

Ethnobotanical Study and Medicinal Plant Bioprospecting in Tamiang Tribal Community, Aceh

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ABSTRACT

Each tribe has a tradition of ethnobotanical plant utilization and management, one of which is the Tamiang tribe. The community realizes the potential of plant utilization, thus creating considerable economic opportunities for bioprospection. This study used the Participatory Rural Appraisal (PRA) method to collect data by actively involving the community. Semi-structured interview techniques were conducted to explore ethnobotanical information from the Tamiang tribe. From the results of the Slovin analysis, 600 respondents with an age range of 35 to 94 years were obtained. Snowball sampling was used to select respondents. Determination of Sub-district locations selected six Sub-districts from 12 Sub-districts by purposive sampling with the largest number of Tamiang Tribe. The results showed that there were 225 species from 74 families used by the Tamiang people in treating various diseases. The most commonly cured diseases are fever, diabetes, and hypertension. *Tagetes erecta* is the most widely recognized medicinal plant species with a relative citation frequency index of 1.00. At the same time, *Andrographis elongata* is the most frequently used medicinal plant by the local community with a use value index of 1.00. In addition, local people identified the leaf organ (60.89%) as the most commonly used part of the plant, while decoction (58.20%) was the most popular method of administering traditional medicine. Both species of *Andrographis elongata* and *Moringa oleifera* have the potential to treat diabetes and hypertension as seen from the highest ICS value as prospective plants in the utilization and management of medicinal plants, so they can be developed as raw materials for herbal medicine.

Keywords: Bioprospection, Ethnobotany, Malay Tribe, Snowball

INTRODUCTION

Indonesia has natural resources with a very high level of plant biodiversity, estimated to have around 30,000 to 40,000 species of seed plants, with diverse potential (Heyne, 1987; Mulu et al., 2020). There are 6,000 species used as traditional medicines. However, about

20-22% are cultivated, while 78% are of natural origin (Azmin *et al.*, 2019). Each tribe has different traditions related to how they utilize and manage plant species diversity empirically (Walujo, 2011; Husna *et al.*, 2022). These traditions reflect ethnobotanical studies and community knowledge in utilizing plant natural resources for cultural and sustainability purposes (Luković *et al.*, 2023). In addition to treatment, it can also increase the economic income of the local community (Wibisono *et al.*, 2020; Simamora *et al.*, 2023). The utilization of various plant species is known as ethnobotany (Gunarti *et al.*, 2021; Sitanggang *et al.*, 2022). The use of medicinal plants to treat various diseases can be a promising method for creating effective new drugs (Bhattacharjya *et al.*, 2023; Long *et al.*, 2023). Ethnobotanical research has been conducted in the Aceh Tamiang region, the results of which show that there are 30 species of medicinal plants in Rantau Regency (Rupa *et al.*, 2020), 46 species of medicinal plants in Sekerak Regency (Navia *et al.*, 2021), 60 species of medicinal plants in Banai Karang Baru Village (Nufus *et al.*, 2022), and 20 species of medicinal plants in Tangsi Lama Village, Seruway Regency (Junaidi *et al.*, 2023).

Bioprospection is the process of exploration, extraction, and selection of biological resources, including the commercial utilization of biochemicals and their derivatives (Reid *et al.*, 1993; Riyadi, 2008). If applied correctly, bioprospection can generate income while preserving the biodiversity of plant species that are valuable to the surrounding community (Daya *et al.*, 2020). The potential for plant bioprospection in Aceh Tamiang Regency has considerable opportunities (Zakariya *et al.*, 2020; User *et al.*, 2022). Therefore, researchers are interested in presenting more comprehensive documentation of the knowledge and local wisdom of the Tamiang people regarding the use of various types of plants in their daily lives, as well as exploring the potential for bioprospection of medicinal plants that has never been done before. Documenting traditional knowledge about traditional medicinal plants is an important step to obtaining new information, such as bioactive compounds, to develop medicines (Abebe, 1998; Tahir *et al.*, 2023). This research is expected to be a reference for the development of plant biological resources, especially as the main raw material for medicines.

METHODS

Study Area

This research was conducted from July to August 2023. Data were collected in six sub-districts, namely Rantau, Bendahara, Sekerak, Seruway, Tamiang Hulu, and Tenggulun as attached in the research location map (Figure 1). Aceh Tamiang Regency, Aceh Province, is geographically located between 4°20'54.8" N and 98°03'47.5" E. In addition to its position bridging Aceh and North Sumatra Provinces, Aceh Tamiang Regency is a coastal area with a very strategic location (Fahriati, 2019; Fariadi *et al.*, 2023). The district has a humid tropical climate with an average temperature of 29°C and average rainfall ranging from 353 mm to 3,660 mm.

Data Collection

In this research, ethnobotanical studies were conducted to collect data by actively involving the community through PRA (Participatory Rural Appraisal), a method that describes community participation in ethnobotanical studies (Chambers, 1994) through a pre-prepared semi-structured interview technique (Martin, 1998; Nufus, 2022). If needed, follow-

up questions were asked to obtain additional data during the interview. Any data obtained from respondents was collected, recorded, and transcribed. Interviews were conducted with people from different empirical knowledge backgrounds and different cultures using Malay and Bahasa Indonesia.

$$n = \frac{N}{1 + (e)^2}$$

Where 1 is the probability of an event occurring, N is the total population, e is the level of area precision, and n is the sample size representative.

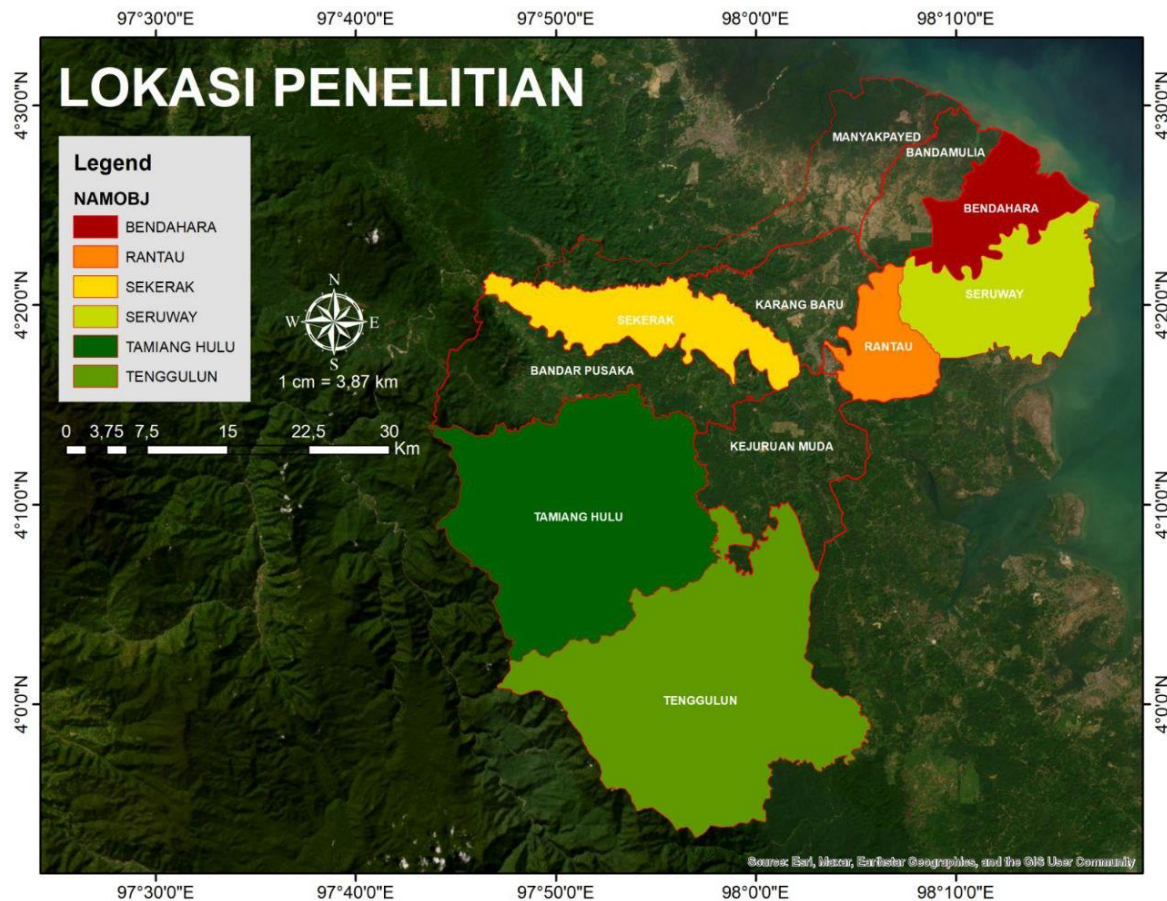


Figure 1. Study area

Determination of respondents through snowball sampling method in ethnobotanical studies (Sugiyono, 2008; Chan, 2020). The criteria used in the respondent group were Tamiang people who knew the types of plants and the utilization of efficacious plants. Traditional leaders, shamans, or medics as informants of medicinal plants and housewives who were 34 years old became respondents (Martin, 1995; Silalahi, 2020). The Slovin method is used to determine the sample size (Umar, 2000). The use of the Slovin method has a probability of error of 1% a minimum variability or margin of error of 5% (0.05) and a maximum of 10% (0.1) (Adam, 2020; Kotrilik *et al.*, 2001). The data obtained showed that the population of the Tamiang people used in this study was 600 respondents consisting of 356 men and 244 women who provided information on the traditional use of plants based on family cards (KK) in each sub-district. The margin of error was 10%, resulting in 100 respondents per Sub-district. Each Sub-district was divided into four villages, with 25 respondents per village, and an age range of 35 to 94 years.

The determination of the research location was carried out by purposive sampling and six Sub-districts from 12 Sub-districts in Aceh Tamiang Regency were determined as the research location. Plant specimen collection was conducted at the Herbarium Laboratory of Syiah Kuala University. Two reference books were used for plant identification: *Tree Flora of Sumatra* (Withmore *et al.*, 1986) and *Flora Malesiana* (Steenis, 1974).

Data Analysis

In evaluating the usefulness value of a plant species, the UV formula value that has been obtained through research on the use of the usefulness value of a plant is determined (Phillips *et al.*, 1994; Thomas *et al.*, 2009; Vitalini *et al.*, 2013; Zoubi *et al.*, 2022).

$$UV = \frac{\sum U_i}{N}$$

Where: UV represents the use value of a given species, U_i = the number of uses each informant mentions for a given species, and n represents the total number of informants. A plant with a "High score" of UV (1) has high reports of use and is significant to the neighborhood. "Low score": (0) UV denotes a low number of usage reports.

RFC is an index of how much a species is valued by the local community (Tardo and Pardo-de-Santayana 2008; Barkaoui *et al.*, 2023).

$$RFC = \frac{FC}{N}$$

Where: F_c is the number of informants who mention using a particular species, N = each informant. RFC's value ranges from 0 to 1, where a value of 0 indicates that no one is aware of the plant's uses and a value of 1 indicates that everyone is aware of them.

The worth of the plant species utilized by the community was ascertained by the quantitative data collection and analysis of the Index of Cultural Relevance (ICS), which calculates the index value of cultural relevance. The following formula was used to calculate the ICS:

$$ICS = \sum_i^n (q_1 \times i_1 \times e_1)n_1 + (q_1 \times i_1 \times e_1)n_2 \dots + (q_1 \times i_1 \times e_1)n$$

The values of ICS range from 1 to n , where n is the final usage that has been mentioned; the subscript n represents the values 1 through n in order. According to Turner (1988), q stands for quality, i for intensity, and e for exclusivity for each usage specified.

RESULTS AND DISCUSSION

Demographics of the Informants

The results showed that the respondent group that contributed the most was respondents aged 35-44 years as many as 228 respondents (with 40 respondents working as farmers), while respondents aged more than 94 years were the least contributing age group, namely six respondents (with two respondents working as craftsmen) (Figure 2). Based on the number of respondent groups, the highest male gender, 90 respondents, work as farmers, while the highest female gender, 50 respondents, work as housewives (Figure 3).

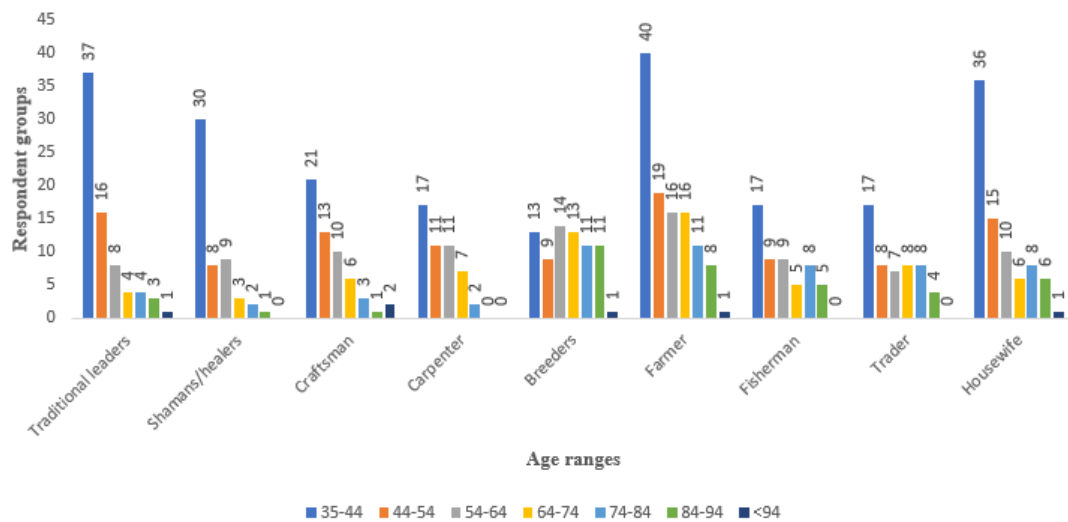


Figure 2. Respondent groups by age level

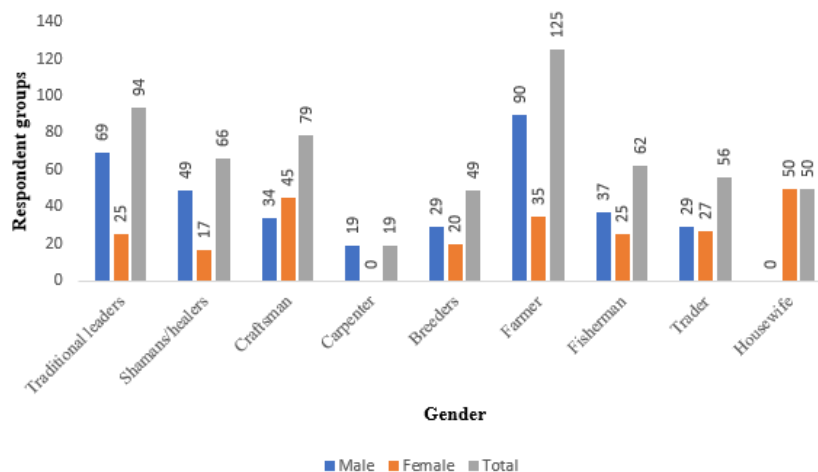


Figure 3. Respondent gender groups

Growth Form and Plant Parts Used

The majority (60.89%) of Tamiang people utilize leaf organs in traditional medicine as seen in (Figure 4). The community believes that leaf organs are also easy to find at any time in large enough quantities. The process of photosynthesis with high concentrations produces secondary metabolite compounds (Long *et al.*, 2023), so the utilization of leaf organs by the community in traditional medicine is appropriate. The leaves are also easy to process due to their soft structure compared to other parts of the plant and are continuously available and more commonly used by people to treat hereditary diseases (Nasution, 2023). Iskandar (2021) and Tantengco *et al.* (2018), reported that secondary metabolite compounds in the leaves are alkaloids, saponins, and phenolic compounds. The following is the percentage of plant organs used as medicine by the Tamiang people.

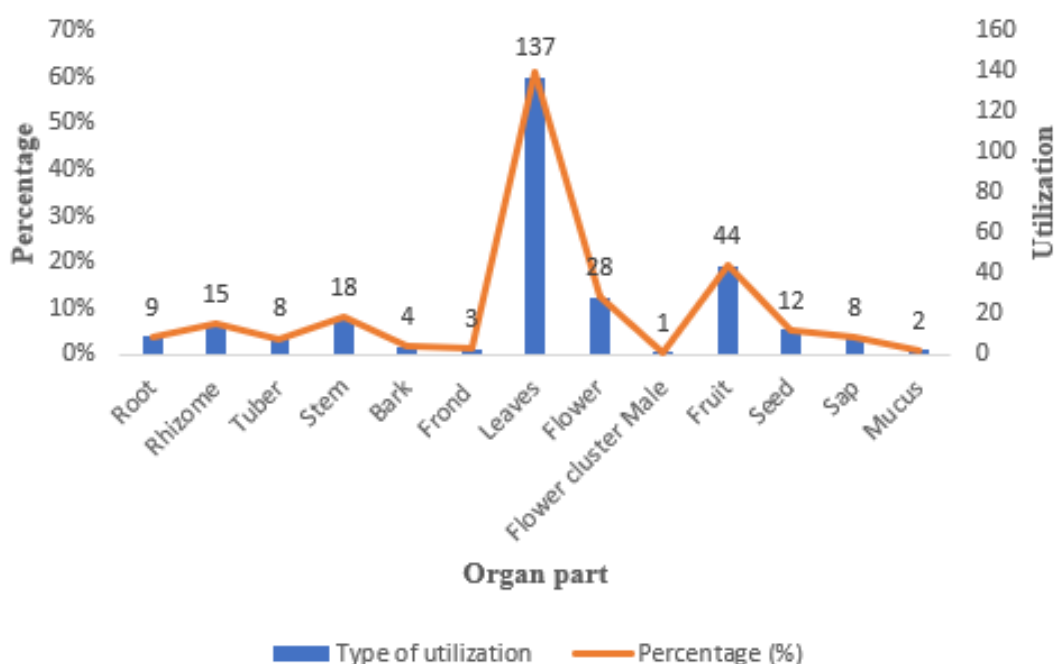


Figure 4. Parts of the plant were used as medicine by the Tamiang Tribe

Tamiang people have various ways to collect, prepare medicine, and make herbal medicine. The results obtained by the decoction method are the most popular method for producing traditional medicine from plant materials (58.20%). Other methods also used by the Tamiang community are pounding, grating, burning, and direct picking (eating or drinking) (Figure 5). Boiling the leaves before drinking is a common habit of the Tamiang people, to improve the taste of medicinal plants and make it easier for the body to absorb herbal medicines. In Olele Village, the processing of medicinal plants used by the community is dominated by boiling techniques (Sahada, 2022). According to Elfrida *et al.* (2021) and Pham *et al.* (2020), the boiling method is considered the best way to process herbal medicines and is often used by other ethnic groups around the world. As in the Malay tribe in Lingga Regency, Riau Islands, it is known that they prefer processing medicinal plants by boiling, soaking, pounding, brewing, squeezing, and without processing (Qasrin *et al.*, 2020). Based on empirical knowledge of the bitter taste of *Andrographis elongata*, which is good for diabetics and appendicitis and neutralizes blood sugar levels, the Tamiang community uses it as a diabetes medicine. Research in line with *A. elongata* can lower elevated glucose levels

by 41.51 and 41.82% in glucose-loaded rats as compared to the corresponding diabetic control rats (Sivanathan and Elamaran, 2013).

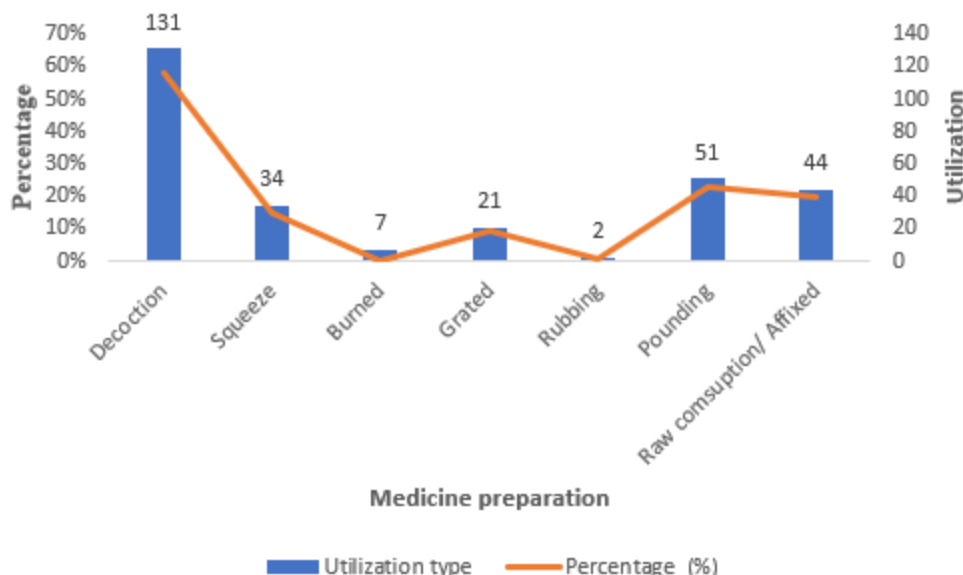


Figure 5. Preparation methods used in medicine making by the Tamiang Tribe

The Tamiang people have a habit of making polyherbal herbal medicine with medicinal plants boiled first before mixing. All the ingredients contained in *jamu* easily dissolve into water during the boiling process. Various types of *jamu* are made into herbal drinks useful for treating vaginal discharge, menstrual irregularities, postpartum wound healing, aches, and uterine tract diseases in women. The majority of plant species found in Tamiang are used either as herbs or polyherbally with other species. For example, *Justicia gendarussa* leaves are pounded and applied to the body to relieve pinched nerves in the waist, and *Sida rhombifolia* and *Rhodocactus sacharosa* are combined and drunk to treat gout.

Tamiang people have used the leaf organs of *Moringa oleifera* species as food, animal feed, rituals, as a treatment for diabetes, and hypertension, and appetite enhancer to reduce stunting. The leaf organs can improve blood sugar levels, minerals, and vitamins, counteract free radicals, support the immune system, and help overcome malnutrition (Magtalas *et al.*, 2023). The medical potential of this plant is based on the presence of secondary metabolite activities such as antioxidant, antibacterial, and antipyretic from phytochemicals. *Moringa oleifera* has been reported as a good source of nutrients and natural organic health supplements that can be used in various medicinal methods (Agesti *et al.*, 2023; Tripathi and Kumar, 2016). According to Gopalakrishnan *et al.* (2016), *M. oleifera* is rich in phytosterols such as stigmasterol, sitosterol, and campesterol, which are hormone precursors and are often prescribed to nursing mothers to increase breast milk supply.

Table 1. List of indigenous medicinal plants used by the people of the Tamiang Tribe

Family	Scientific name	Used part	Common name	UV	RFC	ICS
Acanthaceae	<i>Andrographis elongata</i> (Vahl) T. Anderson	L	Fever, typhoid, diabetes, pneumonia, diarrhea, ispa, cancer, appendicitis, tinea color version	0.98	0.95	126
	<i>Justicia gendarussa</i> Burm.f.	L	Pinched nerves	0.32	0.11	12
	<i>Ruellia simplex</i> C. Wright	L	Diabetic, hemorrhoids	0.07	0.26	27
	<i>Strobilanthes phyllostachya</i> Kurz	L	Diabetes, kidney stones	0.55	0.09	33

Acoraceae	<i>Acorus calamus</i> L.	Rh	Burns	0.11	0.02	12
Alismataceae	<i>Aquarius palifolius</i> (Nees & Mart.) Christenh. & Byng	F	Catch a cold	0.13	0.13	9
	<i>Jasminum sambac</i> (L.) Aiton	L.F	Thrush	0.06	0.05	15
Amaranthaceae	<i>Amaranthus spinosus</i> L.	L	Diabetic, dysentery	0.15	0.11	3
	<i>Beta vulgaris</i> L.	T	Diabetic, antianemia	0.33	0.29	24
	<i>Celosia argentea</i> L.	L	Asthma, TBC	0.09	0.07	9
	<i>Gomphrena globosa</i> L.	F	Fever, cough, asthma	0.13	0.10	15
Amaryllidaceae	<i>Allium cepa</i> L.	T	Catch a cold	0.93	0.39	30
	<i>Allium fistulosum</i> L.	L	Anticancer	0.14	0.11	18
	<i>Allium sativum</i> L.	T	Catch a cold, gastric, heart disease, cholesterol	0.57	0.28	24
Anacardiaceae	<i>Crinum asiaticum</i> L.	L	Fracture	0.23	0.18	12
	<i>Spondias dulcis</i> Parkinson	Fr. L	Postpartum steam bath, heart, chronic cough	0.19	0.17	18
Annonaceae	<i>Annona muricata</i> L.	L.Fr	Hypertension, diabetic, cancer, prostate, cholesterol-lowering	0.66	0.55	30
	<i>Annona squamosa</i> L.	L.Fr	Hypertension, diabetic, cholesterol-lowering	0.94	0.78	30
	<i>Cananga odorata</i> (Lam.) Hook. f. & Thomson.	F	Body odor	0.16	0.13	15
Apiaceae	<i>Anethum graveolens</i> L.	L	Getting breast milk flowing, Cough	0.15	0.14	21
	<i>Apium graveolens</i> L.	L.St	Rheumatic, cholesterol, hypertension	0.72	0.58	42
	<i>Centella asiatica</i> (L.) Urb.	L	Itchy wounds, acne relief, varicose veins, hypertension	0.26	0.25	12
	<i>Coriandrum sativum</i> L.	S	Hypertension	0.29	0.3	24
Apocynaceae	<i>Daucus carota</i> L.	T	Eye	0.62	0.39	39
	<i>Allamanda cathartica</i> L.	L	Liver, ulcers, swelling skin	0.23	0.23	54
	<i>Catharanthus roseus</i> (L.) G.Don	L	Anti-cancer, diabetic Cholesterol	0.15	0.07	16.5
Araceae	<i>Alocasia indica</i> (Lour.) Spach	St	Constipation	0.09	0.10	12
	<i>Alocasia macrorrhizos</i> (L.) G.Don	St	Constipation	0.07	0.06	3
	<i>Colocasia esculenta</i> (L.) Schott	St	Prevent osteoporosis	0.06	0.05	9
	<i>Panax ginseng</i> C.A.Mey.	Rh	Diabetic, colds, erections	0.99	0.82	51
Araliaceae	<i>Polyscias scutellaria</i> (Burm.f.) Fosberg	L	Wound	0.97	0.90	9
	<i>Areca catechu</i> L.	Fr	Stomach ulcer, tooth strengtheners, stamina booster, worms	0.13	0.12	24
Arecaceae	<i>Arenga pinnata</i> (Wurmb) Merr.	F.Fr	Back pain, diabetic	0.84	0.79	42
	<i>Cocos nucifera</i> L.	Fr	Cholesterol, diabetes, immune booster, chickenpox, constipation	0.86	0.86	87
	<i>Nypa fruticans</i> Wurmb	Fr	Antidiabetic	0.43	0.26	39
	<i>Cordyline fruticosa</i> (L.) A.Chev.	R.St.L	Hemorrhoids, TBC, bloody pee, gum inflammation, animal bite	0.76	0.36	108
Asparagaceae	<i>Dracaena angustifolia</i> (Medik.) Roxb.	L	menstrual pain, allergy	0.08	0.06	33
	<i>Aloe vera</i> (L.) Burm. f.	M	Fever, constipation scar remover, ringworm, hair loss treatment	0.31	0.30	30
Asteraceae	<i>Acmella uliginosa</i> (Sw.) Cass.	F	Tooth ache	0.06	0.05	3
	<i>Ageratum conyzoides</i> L.	L	Stomach ache, headache, wound	0.18	0.16	16.5
	<i>Bidens pilosa</i> L.	L.St	Vomiting of blood, TBC, cataract	0.35	0.25	45

	<i>Chromolaena odorata</i> (L.) R.M.King & H.Rob.	L	Skin irritation wounds	0.05	0.06	6
	<i>Cosmos caudatus</i> Kunth	L	Appetite enhancer, wound healing	0.21	0.13	9
	<i>Crassocephalum crepidioides</i> (Benth.) S.Moore	L	Wound cleanser	0.07	0.07	18
	<i>Cyanthillium cinereum</i> (L.) H.Rob.	R.St.L	Ulcers, snakebite bruises	0.09	0.05	12
	<i>Elephantopus scaber</i> L.	R.St.L	Hepatitis, diabetic	0.63	0.47	30
	<i>Emilia sonchifolia</i> (L.) DC.	L	Ear pain	0.29	0.20	33
	<i>Gynura procumbens</i> (Lour.) Merr.	L	Diabetic, animal bite	0.29	0.16	30
	<i>Pluchea indica</i> (L.) Less.	L	Catch a cold	0.8	0.76	30
	<i>Sonchus arvensis</i> L.	L	Kidney stones	0.12	0.09	12
	<i>Synedrella nodiflora</i> (L.) Gaertn	L	Rheumatism, stomach ache	0.26	0.24	39
	<i>Tagetes erecta</i> L.	F.L	Catch a cold	1.00	1.00	30
	<i>Tithonia diversifolia</i> (Hemsl.) A.Gray	L	Stomach ache	0.06	0.05	9
Balsaminaceae	<i>Impatiens balsamina</i> L.	S.F	Irregular menstruation, nail polish	0.07	0.07	33
Basellaceae	<i>Anredera cordifolia</i> (Ten.) Steenis	L	Burns, acne, post-operative wound relief	0.97	0.95	78
Boraginaceae	<i>Heliotropium indicum</i> L.	L	Bladder stones, mumps, wet wound healer	0.29	0.15	27
Brassicaceae	<i>Brassica rapa</i> L.	Ba.L	Detox body, cholesterol	0.09	0.08	18
	<i>Raphanus raphanistrum</i> L.	T	Gout, stroke preventer	0.16	0.11	9
Bromeliaceae	<i>Ananas comosus</i> (L.) Merr.	Fr	Miscarriage, thrush, cholesterol lowering	0.39	0.37	30
Cactaceae	<i>Rhodocactus sacharosa</i> (Griseb.) Backeb.	L	Anticancer, antitumor, gout	1.00	1.00	84
Caesalpiniaceae	<i>Caesalpinia pulcherrima</i> (L.) Sw.	L	Resolve mouth ulcers, facilitate menstruation	0.07	0.11	15
Campanulaceae	<i>Hippobroma longiflora</i> (L.) G.Don	L.F	Cataracts, eye pain	0.54	0.53	42
Cannaceae	<i>Canna indica</i> L.	L.F	Hemorrhoid, hepatitis	0.11	0.06	12
Caricaceae	<i>Carica papaya</i> L.	L.Sa.F. Fr	Diabetic, warts, constipation breast milk facilitator	0.44	0.43	78
Cleomaceae	<i>Cleome rutidosperma</i> DC.	L	Ear pain	0.05	0.05	9
Clusiaceae	<i>Garcinia atroviridis</i> Griff. ex T.Anderson	L.Fr	Cough, hypertension, cholesterol reduction diabetes, obesity	0.96	0.97	54
Combretaceae	<i>Terminalia catappa</i> L.	L	Skin rash, tinea versicolor	0.28	0.16	12
	<i>Combretum indicum</i> (L.) DeFilipps	S	Worms	0.18	0.11	6
Commelinaceae	<i>Tradescantia pallida</i> (Rose) D.R.Hunt	L	Bronchitis, stop wound bleeding	0.13	0.13	21
Convolvulaceae	<i>Ipomoea batatas</i> (L.) Lam.	L	Boils, Fever	0.78	0.48	10.5
	<i>Ipomoea pes-caprae</i> (L.) R.Br.	L	Insect bite relief	0.10	0.09	24
	<i>Ipomoea quamoclit</i> L.	L	Boils, sore throat	0.15	0.10	12
Costaceae	<i>Hellenia speciosa</i> (J.Koenig) S.R.Dutta	L	Fever	0.07	0.11	12
Crassulaceae	<i>Kalanchoe pinnata</i> (Lam.) Pers.	M	Boils, Fever	0.79	0.37	42
Cucurbitaceae	<i>Benincasa hispida</i> (Thunb.) Cogn.	Fr	Typhus, diarrhea relief, pregnant program	1.00	1.00	30
	<i>Cucurbita moschata</i> Duchesne	L.Fr	Magh, fever, cholesterol	0.29	0.25	42
	<i>Cucurbita pepo</i> L.	L.Fr	Anemic, diabetic, magh	0.15	0.11	9
	<i>Cucumis sativus</i> L.	Fr	Hypertension	0.95	0.65	12
	<i>Lagenaria siceraria</i>	Fr	Typhus	0.31	0.14	12

	(Molina) Standl.						
	<i>Luffa acutangula</i>	S.L.Fr	Anemic, hives, prickly heat,	0.33	0.43	48	
	(L.) Roxb.		muscle pain, types				
	<i>Momordica charantia</i> L.	Fr	Diabetic, cholesterol relief	0.75	0.3	30	
Cyperaceae	<i>Sicyos edulis</i> Jacq.	Fr	Typhus	0.11	0.08	9	
	<i>Cyperus rotundus</i> L.	T.L	Wounds, bladder tract infections	0.07	0.07	21	
Euphorbiaceae	<i>Acalypha australis</i> L.	R.St.L	Malaria, gout, nosebleeds, vomiting of blood	0.56	0.54	33	
	<i>Acalypha hispida</i> Burm.f.	L.F	Dysentery, nosebleeds, burns	0.17	0.15	30	
	<i>Aleurites moluccanus</i> (L.) Willd.	Fr	Darken hair, eyebrow	0.58	0.46	30	
	<i>Codiaeum variegatum</i> (L.) Rumph. ex A.Juss.	L	Wound, stomach ache	0.08	0.06	12	
	<i>Equisetum hyemale</i> L.	Ba	Repair bones, teeth	0.05	0.05	9	
	<i>Euphorbia hirta</i> L.	L	Asthma, burns, boils	0.06	0.05	15	
	<i>Euphorbia tirucalli</i> L.	Sa	Fracture	0.06	0.06	24	
	<i>Excoecaria cochinchinensis</i> Lour.	L	Gallstones, urinary tract	0.09	0.09	12	
	<i>Jatropha curcas</i> L.	L.Sa	Colds, toothache	1.00	1.00	39	
Fabaceae	<i>Jatropha multifida</i> L.	Sa	Burns, herpes, thrush	0.10	0.08	16.5	
	<i>Abrus precatorius</i> L.	L	Thrush	0.08	0.06	6	
	<i>Archidendron pauciflorum</i> (Benth.) I.C. Nielsen	R	Diabetic	0.22	0.17	12	
	<i>Clitoria ternatea</i> L.	F	Eye pain, cholesterol, ulcers, diarrhea diabetes, asthma, cough	0.94	0.87	60	
	<i>Leucaena leucocephala</i> (Lam.) de Wit	Se	Worms	0.16	0.15	39	
	<i>Pachyrhizus erosus</i> (L.) Urb.	T	Obesity	0.09	0.09	9	
	<i>Parkia speciosa</i> Hassk.	Se.L	Chickenpox, itchy rashes	0.22	0.22	21	
	<i>Psophocarpus tetragonolobus</i> (L.) DC.	L	Eye pain ear pain, boils	0.20	0.20	30	
	<i>Saraca asoca</i> (Roxb.) W.J.de Wilde	F	Anemic, hemorrhoids, bruise	0.21	0.20	34.5	
	<i>Senna alata</i> (L.) Roxb.	L	Scabies, Treating ringworm	0.95	0.92	30	
	<i>Sesbania grandiflora</i> (L.) Poir.	L.F	Sore throat, cholesterol Thrush	0.20	0.11	3	
	<i>Tamarindus indica</i> L.	L.Fr	Wound cleanser, stomach pain	0.19	0.16	12	
	<i>Vigna unguiculata</i> (L.) Walp.	L	Fever	0.22	0.13	9	
Hypoxidaceae	<i>Curculigo latifolia</i>	R	Stomach pain	0.07	0.06	6	
	Dryand. ex W.T.Aiton						
Iridaceae	<i>Eleutherine bulbosa</i> (Mill.) Urb.	T	Anticancer, obesity	1.00	1.00	30	
Lamiaceae	<i>Clerodendrum thomsoniae</i> Balf.f.	F	Eczema, earache	0.12	0.09	9	
	<i>Coleus amboinicus</i> Lour.	L	Getting breast milk flowing	0.42	0.41	24	
	<i>Coleus scutellarioides</i> (L.) Benth.	L	Fever, hemorrhoid	0.54	0.53	9	
	<i>Hyptis capitata</i> Jacq.	L	Clean the wound	0.06	0.04	6	
	<i>Mentha × piperita</i> L.	L	Nausea, vaginal discharge, thrush	0.29	0.22	39	
	<i>Ocimum basilicum</i> L.	L	Magh, antidiabetes, heart tinea versicolor, obesity	0.76	0.74	66	
	<i>Ocimum tenuiflorum</i> L.	L	Diabetic, wound healing	0.15	0.13	9	
	<i>Orthosiphon aristatus</i> (Blume) Miq.	L	Diabetic, back pain relief	0.98	0.82	30	
	<i>Plectranthus purpuratus</i> Harv.	L	Hemorrhoids, hepatitis	0.15	0.12	30	
	<i>Pogostemon heyneanus</i> Benth.	L	Hives, watery wounds	0.35	0.36	18	
	<i>Premna serratifolia</i> L.	L	Appetite enhancer, getting breast milk flowing	0.95	0.77	15	
Lauraceae	<i>Cinnamomum burmanni</i> (Nees & T.Ness) Blume	Ba	Colds, headaches rheumatism, toothache	0.33	0.26	33	
	<i>Persea americana</i> Mill.	L.Fr	Diabetic, cholesterol constipation preventer	0.46	0.35	39	

Lythraceae	<i>Punica granatum</i> L.	L.Fr	Dysentery, stroke preventer, cough	0.16	0.12	24
	<i>Sonneratia caseolaris</i> (L.) Engl.	L	Sprain	0.15	0.13	9
Magnoliaceae	<i>Magnolia × alba</i> (DC.) Figlar	F	Catch a cold, body odor	0.05	0.07	18
Malvaceae	<i>Ceiba pentandra</i> (L.) Gaertn.	L.Sa	Fever	0.75	0.63	9
	<i>Hibiscus indicus</i> (Burm.f.) Hochr.	L	Obesity	0.06	0.05	6
	<i>Hibiscus rosa-sinensis</i> L.	Sa.L	Fever	0.66	0.64	30
	<i>Hibiscus sabdariffa</i> L.	F	Hypertension, cholesterol	0.24	0.17	39
	<i>Hibiscus tiliaceus</i> L.	L	Boils	0.15	0.1	24
	<i>Malvastrum coromandelianum</i> (L.) Garcke	L	Antidiarrhea, wound healing	0.07	0.05	15
	<i>Sida rhombifolia</i> L.	R	Gout	0.13	0.13	6
	<i>Theobroma cacao</i> L.	Fr	Worms	0.07	0.07	15
	<i>Urena lobata</i> L.	L	Fever, rheumatism	0.16	0.12	24
Marantaceae	<i>Donax canniformis</i> (G.Forst.) K.Schum.	L.Se	Clean eyes, swelling	0.28	0.26	21
Melastomataceae	<i>Melastoma malabathricum</i> L.	L.Fr	Gastric, hypertension, diabetic, burns	0.91	0.67	84
	<i>Miconia crenata</i> (Vahl) Michelang.	L	Postpartum steam bath, itchy wounds	0.14	0.15	30
Meliaceae	<i>Aglaia odorata</i> Lour.	L	Stomach pain, worms	0.24	0.22	12
	<i>Lansium domesticum</i> Corrêa	Ba	Malaria, dysentery	0.07	0.05	9
	<i>Lawsonia inermis</i> L.	L	Ingrow toenail, gastric ulcer vaginal discharge boils	0.44	0.42	62.5
Menispermaceae	<i>Tinospora crispa</i> (L.) Hook.f. & Thomson	Ba	Fever, diabetic	0.99	0.87	51
Moraceae	<i>Artocarpus altilis</i> (Parkinson) Fosberg	L	Gout	0.07	0.11	9
	<i>Artocarpus heterophyllus</i> Lam.	F.L	Diarrhea, baby umbilical cord sanitizer	0.52	0.3	9
	<i>Ficus elastica</i> Roxb. ex Hornem.	L	Fever	0.05	0.05	6
	<i>Morus alba</i> L.	L.Fr	Obesity, antidiabetic	0.14	0.1	21
Moringaceae	<i>Moringa oleifera</i> Lam.	L	Diabetic, heart disease, hypertension appetite enhancer, hives	1.00	1.00	54
Musaceae	<i>Musa × paradisiaca</i> L.	Sa.F	Stopping wound bleeding	0.19	0.19	12
Myristicaceae	<i>Myristica fragrans</i> Houtt.	Se	Bruises, sprains, insomnia	0.90	0.86	24
Myrtaceae	<i>Syzygium cumini</i> (L.) Skeels	Ba	Dysentery	0.10	0.08	12
	<i>Syzygium nervosum</i> DC.	L	Diabetic	0.90	0.90	24
	<i>Psidium guajava</i> L.	L	Dysentery	1.00	1.00	48
Nyctaginaceae	<i>Bougainvillea spectabilis</i> Willd.	F	Boils	0.12	0.09	6
	<i>Mirabilis jalapa</i> L.	F	Eye inflammation	0.14	0.11	9
Oxalidaceae	<i>Averrhoa bilimbi</i> L.	Fr	Acne, treating tinea versicolor, toothache	0.90	0.69	78
	<i>Averrhoa carambola</i> L.	Fr	Antistrokes, cardiac, cough	0.15	0.13	33
Pandanaceae	<i>Pandanus amaryllifolius</i> Roxb. ex Lindl.	L	Postpartum steambath colds, antidiarrhea	0.96	0.93	39
	<i>Pandanus tectorius</i> Parkinson	L	Leprosy, chickenpox, hives postpartum steambath	0.85	0.80	79.5
Passifloraceae	<i>Passiflora edulis</i> Sims	Fr	Thrush, sore throat	0.22	0.22	27
	<i>Passiflora foetida</i> L.	Fr	Thrush, sore throat	0.23	0.21	21
Phyllanthaceae	<i>Baccaurea motleyana</i> (Müll.Arg.) Müll.Arg.	Ba	Malaria	0.07	0.05	12
	<i>Breynia androgyna</i> (L.) Chakrab. & N.P.Balacr.	L	Getting breast milk flowing	0.98	0.96	30
	<i>Phyllanthus acidus</i> (L.) Skeells	L	Hypertension	0.10	0.09	9
	<i>Phyllanthus urinaria</i> L.	L	Gastric acid, liver, fertility,	0.64	0.6	33

Piperaceae	<i>Peperomia pellucida</i> (L.) Kunth	L	kidney stones, hypertension Gout, hypertension	0.17	0.19	24
	<i>Piper aduncum</i> L.	Sa	Boils	0.13	0.09	9
	<i>Piper crocatum</i> Ruiz & Pav.	L	Diabetic, miscarriage remnant cleanser	0.49	0.43	42
	<i>Piper betle</i> L.	L	Stomach pain, nosebleeds, vaginal discharge, diabetic, hypertension	0.87	0.85	78
	<i>Piper nigrum</i> L.	L	Itching, fever	0.06	0.05	6
Plantaginaceae	<i>Plantago major</i> L.	L	Diarrhea, cholesterol	0.64	0.59	36
Poaceae	<i>Bambusa vulgaris</i> Schrad. ex J.C.Wendl.	R	Hepatitis	0.14	0.1	30
	<i>Cymbopogon citratus</i> (DC.) Stapf	St	Colds, back pain, Postpartum steambath antimalaria, rheumatism, hypertension	0.33	0.31	72
	<i>Cymbopogon nardus</i> (L.) Rendle	St.L	Hives, stomach pain	0.24	0.23	21
	<i>Eleusine indica</i> (L.) Gaertn.	L	Fever	0.83	0.65	24
	<i>Imperata cylindrica</i> (L.) Rausch.	R.F	Kidney stones, incision wound cleanser, hypertension	0.15	0.12	15
	<i>Saccharum officinarum</i> L.	St	Cough	0.14	0.14	9
	<i>Saccharum × sinense</i> Roxb.	St	Diabetic, miscarriage remnant cleanser	0.32	0.31	63
	<i>Schizostachyum brachycladum</i> (Kurz ex Munro) Kurz	L	Hypertension	0.30	0.29	19
Polygalaceae	<i>Polygala exilis</i> DC.	R.St.L	Animal bite	0.26	0.25	12
Polypodiaceae	<i>Platycerium coronarium</i> (Konig) Desv.	L	Stomach pain	0.05	0.05	15
Portulacaceae	<i>Portulaca amilis</i> Speg.	F.L	Cardiac	0.06	0.06	3
	<i>Portulaca oleracea</i> L.	Ba.L.F	Diarrhea, appendicitis	0.11	0.07	24
Rhamnaceae	<i>Ziziphus mauritiana</i> Lam.	L.Fr	Diabetic, obesity	1.00	1.00	63
Rosaceae	<i>Rubus alceifolius</i> Poir.	Fr	Dysentery, diarrhea	0.13	0.09	9
Rubiaceae	<i>Coffea</i> sp.	L	Cholesterol	0.05	0.07	9
	<i>Gardenia jasminoides</i> J.Ellis	L	Fever, gout	0.97	0.82	24
	<i>Morinda citrifolia</i> L.	L.Fr	Hypertension, gout, cholesterol	0.83	0.65	42
	<i>Oldenlandia herbacea</i> (L.) Roxb.	L	Rheumatism, snakebite	0.05	0.05	12
	<i>Paederia foetida</i> L.	L	Catch a cold, diabetic	0.99	0.99	16
	<i>Spermacoce ocymoides</i> Burm.f.	L	Itchy wounds	0.08	0.07	6
	<i>Uncaria gambir</i> (W.Hunter) Roxb.	Sa	Hemorrhoids, gastric	0.21	0.21	33
Rutaceae	<i>Bergera koenigii</i> L.	L	Hypertension, catch a cold	0.39	0.37	38
	<i>Citrus × aurantiifolia</i> (Christm.) Swingle	Fr	Thrush, inner heat, cough	0.97	0.94	54
	<i>Citrus hystrix</i> DC.	Fr	Itching, typhoid, postpartum steambath	0.41	0.4	63
	<i>Citrus × limon</i> (L.) Osbeck	Fr	Thrush, inner heat, detox body	0.91	0.9	72
	<i>Citrus maxima</i> (Burm.) Merr.	Fr	Thrush	0.27	0.26	9
	<i>Murraya paniculata</i> (L.) Jack	L	Obesity, postpartum steambath	0.15	0.11	12
Sapotaceae	<i>Manilkara kauki</i> (L.) Dubard	L.Fr	Diarrhea, anemic	0.10	0.10	12
Schisandraceae	<i>Illicium verum</i> Hook.f.	F	Cough, menstrual disorders	0.11	0.09	42
Solanaceae	<i>Capsicum frutescens</i> L.	L	Baby's forehead, darken hair, fever	0.29	0.25	30
	<i>Datura metel</i> L.	L	Asthma	0.19	0.18	9
	<i>Physalis angulata</i> L.	L	Hiccups, chicken pox, anti-cancer	0.14	0.12	30
	<i>Solanum lasiocarpum</i> Dunal	Fr	Diabetic	0.18	0.16	9
	<i>Solanum lycopersicum</i> L.	Fr	Eye pain, cancer, acne	0.13	0.12	24

Thymelaeaceae	<i>Solanum torvum</i> Sw.	L.Fr	Eye pain, anemia, diabetic	0.33	0.29	60
	<i>Phaleria macrocarpa</i> (Scheff.) Boerl.	L.Fr	Cholesterol, wound	0.76	0.75	42
Verbenaceae	<i>Lantana camara</i> L.	F	Catch a cold	0.67	0.62	9
	<i>Peronema canescens</i> Jack	L	Hypertension	0.10	0.09	6
	<i>Stachytarpheta jamaicensis</i> (L.) Vahl	L	Cough, asthma	0.14	0.16	39
Vitaceae	<i>Causonis trifolia</i> (L.) Mabb. & J.Wen	L	Boils	0.26	0.24	30
Zingiberaceae	<i>Alpinia conchigera</i> griff.	Rh.L	Nausea, rheumatism, hives	0.64	0.63	39
	<i>Alpinia purpurata</i> (Vieill.) K.Schum.	Rh	Diabetic, cough, cancer, lower blood level	0.78	0.76	63
	<i>Boesenbergia rotunda</i> (L.) Mansf.	Rh.L	Hives, Gastric pain, tinea versicolor	1.00	1.00	57
	<i>Curcuma aeruginosa</i> Roxb.	Rh	Gastric pain	0.66	0.64	30
	<i>Curcuma amada</i> Roxb.	R	Colds, menstruation vaginal discharge, insect bites	0.66	0.65	72
	<i>Curcuma longa</i> L.	L.Rh	Colds, itchy scars, menstrual pain, wounds, liver, pregnancy program, cholesterol, anti-hepatitis, stomach ulcer, antidiarrhea	1.00	1.00	108
	<i>Curcuma mangga</i> Valeton & Zijp	Rh.L	Anticancer, stomach pain	0.97	0.95	72
	<i>Curcuma zanthorrhiza</i> Roxb.	Rh.L	Anti- cancer, catch a cold, Miscarriage, Diabetic	0.67	0.67	63
	<i>Curcuma zedoaria</i> (Christm.) Roscoe	R	Gout, leucorrhoea, appetite enhancer	0.48	0.47	39
	<i>Etlingeria elatior</i> (Jack) R.M.Sm.	St.F	Diabetes, allergic itching	0.49	0.48	30
	<i>Kaempferia galanga</i> L.	Rh	Catch a cold, cholesterol, Cough, rheumatism	0.80	0.72	51
	<i>Zingiber montanum</i> (J.Koenig) Link ex A.Dietr.	R	Bleeding cleanser, worms	0.63	0.62	69
	<i>Zingiber officinale</i> Roscoe	Rh	Labor tonic, cholesterol, menstruation facilitator, colds	0.95	0.80	90

Notes: Sa=Sap; M=Mucus; B=Bark; Rh=Rhizoma; R=Root; T=Tubers; St=Stem; L=Leaf; F=Flowers; Fr=Fruits; S=Seed; UV=Use Value; RFC=Relative Frequency of Citation; ICS=Index of Cultural Significance.

Quantitative of Medicinal Plants

The RFC value of 1.00 was obtained in the species *Tagetes erecta*, *Eleutherine bulbulosa*, *Moringa oleifera*, *Andrographis elongata*, *Jatropha curcas*, *Psidium guajava*, *Curcuma longa*, *Benincasa hispida*, followed by *Paederia foetida* (0.99), *Garcinia atroviridis* (0.97), *Panax ginseng* (0.82), *Citrus x aurantiifolia* (0.94), *Ceiba pentandra* (0.65), *Momordica charantia* (0.30), and *Acorus calamus* (0.02) (Figure 6).

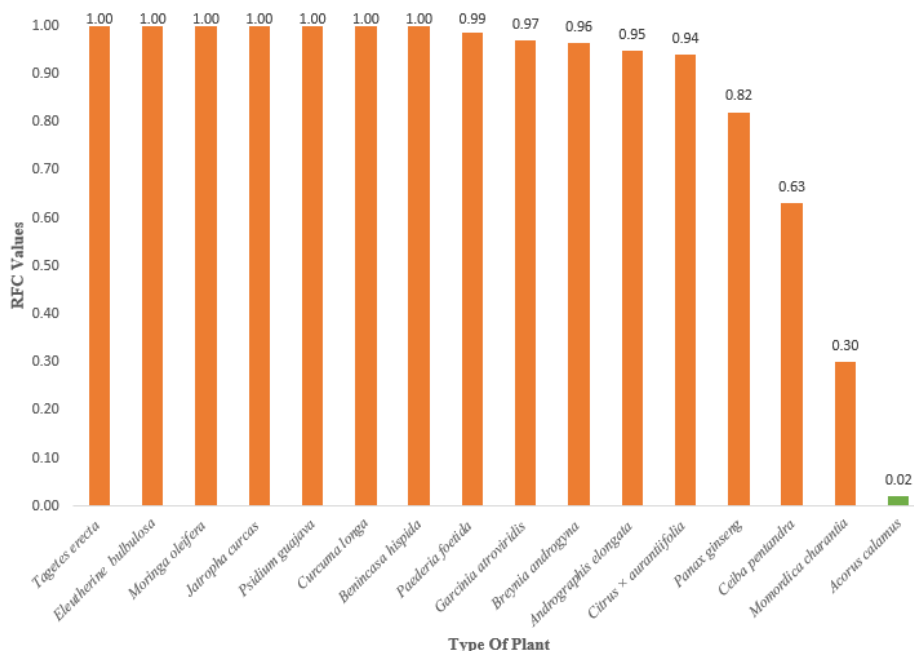


Figure 6. Medicinal plant species with high and low Relative Frequency (RFC)

Species with an RFC value (1.00) above is the number of respondents who mentioned the utilization of the species most often used by the Tamiang people. Furthermore, species with the value of using a species with the number of reports of use for that species in Tamiang traditional medicine with UV > 1.00 consist of *T. erecta* (1.00), *E. bulbosa* (1.00), *M. oleifera* (1.00), *B. hispida* (1.00), *A. elongata* (1.00), *Anredera cordifolia* (1.00), followed by *Ziziphus mauritiana* (0.99), *Boesenbergia rotunda* (1.00), *P. ginseng* (0.99), *Orthosiphon aristatus* (0.98), *Pandanus amaryllifolius* (0.95), *Piper betle* (0.87), *Beta vulgaris*, *Acalypha hispida* (0.17), and *Cleome rutidosperma* (0.05) (Figure 7). The UV values of these medicinal plants are between 0.05 and 1.00 and the species *C. rutidosperma*, which belongs to the Cleomaceae family, has a relatively low value of 0.05. A group of communities indicated that plants with the highest Use Value (UV) have the most reported uses within the species (Zenderland et al., 2019).

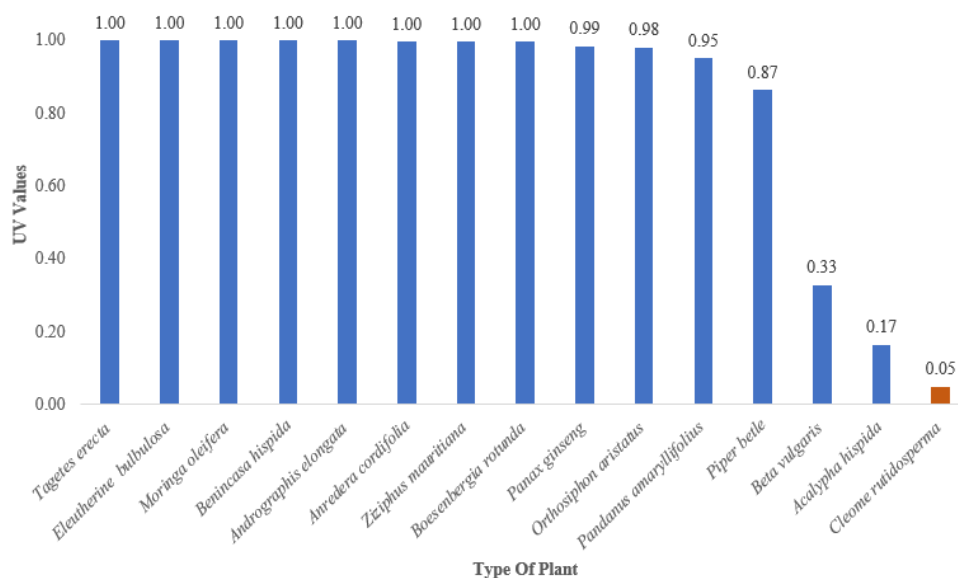


Figure 7. Medicinal plant species with high and low use value (UV)

The ICS value of plants utilized by the Tamiang tribal community with a range of very high to low values such as *Andrographis elongata* is very high, followed by *Curcuma longa*, *Zingiber officinale*, *Moringa oleifera*, *Psidium guajava*, *Centella asiatica*, and *Sesbania grandiflora* (Figure 8).

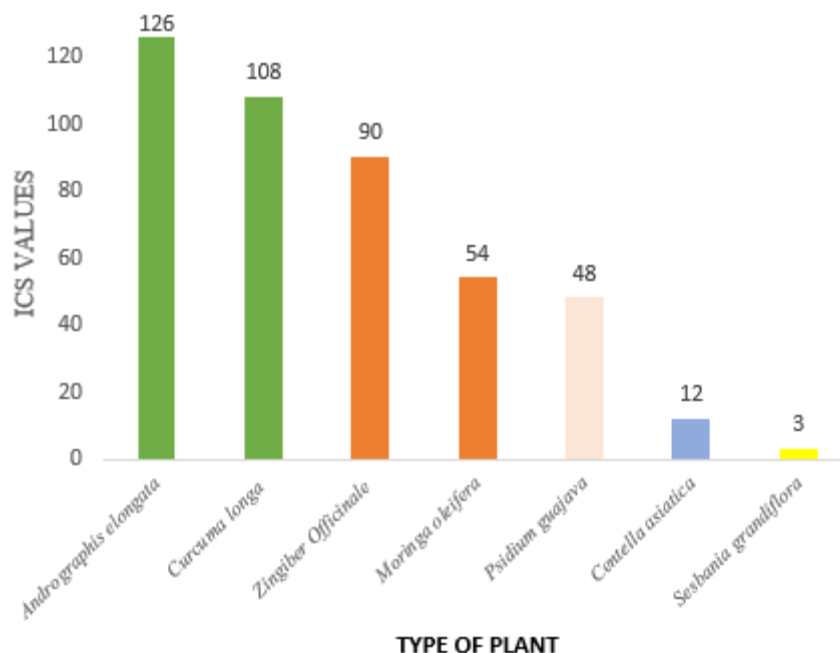


Figure 8. Medicinal plant species with the highest to lowest ICS values

If the ICS value is moderate on a mild scale, the plant species are categorized into alternative uses for traditional medicine. The fact that *A. elongata* has the highest ICS value (126) indicates that this plant is traditionally used in treating several types of diseases, one of which is diabetes, which is dominantly found in the Tamiang tribal community. In addition, *M. oleifera*, which has the largest value (54), is still used in traditional ceremonies because it can be used as food, medicine, animal feed, and repellent. Using ICS analysis, plant species were found at very high, medium, and low levels. This shows how important the role of these species is in helping to treat a disease, something that has been obtained by the same research in the use of ICS (Has et al., 2020; Maruapey et al., 2022; Sitanggang et al., 2022).

Among the 10% of plants that have significant potential as a source of medicines is *M. oleifera*. Every part of this plan has potential as a bioprospecting, one of which is the moringa seed organ in India which contains secondary metabolites used by people around the world. Arora and Onsare (2015) reported maximum inhibition against *E. coli*, *S. typhi*, and *V. cholera* was seen in moringa seed extracts containing methanol and n-hexane, which were most effectively used at low doses. The potential of some organs of *M. oleifera* in the Tamiang tribal community has the potential as a prospective source of food raw materials in the form of vegetables, traditional rituals, and herbal medicines in the future. In addition, it is utilized as firewood for daily food cooking needs.

CONCLUSION

Cataloging all medicinal plant uses to support sustainable management of herbal medicine raw materials and bioprospecting medicinal plants that obtain ICS values such as *A.*

elongata which treats diabetes and *M. oleifera* which treats hypertension as natural raw materials for herbal medicines in the future.

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