized by solid consistency and has possibility to develop into malignancy. In modern medicine, cancer is defined as a group of diseases

characterized by the uncontrolled growth and spread of abnormal cells which can result in death (Anon 2018a). The latest World Health Organization data showed there were 18.1 million new cases and 9.6 million deaths caused by cancer whereas lung cancer, breast cancer, and colorectal cancer were the major cancer types among 2018. World cancer prevalence for the last five years (2014-2018) estimated at 43.8 million (Anon 2018). Different data came from the Health Department of Morowali District whereas diarrhea was reported as the most common disease in Menui Islands among 2017 with the case number of 369 (Anon 2018). Some medicinal plants are reported to have antidiarrheal activity, one of them is *Curcuma longa* L. It has a correlation with this current research whereas *C. longa* was declared as the most widely medicinal plant used by traditional healers in To Manui ethnic. Previous research showed aqueous extracts of *C. longa* with a dose of 1000 mg/kg bw indicated to have potent antidiarrhoeal activity compared to standard drug and proven to have no toxic effect (Krishna et al. 2019).

Among fifty families documented from this present study, Asteraceae (formerly called Compositae) is the most prominent plant family used by traditional healers in To Manui ethnic. (Megersa et al. 2019) also reported Asteraceae as the leading family followed by Fabaceae on treating toothache in Ethiopia. This is slightly different from the study results conducted by (Yulia et al. 2017) in which Lamiaceae was determined as the most widely plant family used by the Topo Uma ethnic group in Sigi District, Central Sulawesi. On the other hand, another study highlighted whether Fabaceae was the most abundant family in Kurdistan, Iraq (Ahmed 2016). Sciences et al. (2008) mentioned several genera such as Aster, Helianthus, Chrysanthemum and Tagetes from Asteraceae family were potential to be developed as a source of medicinal ingredients. *A. conyzoides* (UV= 0.4), one of Asteraceae family species was the most frequently used by traditional healers in To Manui ethnic to treat fever, flu, and colds. (Masudur et al. 2013) reported *A. conyzoides* was exhibited to have antioxidant and analgesic activity. All plant parts of *A. conyzoides* reported containing alkaloid, flavonoids, saponins, chalcones, tannins, saponins and phenols compounds (Amadi et al. 2012). Antioxidant activity of a plant is correlated with its flavonoids content, types of flavonoids, chemical structures and OH functional groups position of in these molecules. Many flavonoids are the active components of medicinal plants which show any pharmacological activities (Ogbalu and Williams 2014). The ability of proton or electron donors to free radicals, chelating ions, inhibition of free radical-forming enzymes, interactions with mitochondria and changes in gene expression are some factors affecting the antioxidant activity of a compound (Bessada et al. 2015).

The conservation status of all species documented was examined at The IUCN Red List of Threatened Species and it was known that *Alstonia scholaris* (L.) R. Br. is the only species included in the list with the least concern or lower risk category (LC/ LR/ Ic). With the main chemical compositions of alkaloids, iridoids, coumarin, flavonoids, saponins, tannins, steroids, phenols and leukoantosians, *A.*

*scholaris*. reported to have various pharmacological activities such as antidiabetic, anti hyperlipidemia, antibacterial, antioxidant, anticancer, anti-inflammatory, analgesic, immunostimulant, antitussive, anti-inflammatory, hepatoprotective, antidepressant and antidiarrheal (Pankti et al. 2012; Wang et al. 2017). With the current LC/LR/Ic conservation status, it is necessary to regulate and limit the exploration and exploitation of *A. scholaris* for preventing conservation status increase to near threatened or even become vulnerable. Moreover, Large-scale exploitation of a plant without being balanced with any cultivation and conservation programs will just remain several problems related to the sustainability and availability of these plants (Sharma 2017).

In conclusion, the large number of medicinal plants cited by traditional healers showed valuable local knowledge in To Manui ethnic. The results showed that 89 species of medicinal plants distributed in 50 families and 80 genera had been utilized by traditional healers in To Manui ethnic for therapeutic uses to treating 37 types of ailments and diseases whereas tumor/cancer (13.02%) was the most commonly treated. The most widely used medicinal plant by traditional healers was *C. longa* with the use-value index as of 1.6 and the percentage of use as of 5.41%. Leaf (54.1%) was recognized as the most widely used plant part by traditional healers. Asteraceae, Acanthaceae, Anacardiaceae, Euphorbiaceae, Apocynaceae, Arecaceae, Bignoniaceae, Cyperaceae, Davalliaceae, and Lamiaceae were reported to be the ten leading families of plants used by traditional healers. Further investigations on determining the chemical compositions and proving any pharmacological activities of each species need to be programmed in order to provide the scientific database as an alternative for developing safe and effective new therapeutic agents.

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