CHAPTER 3

Survey on ethnomedicinal uses of traditional medicinal plant used by the indigenous inhabitants of southern Manipur

3.1. Introduction

Ethnomedicine is the study of indigenous ideas, thoughts, knowledge, and practices used by tribal and rural ethnic communities to prevent, cure, and treat disease. Since antiquity, the ethnic or tribal community has relied heavily on native flora for medicinal and other purposes (Thakur at al., 2015; Abu-Rabia, 2005). The traditional medicine system represents rural and tribal populations' indigenous beliefs, abilities, and practices for maintaining their health, as informed by their experiences (Sharma et al., 2012). Ethnic communities have traditionally learnt and passed down traditional knowledge orally from generation to generation. This knowledge was mostly based on their lifelong experience with the use of plants to treat ailments and has been seen as culturally significant in protecting and maintaining the continuity of transmission among individuals (Boudjelal et al., 2013). People from all civilizations have mastered and used plants and their products to treat various diseases. In most poor nations, people successfully and steadfastly rely on traditional medicine for optimal healthcare. According to the World Health Organization (WHO), up to 80% of the world's population continues to rely on traditional medicine for basic healthcare (Bodekar et al., 2005; Mukherjee, 2002). In India, the traditional belief system of therapy has a long history and is profoundly ingrained in the country's rural and tribal people. The country's indigenous populations numbered up to 53 million, divided into 550 separate communities. India is rich in biodiversity, with three biodiversity hotspots: the Himalaya, the Western Ghats, and Indo-Burma. It has an estimated 47,513 plant species, accounting for around 11.4% of the world's flora and covering 2.4% of the earth's area. It is also rich in genetic resources of medicinal and aromatic plants, with 11% recognized to have therapeutic properties (Singh and Dash, 2014).

The North-Eastern states of India are blessed with various valuable medicinal plant species with pharmaceutical applications. It is also known as one of the world's richest sources of various plants, including medicinal and aromatic species (Haridasan and Rao, 1987). It has a diversified population and is home to the biggest number of Scheduled Tribes

(Marchang, 2017). Because of the area's good geographical and climatic characteristics, the locals rely heavily on the accessible photographic resources. The study was done in Manipur, one of India's eight North-Eastern states. It is located between 87°32'E to 97°52'E latitude and 21°34'N to 29°50'N latitude and is renowned as India's biographical gateway due to its abundant genetic resources (Singh et al., 1996). It is a small state located in India's extreme eastern corner. It is bordered on the east by Myanmar and on the west by Assam, Mizoram in the south, and Nagaland in the north. The state covers a total area of 22,327 km^2. It is topographically divided into two main regions: hills (which cover 90% of the entire area) and plains (10%). The plain is almost exactly in the centre, surrounded and flanked by hillside walls (Chatterjee et al., 2006). Manipur has a monsoon climate, with hot and wet summers and cold, dry winters, due to its physical structure, position, forest cover intensity, and water bodies. The hills are dominated by Manipur's two principal tribes, the Kuki and Naga. And the valley is densely controlled by the Meitei. The state is part of the Indo-Myanmar hotspot region and is ranked eighth out of 34 biodiversity hotspots worldwide (Myer et al., 2000). As a hilly location, tribal communities must rely on traditional herbal remedies. Traditional healthcare techniques continue to be widely practiced in Manipur (Deb et al., 2015).

This therapy approach may be the sole healthcare option accessible in some rural Manipur villages. So, the future goal should be to discover unexplored medicinal plant species in this region while keeping the conservation aspects of known plants in mind, as well as to provide quality knowledge to improve the skill of planting these valuable medicinal plants in large-scale productions, which will eventually benefit the state's larger populations.

3.2. Materials and methods

3.2.1. Study Area

The research investigation was conducted in four villages in the Churachandpur district of Manipur: Patlen, Songpi, Kingkin, and Molhoi. Churachandpur district is in the south-western region of Manipur (Fig. 3.1). It is roughly located between latitudes 23 56'43"N and 24 42'N, and longitudes 920 58'E to 930 52'8"E. It is bordered to the north by Tamenglong, Imphal East, Senapati, Bishnupur, and Thoubal Districts, to the south by Mizoram and Myanmar (Burma), to the east by Chandel District, and to the west by Assam

State. The district's overall area is 4,570 square kilometers. It is the largest district in Manipur. The district has hilly terrain and is located 60 kilometers south of the city, Imphal.

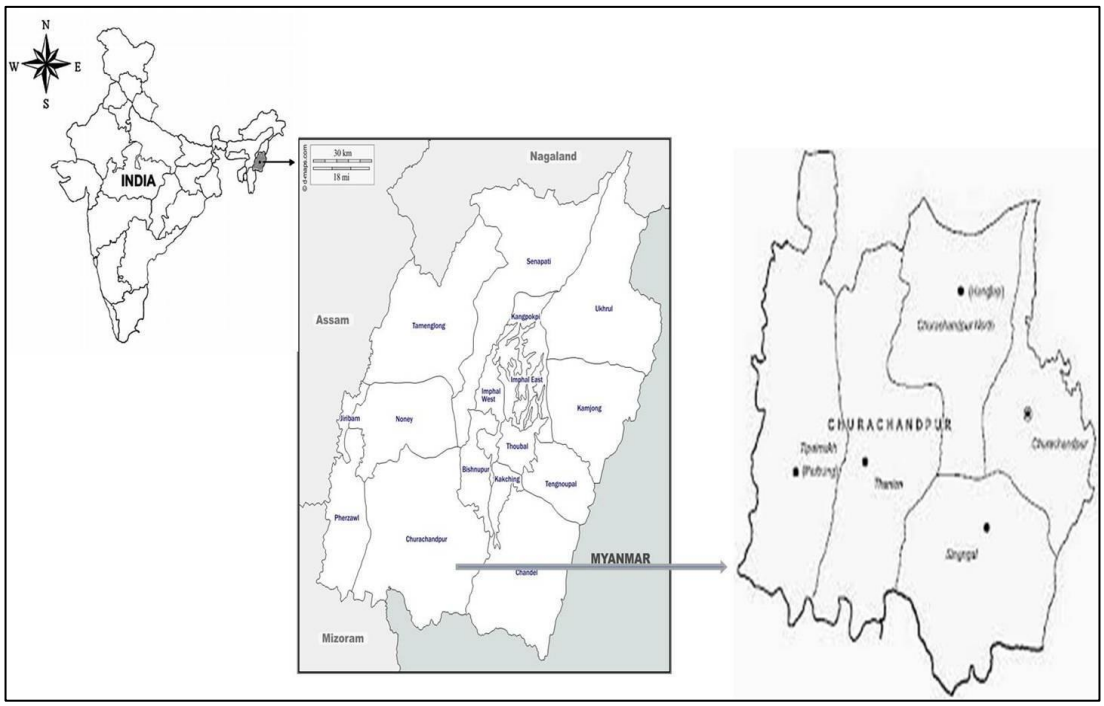


Fig. 3.1: Map of Manipur showing the present study area

The district features a tiny valley component that extends from Manipur (Imphal) valley along the Khuga River basin, with most of the area covered by rough hilly terrain. Churachandpur district is split into three hilly regions based on geology, soils, topography, climate, and natural vegetation (Indian Census, 2011).

According to the 2011 census data, Scheduled Tribes account for approximately 92.9 percent of the district's total population, with an absolute population of 254,787 people, 126,328 of whom are men and the remaining 128,459 females. Scheduled Castes account for only 0.2% of the population, whereas the general population makes up 6.9%. The main ethnic group speaks Thadou-Kuki.

3.2.2. About the selected tribes

The term 'Kuki' refers to an ethnic group in Bengali that means 'hill people' or 'highlander'. The Kuki groups are primarily located in northeast India, northwest Burma, and the Chittagong hill tracts of Bangladesh (Haokip, 2013). In Manipur, the Kuki and its

associated tribes are spread over the hill districts. They dominated the districts of Churachandpur, Kangpokpi, and Chandel. The Kuki was divided into sub-groups, including Thadou, Paite, Hmar, Vaiphei, Simte, Gangte, Sukte, Mizo/Lushai, Kom, Zou, and so on. Thadou's is a subgroup of the Kuki group, which is Manipur's most populous tribe, with 2,15,913 speakers of the language (Sitlhou, 2018).

The indigenous Kuki people have historically relied on forests for food, fuel wood, timber, bamboo, medicinal plants, and other socio-cultural requirements. They also have a solid understanding of medicinal plants found in their environs that are utilized to treat a variety of diseases. Their reliance on medicinal plants ranged from 10% to 40% in the forest (Singsit, 2009). Proper substantiation has been advocated for a variety of reasons to conserve indigenous knowledge of therapeutic plants. First, it ensures that indigenous cultural inheritance is not lost for future generations. This process of confirming traditional knowledge of native plant species has resulted in many crucial pharmaceuticals and will be an important component of the conservation approach (Mahwasane et al., 2013). Because of changes in our traditional culture and the advent of contemporary technologies, indigenous traditional knowledge of traditional plants and medicines from many tribes is vanishing. As a result, the purpose of this study was to establish systematic and thorough documentation, presentation, and validation of folk medicine, as well as the traditions and culture of the region's indigenous tribes.

3.2.3. Methods of study

3.2.3.1. Informants

The informants were residents from the four villages indicated. The informants were primarily female, with relatively few male informants. Male informants made for 10% of the respondents, while female informants accounted for 90%. Aged folks were favoured over the younger generation since they are better knowledgeable about traditional plant treatment.

3.2.3.2. Field Survey and Data collection

Ethnomedicinal surveys were carried out in the Thadou-Kuki populated areas of Churachandpur district, Manipur, from April 2017 to March 2018 to interact with and

obtain information on ethnomedicinal plants used to treat ailments. The targeted group speaks the Thadou dialect, therefore there was no language barrier throughout the survey, and the interviewer was able to fully understand the material. Before gathering the information, the informants gave their prior agreement. Twenty interviews were randomly selected from each of the four villages. However, this was primarily carried out based on individual experiences with plant knowledge as reported by people.

Questions were posed using pre-made semi-structured questionnaires and group discussions, and data was obtained using a semi-structured questionnaire. Information about the demographic background, local plant names, part(s) used, methods of preparation, and application was collected. The usual methods of Martin, (1995) were used during plant collection as well as preparation of specimens for reference and depositing. During the field survey, medicinal plants reported by informants were verified, collected, and identified in the field using vernacular/local names by residents. Some of the plants were not found in neighbouring fields, therefore they were gathered from the wild. Because the plants were not in flowering or fruiting mode during the visit, the same location was returned for sample collection during the flowering and fruiting season. A plant taxonomist from the Botanical Survey of India (BSI), Eastern Regional Centre, Shillong, and Ethnomedicinal Research Centre, Manipur, created the herbarium and identified the voucher specimens. Scientific names were cross-checked against "The Plant List" (www.theplantlist.org) databases (The Plant Lists, 2013). The ethical guidelines provided by "The Biological Diversity of India" (The BDA, 2002 & BDR, 2004), and "International Society of Ethnobiology" were followed.

3.2.4. Quantitative data analysis

The data gathered from respondents during the survey was examined using three quantitative indices, namely Informant Consensus Factor (ICF) and Fidelity Level (FL), as indicated below: The Informants' Consensus Factor (ICF) measures the level of uniformity in the information provided by respondents (Trotter & Logan, 1986). It assesses the consistency of respondents' knowledge as well as their understanding of employing plants to cure a certain ailment. The ICF is determined using the Equation as follows:

$$ICF = \frac{(N_{ur} - N_s)}{(N_{ur} - 1)} \qquad 3.1$$

where, N_{ur} = number of use reports from respondents for a particular plant-use category

N_s = number of species that are used for that plant use category for all informants.

Fidelity Level is the percentage of respondents who claim to have used a certain plant for the same principal purpose to treat a specific sickness (Friedman et al., 1986). The FL value was used to identify the most well-received species for treating a specific condition. The FL was determined using the Equation as follows:

$$FL\ (\%) = \frac{N_i}{N_t \times 100} \qquad 3.2$$

Where, N_i = number of respondents who independently claimed the use of a particular species for the same major disease

N_t = total number of respondents who claimed the plant species for any major disease.

3.3. Results and discussions

3.3.1. Demographic profile of the respondents

A total of 80 informants, including 70 women and 10 men, were questioned. The informants were then divided into groups based on their demographic profiles (name, gender, age, and qualification), as shown in Table 3.1. Most of the informants were farmers by occupation, as agriculture was their sole source of income. Some of the informants were laborers in other agricultural sectors, and only a few of them owned and worked in their own agricultural fields for a living. Farming was the primary occupation of the respondents. The respondents were divided into age categories to determine which age groups had the most knowledge about the use of plants as medicines for various sorts of diseases as well as emergency situations such as allergies, cuts, and wounds. The age categories of 40 years and older had the highest number of responses, with 39, followed by the age groups of 31-40 years, with several 25 respondents. The age group ranging from 20 to 30 years old had the fewest respondents (16).

A sizable proportion of respondents (51.25%) had completed basic school but were unable to continue their education due to financial constraints. While at the very least, 3.75% had completed their graduation. Different characteristics were utilized to determine where the

Table 3.1: Demographic profile of the informants.

Parameter	Specification	Frequency	Percentage (%) (n=80)
Gender	Female	70	87.50
	Male	10	12.50
Age groups	20-30 years	16	20.00
	31-40 years	25	31.25
	41 years & above	39	48.75
Occupation	Farmers	45	56.25
	Government employee	9	11.25
	Others	26	32.50
Education level	Primary	41	51.25
	Intermediate	8	10.00
	Graduate	3	3.75
	Never attended school	8	10.00
Source of knowledge	Parental	46	57.50
	Friends	24	30.00
	Traditional health practitioners	4	5.00
	Others	6	7.50

source of knowledge was acquired. According to the study, respondents learned the most about plants and how to use them from their parents (57.5%), with the least amount coming from traditional health practitioners (5%).

3.3.2. Characteristics of the ethnomedicinal plants

During the survey, 55 ethnomedicinal plants from 55 genera and 34 families were documented using native people's information and knowledge given in Table 3.2. The number of taxa under each family are –

Acanthaceae (3) Amyryllidaceaen(1) Anarcadiaceae (1) Apiaceae (2) Asteraceae (12) Balsaminaceae (1) Begoniaceae (2) Campulunaceae (1) Cannabaceae (1) Caricaceae (1) Caryophyllaceae (1) Convolvulaceae (1) Costataceae (1) Crassulaceae (1) Cucurbitaceae (2) Eleocarpaceae (1) Fabaceae (1) Lamiaceae (3) Leguminosae (1) Lythraceae (1) Melastamaceae (1) Mimosaceae (1) Myrtaceae (1) Oxcidaceae (1) Passifloraceae (1) Plantaginaceae (2) Poaceae (1) Polygonaceae (1) Rutaceae (1) Saururaceae (1) Solanaceae

(3) Urticaceae (1) Xantharrhoraceae (1) Zingiberaceae (1). Out of the 34 families identified, Asteraceae had the most species (12), followed by Acanthaceae and Solanaceae, each with three. Table 3.2. lists the families and species of plants used in herbal remedies. A study on medicinal plants in Manipur (Lokho et al., 2012; Nongmaithem and Das, 2013) found that the Asteraceae family has the highest prevalence of any plant family. This could be related to the fact that Asteraceae is the most common plant family in the state of Manipur.

Asteraceae is one of the world's largest flowering plant families. The ubiquity of the Asteraceae family for therapeutic purposes is not a new discovery; comparable research has been reported from all around the world (Stepp and Moerman, 2001). These findings were also consistent with the majority of ethnomedicinal plant investigations conducted in northeastern India (Tangjang et al., 2011).

Table 3.2: Ethnomedicinal plants used by the indigenous people with their vernacular name, specimen number, scientific names, family, habitat, parts used, used against diseases/purposes, mode of preparation and application and use value.

Sl.no.	Vernacular name	Specimen no.	Scientific names	Family	Habitat	Parts Used	Used against diseases/ Purposes	Mode of preparation and application	Used Values
1.	Japanese na	HAOKIP 01	*Eupatorium adenopharum* Hort.Berol.ex Kunth	Asteraceae	Small gregarious undershrub	L	Diabetes	Leaves is boiled to make a decoction and taken orally	0.61
2.	Belbukong /Leisan	HAOKIP 02	*Melastoma malabathricum* L.	Melastomaceae	Hispid undershrub	WP	Diabetes Tongue ulcers	Whole parts of the plants is boiled to make a decoction and taken orally Ripened fruits are chewed	0.37
3.	Lhangmui	HAOKIP 03	*Luffa acutangula* (L.) Roxb.	Cucurbitaceae	Large tendril climber	L, Fr	Liver diseases	The leaves are boiled to make a decoction and taken orally The fruits are boiled and included in the diet	0.11
4.	Bahlong	HAOKIP 04	*Oroxylum indicum* (L.) Kurz.	Begoniaceae	Small tree	Fr (Unripe)	Diabetes Liver diseases	The fruits are first roasted and the blackish layer of it is removed. After cleaning it is then boiled to make a decoction and taken orally	0.87

							Gastrointestinal problem Kidney diseases (oedema)		
5.	Belhenga na	HAOKIP 05	*Cajanus cajan* (L.) Millsp.	Leguminoseae	Hispid profuse shrub	L	Kidney diseases (oedema)	The leaves are boiled to make a decoction and taken orally	0.15
6.	Vailou	HAOKIP 06	*Ageratum conyzoides* (L.) L.	Asteraceae	Profuse hispid herb	L	Antiseptic / Antibiotic	Fresh leaves extract is applied topically	0.87
7.	Sumkawnpah	HAOKIP 07	*Datura metel* L.	Solanaceae	Large, erect and stout herb	L	Dysentery Piles	Decoction of the leaves is mixed with mishri and 1 teaspoon is taken orally *High doses not recommended as it can be poisonous	0.07
8.	Khongbaianche	HAOKIP 08	*Scoparia dulcis* L.	Plantaginaceae	Erect herb	L, St	Fever Diabetes Gastrointestinal problem	Decoction of the leaves is taken orally	0.05

9.	Sai anjang	HAOKIP 09	*Solanum torvum* Sw.	Solanaceae	Profuse spiny undershrub	Fr, S	Gastroint estinal problem Headache	The whole fruits with seeds is steamed or boiled and consumed as such The fruits with seeds is pounded to make a paste and applied directly on the forehead	0.83
10.	Meikah lou	HAOKIP 10	*Bryophyllum pinnatum* (Lam.) Oken	Crassulacea e	Succulant herb	Phyllocl ades	Cuts and burns	The paste is applied topically	0.87
11.	Loubuong	HAOKIP 11	*Crassocephalu m crepidioides* (Benth.) S. Moore	Asteraceae	Erect herb	L	Gastroint estinal	Decoction of the leaves is taken orally	0.92
12.	Aithanglo u	HAOKIP 13	*Houttuynia cordata* Thunb.	Saururaceae	Profusely spreading aromatic herb	L, R	Kidney stones Tonsilitis	Decoction of the leaves is taken orally The leaves can be included in the diet and eaten raw The leaves and roots are pounded and the paste is taken orally	0.05
13.	Sihmichan gmai	HAOKIP 14	*Oxalis corniculata* L.	Oxalidaceae	Profused straggliing herb	WP	Sinusitis	The whole plant is boiled and the steam is inhaled through the nostril	0.3
14.	Ansache	HAOKIP 15	*Acmella paniculata*	Asteraceae	Trailing herb	L, F	Hookwor m	Decoction of the leaves and flowers is taken orally	0.75

			(Wall. Ex DC.) R.K. Jansen				infestations Piles	The leaves are boiled and the pile patient is made to sit	
15.	Vohbilche	HAOKIP 16	*Plantago major* L.	Plantaginaceae	Gregarious delicate herb	L, F	Boil sepsis Hypertension Intestinal wall thickness Kidney stones	The leaves paste is applied directly to the affected part The leaves are boiled and included in the diet Decoction of the leaves is taken orally	0.72
16.	Sinus lou	HAOKIP 17	*Drymaria cordata* (L.) Willd. Ex Schult.	Caryophyllaceae	Profuse straggling creeping herb	WP	Sinusitis	The whole plant is boiled and the steam is inhaled through the nostril	0.75
17.	Changkongche	HAOKIP 18	*Centella asiatica* (L.) Urb.	Apiaceae	Profuse straggling herb	WP	Asthma Gastrointestinal problem Hypertension	Decoction of the leaves are taken orally or the The whole plants is boiled and included in the diet	0.97
18.	Gulkhi	HAOKIP 19	*Lobelia nummularia* Lam.	Campunulaceae	Trailing herb	WP	Kidney stones	Decoction of the whole plants is taken orally	0.22

19.	Huihing	HAOKIP 20	*Cuscuta reflexa* Roxb.	Convolvulaceae	Leafless parasitic climber	WP	Liver diseases	Decoction of the whole plants is taken orally	0.47
20.	Kolthei na	HAOKIP 21	*Psidium guajava* L.	Myrtaceae	Small tree	Sh	Diarrhoea Dysentry	The shoots are eaten raw	1
21.	Ponkap	HAOKIP 22	*Bidens pilosa* L.	Asteraceae	Erect herb	WP	Anti-inflammatory Digestive problem	Decoction of the whole plants is taken orally	0.18
22.	Lingsi na	HAOKIP 23	*Debregeasia longifolia* (Burm.f.) Wedd.	Urticaceae	Large dioecious shrub	L	Diabetes	Decoction of the leaves is taken orally	0.25
23.	Sapthei na	HAOKIP 24	*Passiflora edulis* Sims	Passifloraceae	Climber	L	Hypertension	Decoction of the leaves is taken orally The boiled leaves can be included in the diet	0.91
24.	Ngencha	HAOKIP 25	*Cheilocostus speciosus* (J.Konig) C.Specht	Costaceae	Rhizomatous slender herb	St	Ear infection	The leaves extracts is applied directly to the ear or it is applied dabbing the extracts in a cotton and applied poultice	0.1
25.	Anphui	HAOKIP 26	*Clerodendrum glandulosum* Lindl.	Lamiaceae	Large glabrous shrub	L	Hypertension	Decoction of the leaves is taken orally	1

								The boiled leaves can be included in the diet	
26.	Khongma	HAOKIP 27	*Rhus chinensis* var. chinensis	Anacardiaceae	Small deciduous tree	L, Fr	Chicken pox Kidney stones	Decoction of the leaves is taken orally The fruits are coarsely pounded and is soaked in water for few days and it taken orally	0.18
27.	Maipong	HAOKIP 28	*Benincasa hispida* (Thunb.) Cogn.	Cucurbitaceae	Robust climber	Fr	Liver diseases Blood purifier	Juice is extracted from the fruits and taken orally in empty stomach	0.97
28.	Veinamgui	HAOKIP 29	*Mikania micrantha* Kunth	Asteraceae	Aggressive climber	L	Sprain Piles	The leaves paste/poultice is applied over the sprain The leaves are boiled and a person is made to sit in the hot decoction in case of piles	0.4
29.	Manchep	HAOKIP 30	*Xanthium strumarium* L.	Asteraceae	A medium-sized subshrub	L, S	Kidney stones	The leaves and seeds decoction is taken orally	0.25
30.	Saikang	HAOKIP 31	*Artemisia nilagirica* (C.B.Clarke) Pamp.	Asteraceae	Hispid undershrub	WP	Body odour Skin rashes	The whole plants is boiled and it is used for bathing	0.22

31.	Anjangkhaneote	HAOKIP 32	*Solanum indicum* L.	Asteraceae	Perennial prickly undershrub	Fr	Hypertension Mouth ulcers Stomache	The whole fruits with seeds is steamed or boiled and consumed as such The crushed fruits along with the seeds is mixed with honey and applied to the tongue The fruits are chewed and eaten	1
32.	Hampa jahcha	HAOKIP 33	*Mimosa pudica* L.	Mimosaceae	Straggling spiny undershrub	L, R	Fomentation after childbirth for faster healing Urethritis White discharge in women	The leaves and roots are boiled water and used for bathing. Decoction of the leaves and roots are taken orally	0.78
33.	Seilkhup don	HAOKIP 34	*Begonia palmata* D.Don	Begoniaceae	Small herb	L, R	Chicken pox Measles Kidney stones	Decoction of the leaves and roots is taken orally	0.17
34.	Nangkang	HAOKIP 35	*Chromolaena odorata* (L.)	Asteraceae	Schrumblinggshrub	L	Diabetes	Decoction of the leaves is taken orally	0.26

			R.M.King and H.Rob.						
35.	Thingchangmai	HAOKIP 36	*Carica papaya* L.	Caricaceae	Small tree	Fr, L	Malaria	Decoction of the leaves is taken orally Juice of immature fruits is taken orally	0.35
36.	Aloevera	HAOKIP 37	*Aloe vera* (L.) Burm.f.	Xanthorrhoeaceae	Short-stemmed shrubby aloe	L	Cuts and burns Heart burn	The gel extracts is applied to the affected area The gel is cut into pieces and consumed with honey	0.75
37.	Kolbuthei	HAOKIP 38	*Punica granatum* L.	Lythraceae	Small tree	L	Diabetes	Decoction of the leaves is taken orally	0.16
38.	Jonmot	HAOKIP 39	*Elaeocarpus floribundus* Blume	Elaeocarpaceae	Medium sized evergreen tree	L	Gastrointestinal problem	Decoction of the leaves is taken orally	0.12
39.	Puhlou	HAOKIP 40	*Blumea flava* DC	Asteraceae	Tall aromatic herb	Sh/L	Headache	The leaves are pounded and the paste applied directly on the forehead The leaves are boiled and eaten	0.92
40.	Changkuong Patikhom	HAOKIP 41	*Eryngium foetidum* L.	Apiaceae	Spiny aromatic herb	WP	Burns	The leaves are pounded and applied directly to the affected part of the body	0.37
41.	Ahmutan	HAOKIP 42	*Persicaria chinensis* (L.) H. Gross		Scandent subshrubs	L	Kidney stones	Decoction of the leaves is taken orally	0.17

				Polygonaceae				The boiled leaves can be included in the diet	
42.	Kolhou Aeng	HAOKIP 43	*Phlogocanthus thyrsiformis* (Roxb.ex.Hardw.) Mabb.	Acanthaceae	Bushy shrub	L	Cough and cold Fever Hypertension Skin itching	The leaves are boiled and the steam is inhaled in a close environment Decoction of the leaves is taken orally The leaves are boiled and it is used for bathing	0.37
43.	Kolhou Akang	HAOKIP 44	*Justicia adhatoda* L.	Acanthaceae	Gregarious shrub	L	Cough and cold Fever Hypertension Skin itching	The leaves are boiled and the steam is inhaled in a close environment Decoction of the leaves is taken orally The leaves are boiled and it is used for bathing	0.33
44.	Kolhou Asan	HAOKIP 45	*Phlogocanthus pubinervius* T.Anderson	Acanthaceae	Large branched shrub	L	Cough and cold Fever	Decoction of the leaves is taken orally	0.93
45.	Lengmasel	HAOKIP 46	*Elsholtzia communis* Benth.	Lamiaceae	Aromatic undershrub	F, L	Pharyngitis	The dried leaf powder are burnt and the smoke is inhaled	0.05

46.	Ganja	HAOKIP 47	*Cannabis sativa* L.	Cannabaceae	Aromatic bushy shrub	L	Appetiser Dysentery	The dried leaf powder is smoked before meal to increase the appetite The dried leaf powder mixed with water is taken orally	0.47
47.	Buolje	HAOKIP 48	*Blumea lanceolaria* (Roxb.) Druce	Asteraceae	Tall erect shrub	L	Cancer	Decoction of the leaves is taken orally	0.46
48.	Lingnamse	HAOKIP 49	*Zanthoxylum acanthopodium* DC.	Rutaceae	Spiny bushy shrub	S	Cough Indigestion Toothache	The dried seeds are taken orally for cough and indigestion The fresh seeds are pounded and the extracts is taken in a cotton and applied to the affected part	0.15
49.	Louthul Peh	HAOKIP 50	*Allium hookeri* Thwaites	Amaryllidaceae	Aromatic delicate herb	WP	Micturition	Decoction of the whole plants is taken orally	0.43
50.	Noisan	HAOKIP 51	*Impatiens balsimina* L.	Balsaminaceae	Tall succulent herb	WP	Antibiotic	The leaves and young stems of the plant is lightly pounded to extract the juice and is applied on to the affected part	0.22
51.	Ailaivom	HAOKIP 52	*Kaempferia parviflora* Wall. Ex Baker	Zingiberaceae	Rhizomatous herb	Rh	Epigestic pain Dysentery	The roots are pounded and the extract is taken orally	0.91

							Lungs diseases Piles		
52.	Hanaling	HAOKIP 53	*Solanum myriacanthum* Dunal	Solanaceae	Stout bushy undershrubs	S	Dental caries	The seeds are crushed and the extract is applied to the affected area	0.5
53.	Kolchu Kang	HAOKIP 54	*Saccharum officinarum* L.	Poaceae	Tall erect succulent undershrub	St	Liver diseases	The juiceis taken orally early in the morning before meal	0.87
54.	Hampa Namse	HAOKIP 55	*Mentha spicata* L.	Lamiaceae	Profuse aromatic herb	WP	Carminative Cough and cold	The whole plants can be eaten with food or consumed as such	0.72
55.	Songko Kang	HAOKIP 56	*Erythrina variegate* L.	Fabaceae	Thorny deciduous tree	B	Skin Allergy	The bark of the tree is scrapped and applied directly to the skin	0.93

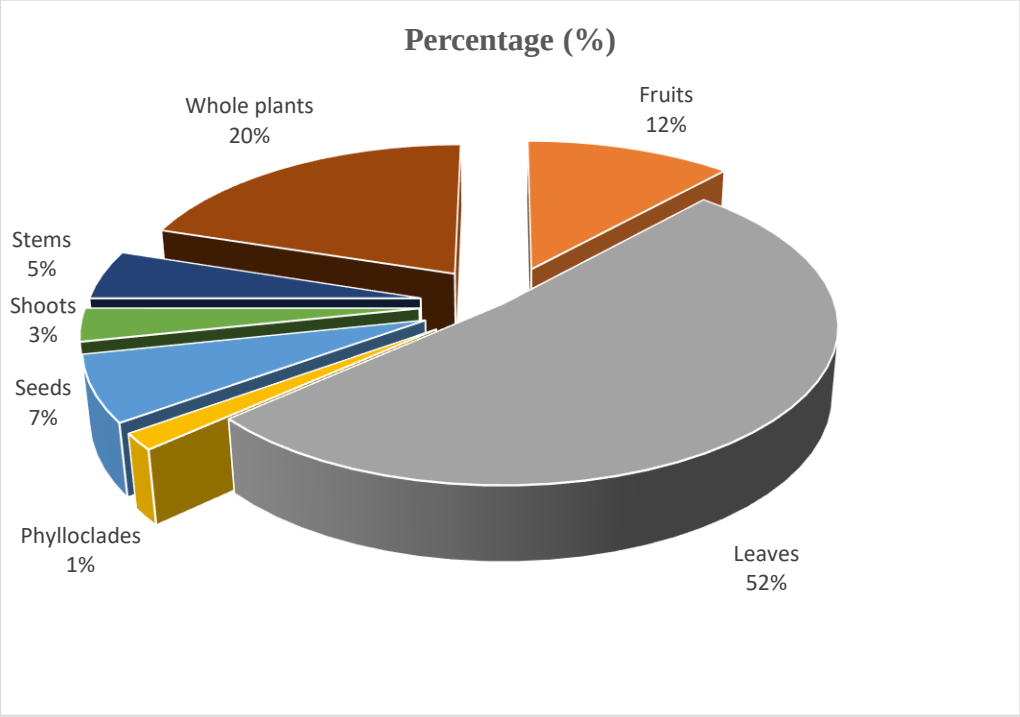
F-Fruits; L-Leaves; P-Phylloclades; S-Shoots; St-Stems and WP-Whole plants

3.3.3. Habitat

The plant species collected grow in a wide range of environments, including valley plains, upland forests, and hilly regions. The medicinal plants identified in the study grow as herbs, shrubs, subshrubs, undershrubs, trees, and climbers. Herbs constituted the biggest proportion of indigenous plants in the community, accounting for 38.18%, possibly due to their ease of availability and better curative power when compared to other growth types. The current findings are also consistent with the findings of earlier studies (Abbasi et al. 2013; Saxena et al. 2014), which state that herbs are the most often employed plants worldwide by traditional healers for ethnomedicinal plant mixtures. Other growth forms of ethnomedicinal plants are undershrub (16.30%), subshrub (3.63%), shrubs (20%), trees (12.72%), and climbers (9.09%), respectively.

3.3.4. Parts Used

In the current study, the most used portion of the plant was the leaves (56.36%), which much surpassed other sections of the plant (Fig. 3.2). This is followed by entire plants (21.81%) and fruits (12.72%).



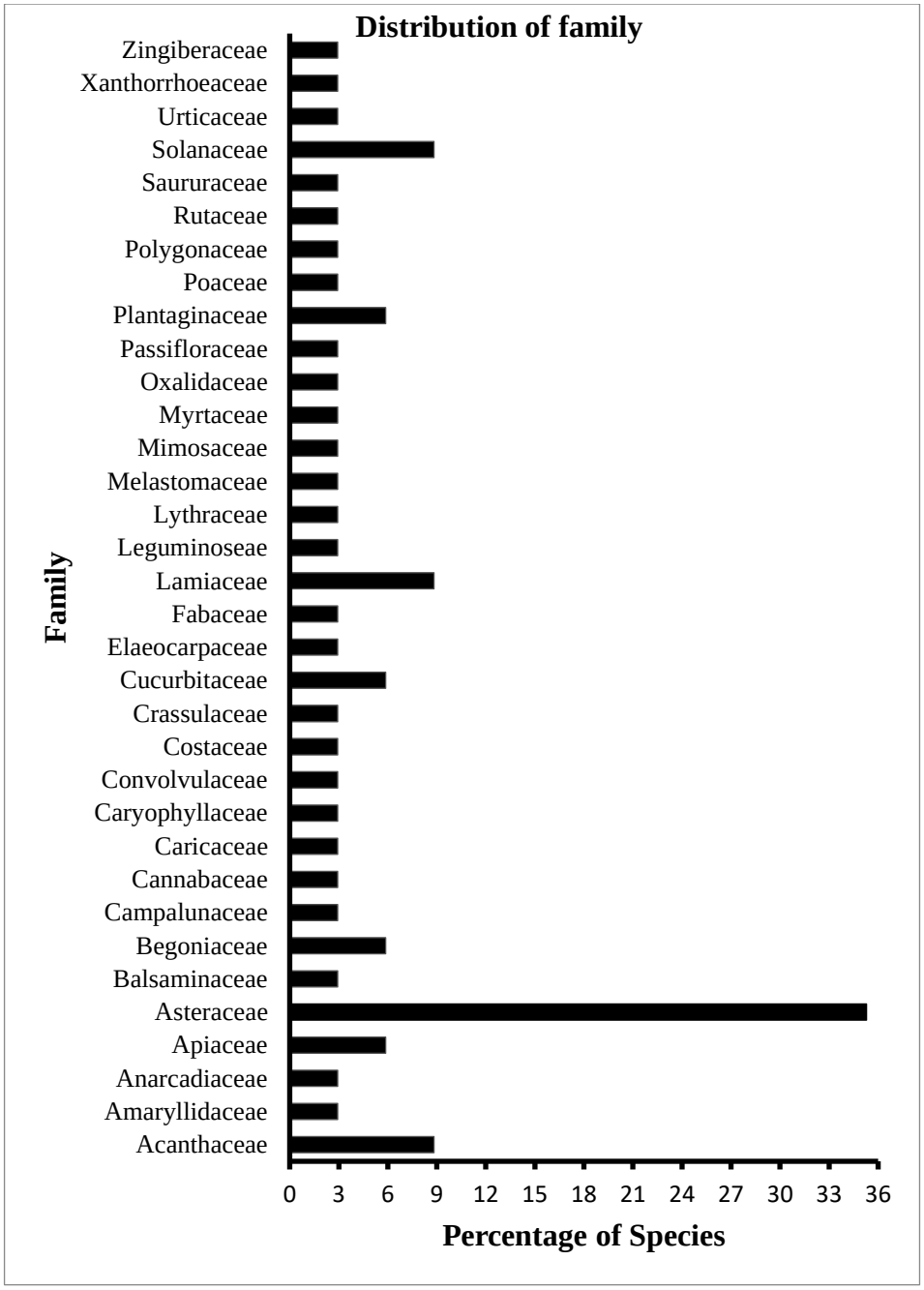


Fig. 3.2: Number of species present in the families and distributions of plant parts.

Leaves are easily accessible and desirable because they produce secondary metabolites and are active photosynthesis sites (Ghorbani, 2005). Aside from the other components of the plant, such as the bark and roots, leaves are heavily employed to avoid overexploitation, which would harm the species. Uprooting the entire plant or only the roots will eventually lead to a decrease in the population of medicinal plants (Pyakurel et al., 2018).

3.3.5. Cultivated and wild medicinal plants

Most of the plants collected in this study are not farmed and can be found in forests, mountainous trails, and paddy fields. Others are grown or found in and around the residents' homes and neighborhoods. *Aloe vera* (L.) Burm.f., *Cannabis sativa* L., and *Kaempferia parviflora* Wall Ex. Baker are widely farmed and offered in the market at a reasonable price. Because of their great medicinal worth and powerful healing properties, cultivated plants are thought to be of higher quality than those found in woods. However, according to a study conducted by Uniyal et al., (2000), no scientific investigation supports these views because the medicinal characteristics found in plants are primarily attributable to secondary metabolites. *Lobelia nummularia* Lam., *Cheilocostus speciosus* (J. Konig) C. Spect, and *Blumea lanceolaria* (Roxb) Druce are a few of the wild plants examined in this study.

Many medicinal plants can be classified as medicinal food plants, which are part of the indigenous people's daily diet. People have historically integrated medicinal herbs into their daily diets (Ramalingum and Mahomoodally, 2014). Medicinal foods are the earliest kind of therapy known to humans, as well as the most documented traditional method of treatment across many populations (Gurib-Fakim, 2011). Medicinal food derived from plants has a long history of use in Chinese traditional medicine, commonly known as Food Therapy (Weng and Chen, 1996), which is well aligned with current popular ideas.

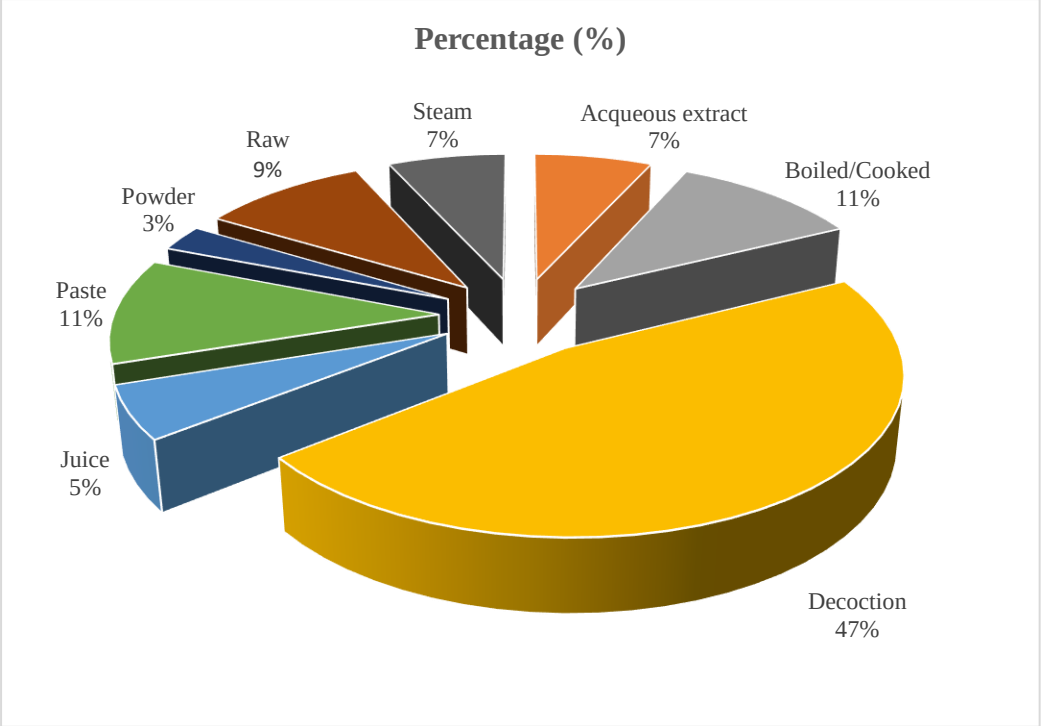
3.3.6. Mode of preparations

Plant preparations can be divided into eight categories: aqueous extract, decoction, juice, paste, powder, uncooked, soup, and steam. Extracts are fresh exudates from plants that are applied directly to the diseased area of the body. A decoction is made by boiling plant parts in water until the volume of water is decreased to the desired amount. The leaves are steeped in boiling water for at least 30 minutes to extract the most of their nutrients. The juice is used orally as is or with honey. The paste is made by crushing either fresh or dried leaves with water or oil. It is completely mashed into a smooth paste that may be applied to the skin. The fresh leaves are sun-dried or shade-dried to produce a powder, which is then smoked using rolling paper or tobacco leaves. Raw preparation involves eating fresh shoots or plant components. Soup is made by cooking plant materials such as leaves seeds, blossoms, stems, and shoots and adding salt to enhance the flavour.

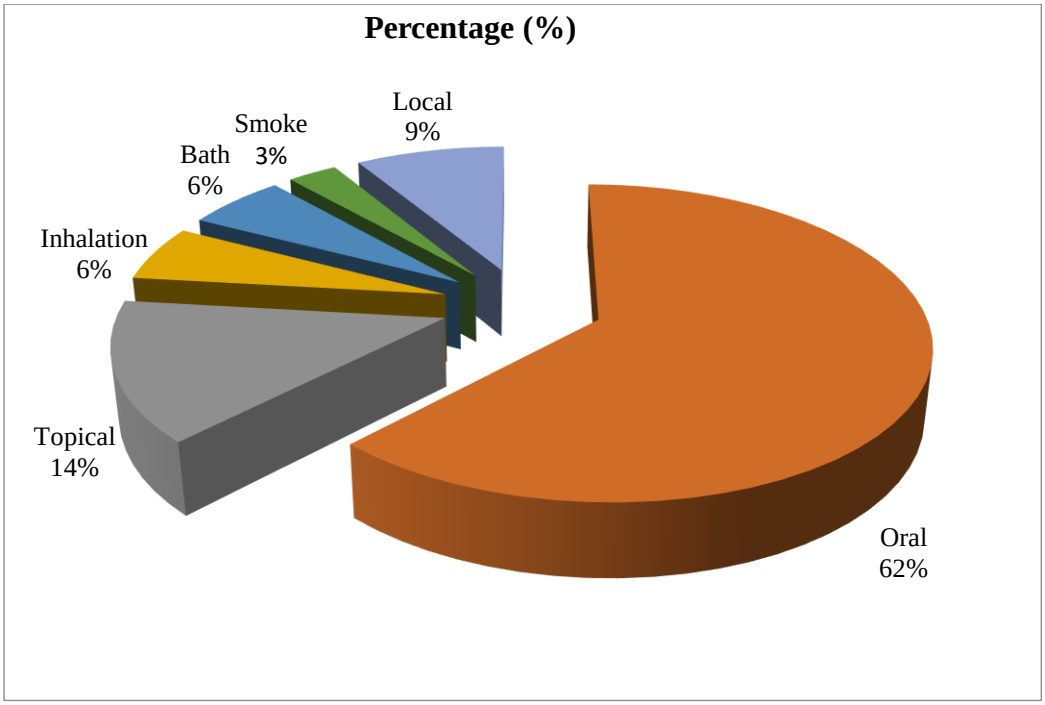
Steaming was accomplished by boiling the plants in water and inhaling the steam in a closed area, or by covering the face with a thick cloth to prevent steam from escaping from open spaces. Among the various ways of preparation of medicinal plants, most of the preparations were done in the form of decoction (46.6%) from freshly harvested plant components, primarily the leaves (Fig. 3.3a). Other research found that decoction is the most popular method of preparation in herbal medications (Panmei et al., 2019; Tangjang et al., 2011). A decoction is also the most prevalent form of administration in Chinese herbal medicine.

It is taken orally, and many people believe it is the most swiftly absorbed and effective of all traditional remedies (Yang and Ross, 2010). Other types of preparations were boiled/cooked (10.9%), paste (9.6%), aqueous extract (6.8%), steam (6.8%), juice (5.5%), and powder (2.7%). The boiled/cooked technique of preparation entails preparing edible plants with therapeutic characteristics that are incorporated into the diet. This approach is also often used in tribal populations. The paste is made by pounding the plants (leaves, roots, barks, etc.) and then applied topically to the diseased area of the skin. This type is very popular because to its simple preparation for wound healing (Ayyanar and Ignacimuthu, 2009).

The raw technique of preparation requires fewer processes and involves the direct application of raw plants; hence it is also one of the most prevalent methods of preparation. Steam inhalation is a technique in which steam is extracted from boiling water containing herbal plants and inhaled by the person at normal room temperatures. This type of treatment is used in many other ethnomedicinal investigations (Olorunnisola et al., 2013).



(a)



(b)

Fig. 3.3. Mode of preparation (a) and route of application (b)

3.3.7. Route of administrations

The findings of the current investigation revealed that plant treatments are widely categorized into six (6) categories: oral, topical, inhalation, bathing, and smoking. Oral administration accounted for 62.3% of the administration (Fig. 3.3b). Several ethnomedicinal plant research have found that oral administration is the preferred method (Tolossa et al., 2013; Singh and Singh, 2009; Bhatia et al., 2014). Oral medications are commonly used to treat cardiovascular, gastrointestinal, gynaecological, hepatic, and urological issues. Topical application accounts for 14.5% of overall administrations. Most ethnobotanical studies of medicinal plants involved oral administration followed by topical applications (Kichu et al., 2015; Chander et al., 2014). Topical applications were mostly employed in skin treatments. Other modes of application included the local route, which accounted for 8.7% and is mostly used to treat eye infections, ear infections, and headaches. Inhalation was used to treat respiratory infections. Bathing (5.8%) was primarily used to cure fevers and skin infections. Bathing to treat a specific condition, such as fever, is a rare practice among ethnomedicinal plant treatments. Other studies have found that using plants in bathing can help treat fever and skin problems. The least popular route was smoking, at 2.9% (Boer et al. 2011).

3.3.8. Incensus Conformus Factor (ICF)

The Incensus Conformus Factor (ICF) may be considered one of the most successful ways for identifying potentially beneficial medicinal plants (Trotter & Logan, 1986). The factor ranges from 0 to 1, with higher ICF values indicating a higher rate of Informant Consensus. Other ethnobotanical researchers (Heinrich, 2000; Cook, 1995) support this way of categorizing various ailments. The current study's ICF values vary from 0 to 0.96. The current study found 52 different disorders, which were further classified into 13 broad categories based on information received from respondents (Table 3.3). Liver diseases, cardiovascular disorders, and respiratory diseases had the highest ICF.

Table 3.3: Informant consensus factor (ICF).

Major diseases and their ailments	**Number of taxa (Nt)**	**Number of used reports (Nur)**	**Informant Concensus factor (ICF)**
Cardiovascular	8	80	0.91
Dermatological	12	64	0.83
Endocrinal	7	44	0.89
Fever/Malaria	5	31	0.86
Gastrointestinal	23	61	0.71
General state of health	9	58	0.88
Gynaecological	2	65	0.98
Liver diseases	5	64	0.96
Musculo-skeletal	1	35	0.00
Neoplasm	1	37	0.00
Oropharyngeal/Ear infection	9	40	0.86
Resiratory	2	23	0.95
Urological	11	48	0.81

This means that the disorders in these categories have the highest level of agreement to be treated with herbal remedies. Plant species with the highest ICF score of 0.96 and in this category are *Luffa acutangula* (L.) Roxb*, Oroxylum indicum* (L.) Kurtz*, Cuscuta reflexa* Roxb, *Benincasa hispida* (Thunb) Cogn*., and Saccharum officinarum* L. *Plantago major* L., *Centella asiatica* (L.) Urb., *Passiflora edulis* Sims, *Clerodendrum glandulosum* Lindl, *Solanum indicum* L., *Phlogocanthus thyrsiformis* (Roxb. Ex. Hardw.) Mabb., *and Justicia adhatoda* L. were listed as having the second-highest ICF value (0.92).

The high ICF value for liver and cardiovascular disorders could be related to the prevalence of such diseases, extensive knowledge, and the easy availability and richness of plant species in the study area. The other explanation could be its strong efficacy in treating specific disorders. Local healers in Manipur use ethnomedicinal plants to cure liver problems efficiently (Thokchom et al., 2018). The gynecological, musculoskeletal, and neoplasm groups had the lowest ICF values, all of which were 0.

3.3.9. Fidelity Level

The fidelity level (FL) represents the percentage of respondents who claim to use a specific plant for the same principal reasons. The faithfulness level of each species was computed for each category using the data in Table 3.4. A high-Fidelity level number indicates the most popular plants used to cure a specific condition. The Fidelity level of plant species for certain illnesses in the current study region ranges from 19.23 to 100%. The results of the current study revealed that at least four plant species had a 100% FL value. *Centella asiatica* (L.) Urb., *Clerodendrum glandulosum* Lindl., *and Solanum indicum* L. were used to treat hypertension, and *Centella asiatica* (L.) Urb. was also used to treat gastrointestinal disorders (Cheng and Koo, 2000).

Table 3.4: Percentage of Fidelity level

Species with specific ailments	**Fidelity Level (%)**
Cardiovascular	
Plantago major L. (Hypertension)	89.65
Centella asiatica (L.) Urb. (Hypertension)	100.00
Passiflora edulis Sims (Hypertension)	93.58
Clerodendrum glandulosum Lindl. (Hypertension)	100.00
Solanum indicum L. (Hypertension)	100.00
Phlogocanthus thyrsiformis (Roxb.ex.Hardw.) Mabb. (Hypertension)	83.33
Justicia adhatoda L. (Hypertension)	81.48
Phlogocanthus pubinervius T. Anderson (Hypertension)	40.00
Dermatological	
Ageratum conyzoides (L.) L. (Antibiotic/Antiseptic)	82.85
Bryophyllum pinnatum (Lam.) Oken (Cuts and burns)	45.71
Plantago major L. (Boil sepsis)	37.93
Rhus chinensis var. chinensis (Chicken pox)	53.33
Artemisia nilagirica (C.B.Clarke) Pamp. (Body odour, Skin rashes)	50.00
Begonia palmata D. Don (Chicken pox, Measles)	35.71
Aloevera (L.) Burm.f. (Cuts and burns)	91.66
Eryngium foetidum L. (Burns)	90.00
Phlogocanthus thyrsiformis (Roxb.ex.Hardw.) Mabb. (Skin itching)	26.66

Justicia adhatoda L. (Skin itching)	62.96
Impatiens balsimina L. (Antibiotic)	77.77
Erythrina variegate L. (Skin Allergy)	64.00
Endocrinal	
Eupatorium adenopharum Hort.Berol.ex Kunth (Diabetes)	69.3
Oroxylum indicum (L.) Kurz. (Diabetes)	68.57
Melastoma malabathricum L. (Diabetes)	76.66
Scoparia dulcis L. (Diabetes)	50.00
Debregeasia longfolia (Burm.f.) Wedd. (Diabetes)	60.00
Chromolaena odorata (L.) R.M.King and H.Rob. (Diabetes)	76.19
Punica granatum L. (Diabetes)	29.03
Fever/Malaria	
Scoparia dulcis L. (Fever)	75.00
Carica papaya L. (Malaria)	89.28
Phlogocanthus thyrsiformis (Roxb.ex.Hardw.) Mabb. (Fever)	96.66
Justicia adhatoda L. (Fever)	74.07
Phlogocanthus pubinervius T.Anderson (Fever)	86.66
Gastrointestinal	
Melastoma malabathricum L. (Gastrointestinal problem)	26.66
Oroxylum indicum (L.) Kurz. (Dysentry, Piles)	80.00
Datura metel L. (Gastrointestinal problem)	83.33
Scoparia dulcis L. (Gastrointestinal problem)	75.00
Solanum torvum Sw. (Gastrointestinal problem)	50.74
Crassocephalum crepidioides (Benth.) S. Moore (Gastrointestinal problem)	21.62
Acmella paniculata (Wall. Ex DC.) R.K. Jansen (Hookworm infestations, Piles)	66.66
Plantago major L. (Intestinal wall thickness)	43.10
Centella asiatica (L.) Urb. (Gastrointestinal problem)	100.00
Psidium guajava L. (Diarrhoea / Dysentry)	80.00
Bidens pilosa L. (Digestive problem)	60.00
Mikania micrantha Kunth (Piles)	68.75

Solanum indicum L. (Mouth ulcers, stomache)	76.66
Aloevera (L.) Burm.f. (Heart burn)	76.66
Elaeocarpus floribundus Blume (Gastrointestinal problem)	50.00
Cannabis sativa L. (Dysentry)	26.31
Zanthoxylum acanthopodium DC. (Indigestion)	66.66
Kaempferia parviflora Wall. Ex Baker (Epigestic pain, Dysentry, Piles)	78.08
Mentha spicata L. (Carminative)	65.51
General state of health	
Solanum torvum Sw. (Headache)	26.86
Bidens pilosa L. (Anti-inflammatory)	33.33
Benincasa hispida (Thunb.) Cogn. (Blood purifier)	87.17
Blumea flava DC (Headache)	35.13
Phlogocanthus thyrsiformis (Roxb.ex.Hardw.) Mabb.	40.00
Cough and cold	
Justicia adhatoda L. (Cough and cold)	44.44
Phlogocanthus pubinervius T.Anderson (Cough and cold)	20.00
Cannabis sativa L. (Appetiser)	21.05
Zanthoxylum acanthopodium DC. (Cough)	33.33
Mentha spicata L. (Cough and cold)	58.62
Gynaecological	
Mimosa pudica L. (Fomentation after childbirth for faster healing, White discharge in women)	95.23
Liver diseases	
Luffa acutangula (L.) Roxb. (Liver diseases)	77.77
Oroxylum indicum (L.) Kurz. (Liver diseases)	85.71
Cuscuta reflexa Roxb. (Liver diseases)	44.73
Benincasa hispida (Thunb.) Cogn. (Liver diseases)	97.43
Saccharum officinarum L. (Liver diseases)	74.28
Musculo-skeletal	
Mikania micrantha Kunth (Sprain)	62.50
Neoplasm	
Blumea lanceolaria (Roxb.) Druce (Cancer)	81.08

Oropharyngeal/Ear infection	
Melastoma malabathricum L. (Tongue ulcers)	40.00
Houttuynia cordata Thunb. (Tonsilitis)	50.00
Oxalis corniculata L. (Sinusitis)	70.83
Drymaria cordata (L.) Willd. Ex Schult. (Sinusitis)	53.33
Cheilocostus speciosus (J.Konig) C.Specht (Ear infection)	50.00
Solanum indicum L. (Mouth ulcers)	93.75
Elsholtzia communis Benth. (Pharyngitis)	50.00
Zanthoxylum acanthopodium DC. (Toothache)	83.33
Solanum myriacanthum Dunal (Dental caries)	80.00
Respiratory	
Centella asiatica (L.) Urb. (Asthma)	19.23
Kaempferia parviflora Wall. Ex Baker (Lungs diseases)	38.35
Urological	
Oroxylum indicum (L.) Kurz. (Kidney diseases (oedema))	91.42
Cajanus cajan (L.) Millsp. (Kidney diseases (oedema))	50.00
Houttuynia cordata Thunb. (Kidney stones)	75.00
Plantago major L. (Kidney stones)	55.17
Lobelia mummularia Lam. (Kidney stones)	83.33
Rhus chinensis var. chinensis (Kidney stones)	53.33
Xanthium strumarium L. (Kidney stones)	90.00
Mimosa pudica L. (Urethritis)	84.12
Begonia palmata D.Don (Kidney stones)	50.00
Persicaria chinensis (L.) H. Gross (Kidney stones)	71.42
Allium hookeri Thwaites (Micturition)	45.71

While *Centella asiatica* (L.) Urb. was effective in treating hypertension, it had the lowest fidelity rate of 19.23% in treating asthma. The low prevalence of disease in the research area could explain this. Another factor could be that people are turning to allopathic drugs due to the tendency of treating increasingly serious ailments with non-herbal medications. According to Sabaragamuwa et al. (2018), *Centella asiatica* (L.) Urb. is a herbal plant that is highly valued for its medicinal properties and for treating oxidative stress, inflammation,

neuron damage, neurotoxicity, anxiety, depression, ACE inhibition problems, and amyloid plaque accumulation. Pharmacological studies on the Clerodendrum genus have revealed that the compounds and extracts have significant anti-inflammatory, anti-nociceptive, antioxidant, antihypertensive, anticancer, antimicrobial, anti-diarrhoeal, hepatoprotective, hypoglycemic, hypolipidemic, memory enhancing, and neuroprotective properties, among other activities. Other investigations have directly validated the effective usage of the Centella and Clerodendrum genera, which is consistent with current traditional beliefs (Wang et al., 2018).

3.4. Conclusions

The necessity for an ethnomedicinal plant study is more than ever. The study's locations proved to be appropriate for ethnomedicinal plant research. Although scientific advancements have led to the use of allopathic pharmaceuticals to cure ailments, a significant proportion of people continue to rely on medicinal plants to treat any sickness. The World Health Organization reported that herbal medications are used by vast populations, and this is true for people in these regions. Folks continue to rely on herbal plants mostly because of their low or no hazardous effects, ease of access to the plants, and the lack of healthcare facilities in the region due to its remote highland location. During the survey, it was discovered that people still knew how to employ plants and their preparations to cure most ailments. People were also well-versed in the usage of plants. The Thadou-Kuki tribe of Manipur has a rich culture and customs, as well as a wealth of information about ethnomedicinal herbs. However, despite extensive experience and knowledge of plants in disease treatment, a scientific study of the reported plants is required for proper documentation, identification, standardization, and validation, which will eventually guide us in the development of new drugs and the production of naturally derived products in the future. People gathered or used ethnomedicinal plants, either directly or indirectly, to produce food or vegetables. This cycle establishes an unbreakable bond between people and therapeutic plants. The collected data will be extremely valuable to conservationists, scholars, and others. Authorities must oversee the proper use of these plants in terms of sustainability and conservation, as they are under threat of overexploitation. Uprooting entire plants for medical purposes should be prohibited, particularly for vulnerable plant species, to promote plant conservation. Furthermore, our findings will be used as baseline data to establish a relationship between traditional knowledge specialists and scientific researchers.

Given the higher Fidelity value in the cardiovascular section and the Consensus information discovered, it was agreed upon that further physicochemical analysis and the potential antihypertensive activity would be carried out in the plants namely - *Passiflora edulis* Sims, *Plantago major* L, *Clerodendrum glandulosum* Lindl., *Solanum indicum* L, *Centella asiatica* (L) Urb and *Phlogocanthus thyrsiformis* (Roxb. Ex. Hardw.) Mabb. All 80 respondents strongly agreed on the use of these plants to treat cardiovascular illnesses.

भारत सरकार / GOVERNMENT OF INDIA
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय / MINISTRY OF ENVIRONMENT, FORESTS & CLIMATE CHANGE
वैज्ञानिक –ई कार्यालय / OFFICE OF SCIENTIST - E
भारतीय वनस्पति सर्वेक्षण / BOTANICAL SURVEY OF INDIA
पूर्वी क्षेत्रीय केन्द्र / EASTERN REGIONAL CENTRE
शिलांग–793 003 / SHILLONG-793003

दूरभाष /Telephone: 0364- 2223971, 2223618 ई-मेल / e-mail-bsibsishll@yahoo.co.in Telefax: 0364 -2224119

संख्या /No.: BSI/ERC/ Tech/2017/ 283 दिनांक /Dated: 07.08.2017

To,

Nemnunhoi Haokip
Ph.D Scholar
Department of Food Engg. & Tech
Tezpur University, Assam.

विषय/Sub.: Identification of herbarium species- Reg.

Dear Nemnunhoi,

With reference to your letter no. NIL dated 31/07/2017, regarding identification of plant specimens, it is hereby informed that the following plant specimens are identified at ASSAM.

Sl. No	**Voucher No.**	**Botanical Name**	Family
1	Specimen no. 1	*Eupatorium adenophorum* Hort.Berol. ex Kunth	Asteraceae
2	Specimen no. 2	*Melastoma malabathricum* L.	Melastomaceae
3	Specimen no. 3	*Luffa acutangula* (L.) Roxb.	Cucurbitaceae
4	Specimen no. 4	*Oroxylum indicum* (L.) Kurz.	Bigoniaceae
5	Specimen no. 5	*Cajanus cajan* (L.) Millsp.	Leguminosae
6	Specimen no. 6	*Ageratum conyzoides* (L.) L.	Asteraceae
7	Specimen no. 7	*Datura metel* L.	Solanaceae
8	Specimen no. 8	*Scoparia dulcis* L.	Plantaginaceae
9	Specimen no. 9	*Solanum torvum* Sw.	Solanaceae
10	Specimen no. 10	*Bryophyllum pinnatum* (Lam.) Oken	Crassulaceae
11	Specimen no. 11	*Crassocephalum crepidioides* (Benth.) S.Moore	Asteraceae

Thanking You/ सधन्यवाद

भवदीय /Yours Sincerely,
7/8/2017
(Dr. A.A. MAO)
वैज्ञानिक-च एवं कार्यालय प्रमुख/ Scientist-F & HoO

भारत सरकार/GOVERNMENT OF INDIA
पर्यावरण वन एवं जलवायु परिवर्तन मंत्रालय/MINISTRY OF ENVIRONMENT, FOREST & CLIMATE CHANGE
भारतीय वनस्पति सर्वेक्षण/BOTANICAL SURVEY OF INDIA
प्रभारी वैज्ञानिक का कार्यालय/OFFICE OF THE SCIENTIST IN-CHARGE
पूर्वी क्षेत्रीय केंद्र/EASTERN REGIONAL CENTRE
शिलांग-793003/SHILLONG - 793003

भारतीय वनस्पति सर्वेक्षण
BOTANICAL SURVEY OF INDIA

दूरभाष/Telephone: 0364- 2223971, 2223618ई-मेल/e-mail- bsibsishll@yahoo.co.inTelefax: 0364- 2224119

संख्या/No.: BSI/ERC/Tech/2019/613 दिनाक/Dated: 20.11.2019

सेवा मे/To,
Miss Nemnunhoi Haokip
Tezpur University, Assam

विषय/Sub.: Identification and authentication of plant species.

Dear Miss Haokip,

With reference to your letter No. nil dated 26/07/2019 regarding the subject cited above, I am to inform you that your plant specimens have been identified and confirmed as below.

Sl.	Specimen No.	Species	Family
1.	1	*Passiflora edulis* Sims	Passifloraceae
2.	2	*Cheilocostus speciosus* (J.König) C.Specht	Costaceae
3.	4	*Clerodendrum glandulosum* Lindl.	Lamiaceae
4.	5	*Rhus chinensis* var. *chinensis*	Anacardiaceae
5.	6	*Benincasa hispida* (Thunb.) Cogn.	Cucurbitaceae
6.	7	*Osbeckia stellata* Buch.-Ham. ex Ker Gawl.	Melastomaceae
7.	8	*chromolaena odorata* (L.) R.M.King & H.Rob.	Astaraceae
8.	9	*Mikania micrantha* Kunth	Asteraceae
9.	10	*Xanthium strumarium* L.	Asteraceae
10.	17	*Artemisia nilagirica* (C.B.Clarke) Pamp.	Astaraceae
11.	18	*Solanum indicum* L.	Solanaceae
12.	19	*Mimosa pudica* L.	Mimosaceae
13.	20	*Begonia palmata* D.Don	Begoniaceae
14.	22	*Elaeocarpus floribundus* Blume	Elaeocarpaceae
15.	24	*Carica papaya* L.	Caricaceae
16.	25	*Aloe vera* (L.) Burm.f.	Xanthorrhoeaceae
17.	26	*Punica granatum* L.	Lythraceae
18.	27	*Oxalis corniculata* L.	Oxalidaceae

Thank you / सधन्यवाद

भवदीय/Yours sincerely
Deori 20/11/19
(Dr. Chaya Deori)
वैज्ञानिक- D एवं कार्यालय प्रमुख/ Scientist-D & HoO

भारत सरकार/GOVERNMENT OF INDIA
पर्यावरण वन एवं जलवायु परिवर्तन मंत्रालय/MINISTRY OF ENVIRONMENT, FOREST & CLIMATE CHANGE
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दूरभाष/Telephone: 0364- 2223971, 2223618ई-मेल/e-mail- bsibsishll@yahoo.co.inTelefax: 0364- 2224119

संख्या/No.: BSI/ERC/Tech/2019/419 दिनाक/Dated: 29.08.2019

सेवा मे/To,

Miss Nemnunhoi Haokip
Ph.D Scholar
Tezpur University, Assam

विषय/Sub.: Identification and authentication of plant species-reg.

Dear Miss Haokip,

With reference to your letter No. nil dated 26/07/2019 regarding the subject cited above, I am to inform you that your plant specimens have been identified and confirmed as below.

Sl.	Specimen No.	Species	Family
1.	05	*Persicaria chinensis* (L.) H. Gross	Polygonaceae
2.	26	*Houttuynia cordata* Thunb.	Saururaceae
3.	22	*Oxalis corniculata* L.	Oxalidaceae
4.	27	*Ageratum conyzoides* (L.) L.	Asteraceae
5.	11	*Acmella paniculata* (Wall. ex DC.) R.K.Jansen	Asteraceae
6.	12	*Plantago major* L.	Plantaginaceae
7.	14	*chromolaena odorata* (L.) R.M.King & H.Rob.	Astaraceae
8.	15	*Drymaria cordata* (L.) Willd. ex Schult.	Caryophyllaceae
9.	16	*Centella asiatica* (L.) Urb.	Apiaceae
10.	20	*Lobelia nummularia* Lam.	Campanulaceae
11.	21	*Cuscuta reflexa* Roxb.	Convolvulaceae
12.	23	*Psidium guajava* L.	Myrtaceae
13.	17	*Bidens pilosa* L.	Astaraceae
14.	13	*Ageratina adenophora* (Spreng.) R.M.King & H. Rob.	Asteraceae
15.	03	*Debregeasia longifolia* (Burm.f.) Wedd.	Urticaceae

Thank you / सधन्यवाद

भवदीय/Yours sincerely

Deori 29/08/19

(Dr. Chaya Deori)
वैज्ञानिक- D एवं कार्यालय प्रमुख/ Scientist-D & HoO/ic

ETHN0 MEDICINAL RESEARCH CENTRE

Supported by: SEED & KIRAN Division, Department of Science & Technology, Govt. of India

No. FEEDS/EMRC/Plant Tax./Plant Iden./2020/01 Date 27.03.2020

To
Miss Nemnunhoi Haokip
Deptt.of Food Engg. & Tech
Tezpur University, Assam

Subject: Identification and Authentication of plant species

Dear Miss Haokip

With reference to your letter No. Nill, dated 18th March 2020 regarding the subject cited above, I am to inform you that your plant specimens have been identified and confirmed as below:

Sl. no.	Specimen (Voucher no.)	Local name	Scientific name	Family
1.	HAOKIP 40	*Puhlou*	**Blumea flava** DC.	Asteraceae
2.	HAOKIP 41	*ChangkuongPatikhom*	**Eryngium foetidum** L.	Apiaceae
3.	HAOKIP 42	*Ahmutan*	**Persicaria chinensis** (L.) H. Gross	Polygonaceae
4.	HAOKIP 43	*KoulhouAeng*	**Phlogacanthus thyrsiformis** (Roxb. ex. Hardw.) Mabb.	Acanthaceae
5.	HAOKIP 44	*KolhouAkang*	**Justicia adhatoda** L.	Acanthaceae
6.	HAOKIP 45	*Kolhou Asan*	**Phlogacanthus pubinervius** T. Anderson	Acanthaceae
7.	HAOKIP 46	*Lengmasel*	**Elsholtzia communis** Benth.	Lamiaceae
8.	HAOKIP 47	*Ganja*	**Cannabis sativa** L.	Cannabaceae
9.	HAOKIP 48	*Boulje*	**Blumea lanceolaria** (Roxb.) Druce	Asteraceae
10.	HAOKIP 49	*Lingnamse*	**Zanthoxylum acanthopodium** DC.	Rutaceae
11.	HAOKIP 50	*LouthulPeh*	**Allium hookeri** Thwaites	Amaryllidaceae
12.	HAOKIP 51	*Noisan*	**Impatiens balsamina** L.	Balsaminaceae
13.	HAOKIP 52	*Ailaivom*	**Kaempferia parviflora** Wall. ex Baker	Zingiberaceae
14.	HAOKIP 53	*Hanaling*	**Solanum myriacanthum** Dunal	Solanaceae
15.	HAOKIP 54	*Kolchu Kang*	**Saccharum officinarum** L.	Poaceae
16.	HAOKIP 55	*HampaNamse*	**Mentha spicata** L.	Lamiaceae
17.	HAOKIP 56	*Songko Kang*	**Erythrina variegata** L.	Fabaceae

Thanking you.

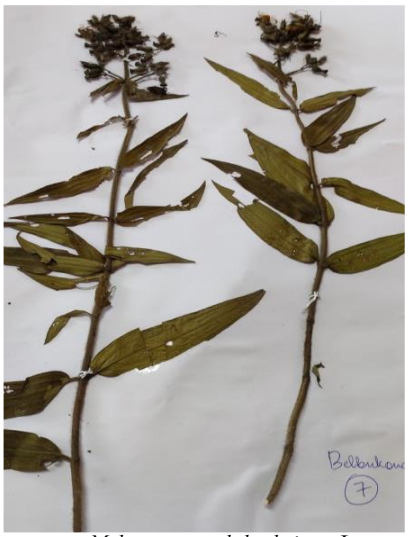
Yours Sincerely

K. Tilotama Devi

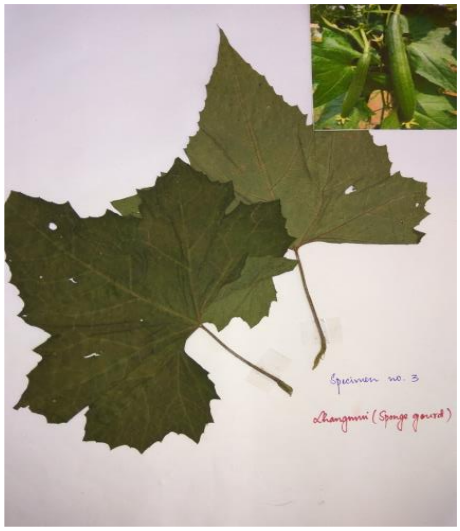
(KANGJAM TILOTAMA DEVI, Ph.D.)
Scientist (Plant Taxonomy)/Herbarium in-charge

FEEDS - KVK Sylvan Campus, Hengbung, P.O. Kangpokpi - 795129, Manipur, India
E-mail: dsthokchom@gmail.com; Mobile: +91-9612929936

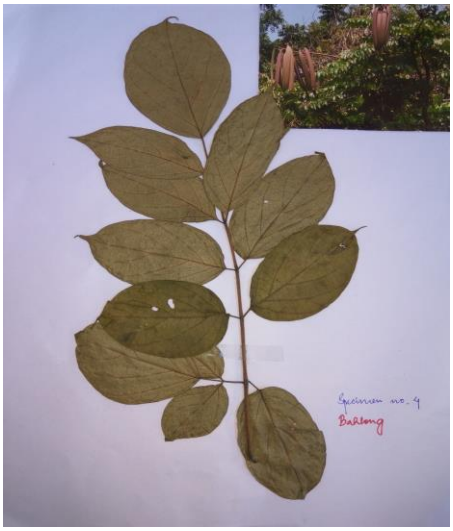
Eupatorium adenopharum Hort. Berol. ex Kunth



Melastoma malabathricum L.



Luffa acutangula (L.) Roxb.



Oroxylum indicum (L.) Kurz.

Cajanus cajan (L.) Millsp

Ageratum conyzoides (L.) L.

Datura metel L.

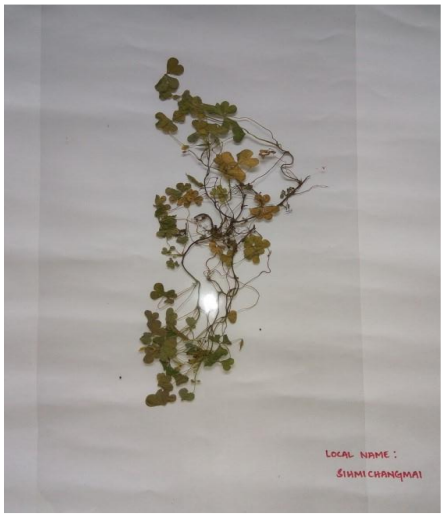
Scoparia dulcis L.

Solanum torvum Sw.

Bryophyllum pinnatum (Lam.) Oken

Crassocephalum crepidioides (Benth.) S. Moore

Houttuynia cordata Thunb.



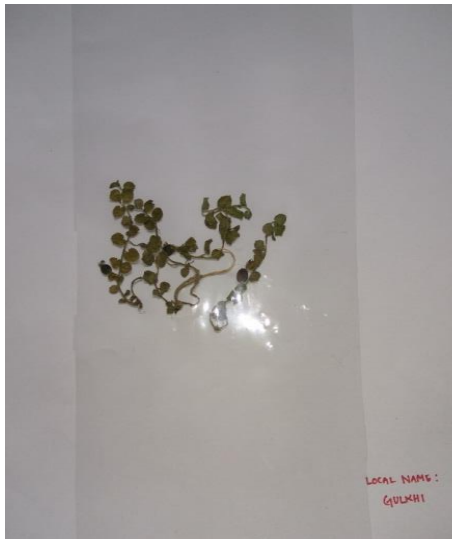
Oxalis corniculata L.

Acmella paniculata (Wall. Ex DC.) R. K. Jansen

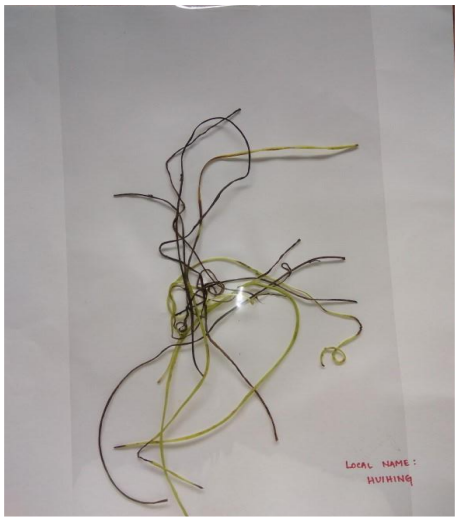
Plantago major L.

Drymaria cordata (L.) Willd. Ex Schult.

Centella asiatica (L.) Urb.



Lobelia nummularia Lam.



Cuscuta reflexa Roxb.

Psidium guajava L.

Bidens pilosa L.

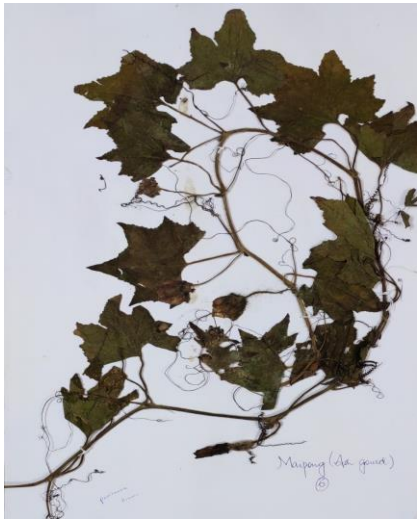
Debregeasia longifolia (Burm.f.) Wedd.

Passiflora edulis Sims

Cheilocostus speciosus (J.Konig) C. Specht

Clerodendrum glandulosum Lindl.

Rhus chinensis var. chinensis



Benincasa hispida (Thunb.) Cogn.

Mikania micrantha Kunth

Xanthium strumarium L.

Artemisia nilagirica (C.B.Clarke) Pamp.

Solanum indicum L.

Mimosa pudica L.

Begonia palmata D. Don

Chromolaena odorata (L.) R. M. King & H. Rob.

Carica papaya L.

Aloe vera (L.) Burm. f.

Punica granatum L.

Elaeocarpus floribundus Blume

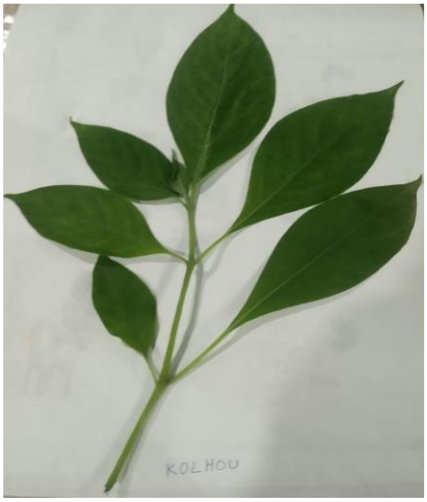
Blumea flava D C

Eryngium foetidum L.

Persicaria chinensis (L.) H. Gross

Phlogocanthus thyrsiformis (Roxb. ex. Hardw.) Mabb.

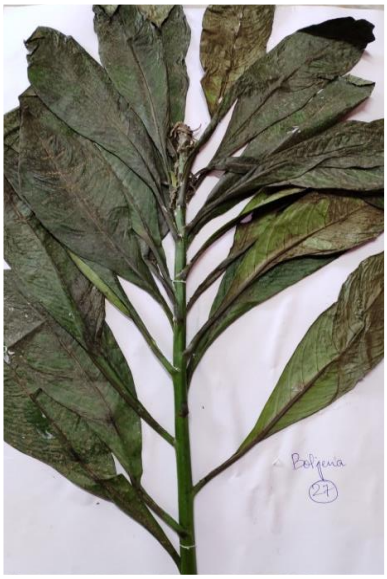
Justicia adhatoda L.



Phlogocanthus pubinervius T. Anderson

Elsholtzia communis Benth.

Cannabis sativa L.



Blumea lanceolaria (Roxb.) Druce

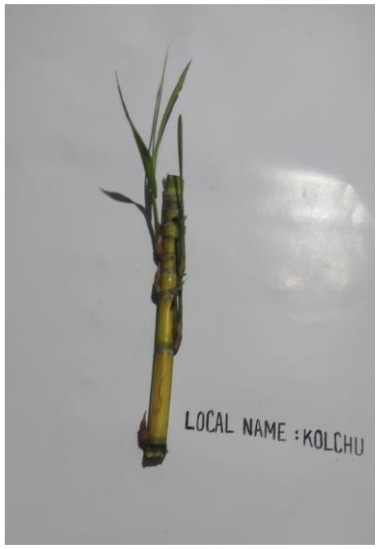
Zanthoxylum acanthopodium D C.

Allium hookeri Thwaites

Impatiens balsimina L.

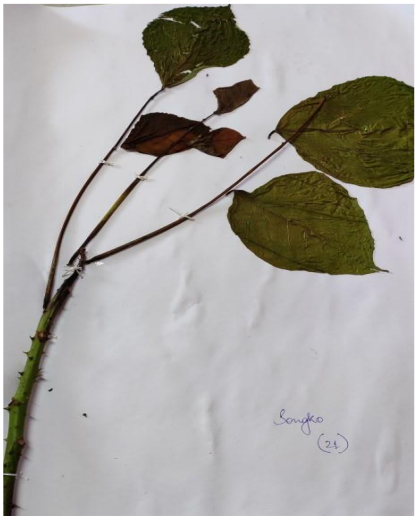
Kaempferia parviflora Wall. ex Baker

Solanum myriacanthum Dunal



Saccharum officinarum L.

Mentha spicata L.



Erythrina variegate L.