

## Ethnomedicinal plants used by the tribal inhabitants of two of the wettest places on earth: An overview

M Wanlambok Sanglyne, Carefulness M Dirborne, Donald H Nongkynrih  
Department of Botany, North Eastern Hill University, Shillong, Meghalaya, India

### Abstract

The present study aim to record locally available plants of ethno-medicinal importance used by the tribal people of the villages of Sohra (Cherrapunjee) and Mawsynram, two places located in the East Khasi Hills District of Meghalaya that currently hold the 1<sup>st</sup> and 2<sup>nd</sup> place in the list of Wettest places on Earth. A total of 110 plant species belonging to 92 genera and 56 families were found to be used traditionally in curing various ailments and diseases as per data collected in these two villages. Of these 110 plant species, the dominant family with maximum number of species being used in traditional medicines was documented to be Asterceae with 8 number of species followed by Rutaceae (7 number of species), Liliaceae (6 number of species), Fabaceae (5 number of species) etc. Plant parts more frequently used are leaves followed by fruits, whole plant, roots, tubers, seeds, flowers etc.

**Keywords:** ethno-medicinal plants, Sohra, Mawsynram Meghalaya

### Introduction

Meghalaya is one of the hilly states located in the North Eastern region of India. Meghalaya means “the abode of clouds” the state’s capital city Shillong is also popularly known as the “Scotland of the East”. It comprises of 11 districts viz. South Garo Hills, South West Garo Hills, North Garo Hills, West Garo Hills, East Garo Hills, West Khasi Hills, South West Khasi Hills East Khasi Hills, Ri-bhoi, East Jaintia Hills and West Jaintia Hills District. Meghalaya lies between 25°47’-26°10’N latitude and 89°45’-92°45’ E longitude which covers an area of approximately 22,429 square KM. The state is bounded on the north, east and west by the state of Assam and on the South by Bangladesh. The Khasis, Jaintias and the Garos communities are the main inhabitants of the state. The earliest mentioned of the word ‘Khasi’ appeared is Sankardeva’s ‘Bhagavata purana’ composed nearly about 1500 A.D. in the Indo Aryan literature [2]. The State possesses a rich and diverse plant wealth that is yet to be fully utilized on a commercial scale. Such commercial utilization if done correctly could provide abundant benefit to the tribal farmers of the region. In fact, the region has a great potential for the plantation and commercialization of traditional or otherwise scientifically proven medicinal plants due to its ideal agro-climatic conditions, suitable nature of the soil and abundance of rainfall which are the key determining factors for the diverse arrays of vegetation ranging from tropical and subtropical to temperate or near temperate [3, 4].

Ethno-medicine is the traditional knowledge practiced by ethnic groups of different cultural diversities in the world using natural products (eg. flora or fauna) to cure various ailments and diseases. This type of knowledge is often handed down from generation to generation simply by means of verbal communication. With the advancement in modern medicines and medical technologies, the art of healing using traditional knowledge has become a thing of the past in modern societies which should not be supported [3, 5, 6]. However, the used of traditional medicine to cure

local ailments and diseases is rapidly gaining popularity in the world today [7]. Plants contains rich sources of useful biologically active compounds with important medicinal properties viz. anticancer, antibacterial, antidiabetic, antidepressants etc [8, 10]. In 1978, the World’s Health Organization (WHO), had estimated that around 80% of the population in all developing countries still relies on ethno medicines for their primary health care needs (Mazid *et al.*, 2012). In our country, around 65% of the general population particularly in rural areas are still dependent on traditional medicine for their health care.

Hence, it became absolutely necessary to document all traditional and indigenous knowledge of tribal communities in our nation and in the world before they are forever lost. Moreover, treatment of diseases using traditional medicines and knowledge of traditional plants hold great promises as potential sources of useful medicinal drugs that were easily available and otherwise unknown to the general population [11]. Today, 50% of the world’s modern clinical drugs originated from natural products of plants origin [12]. Therefore, this knowledge of using traditional plants to cure ailments could also serve as a useful source of future pharmaceutical research, future life-changing drugs, cancer curing drugs etc [11, 13]. Recent studies in India unearth numerous ethno medicinal knowledge and practices of various tribal communities (Debnath *et al.*, 2014). This is one such study with the objective to collect the knowledge of plants used by traditional healers in two of the wettest places on Earth viz. Mawsynram and Sohra (Cherrapunjee) of East Khasi Hills District Meghalaya and to try to assess the conservational status of these medicinal plants used by inhabitants of these two interesting places.

### Materials and Methods

#### Study Sites

The study was carried out in Sohra and Mawsynram villages situated in the East Khasi Hills District of Meghalaya lying between a coordinate of 25.284° N and 91.721° E and

25.2975° N and 91.5826° E respectively. The villages are approximately about 56 KM and 60 KM from Shillong, the state's capital city (Fig. 1). The people residing in the area are mostly of the Khasi and War communities both of which are matrilineal societies, belonging to the Austro-Asiatic language group. The cultural and traditional customs of these two communities have immense similarities, but they do speak different dialects. Cherrapunjee (Sohra) and Mawsynram are the two places in Meghalaya that received maximum rainfall annually with an average annual rainfall of 450 inches and 467 inches respectively. Up until 2019, agriculture is the main source of livelihood for the people. Extraction of limestone and manufacturing of cement in cement factories are alternative sources of income for many people in these areas. The limestone mining activities and cement factories have affected the land, water and forest of the area to a greater extent. The environmental implications visible in Sohra (Cherrapunjee) and Mawsynram Villages include depletion of forest cover, deterioration of air quality, water quality, soil, loss of flora and fauna and degradation of the agriculture fields [14]. Despite these anthropogenic disturbances in the name of development, these research areas still harbours diverse array of plants species and are home to numerous sacred grooves in the state.

### Collection of Data

Studies in these two villages were conducted during the month of July 2018 to June 2019. Through survey and interview with the local inhabitants who had traditional knowledge, the ethno-medicinal information about several plants was recorded. The inhabitants includes traditional medical healers, that mostly relies on local markets and forest products, aged people (>30 and < 95), and people who were willing to share their traditional knowledge, acquired by virtue of ancestral knowledge or past experiences all of which permanently resides in these study areas. A detailed list of plants, their vernacular names, their family, parts used, illness/diseases associated, composition and dosage were also recorded. During the survey, photographs and recorded specimens were collected to ensure correct and proper identification of species. Identifications of correct scientific names was determined with the help of existing standard literature viz. Flora of Tripura, Flora of Assam, Forest Flora of Meghalaya and several other e-floras. The resulting identification was later confirmed with BSI, Shillong, Meghalaya and some of the specimens were later deposited in the Department of Botany, NEHU for future reference.

### Statistical Analysis

The collected data were put systematically with information such as botanical name, local name, family, parts used and ethno medicinal uses attributed to each species in MS Excel spread sheets.

### Informants consensus factor (Fic)

In order to find out the homogeneity in the information gathered, an informant's consensus factors was calculated which is given by the following formula [15]:

$$FIC = \frac{N_{ur} - N_t}{N_{ur} - 1}$$

Where,  $N_{ur}$  is the number of used reported in a particular ailments category by informants and  $N_t$  is the number of

Taxa or species used to treat that particular category by informants.

### Fidelity level (FL) value

The percentage of informants claiming the used of certain plants for the same major purpose was calculated according to the Fidelity Level value formula given below:

$$Fl(\%) = \frac{I_p}{I_u} \times 100$$

Where  $I_p$  is the number of informants who independently suggested the used of numerous plant species for a particular ailments and  $I_u$  is the total number of informants mentioning the same plants for multiple diseases

### Results and Discussions

A total of 110 species belonging to 56 families and 92 genera had been recorded during this study. Out of these, maximum number of locally available medicinal plant species used by the tribal people of these two villages (Sohra and Mawsynram) belongs to the family Asteraceae (8), followed by Rutaceae (7), Liliaceae (6), Fabaceae (5), 4 species each belonging to the family Solanaceae, Euphorbiaceae, Rosaceae, 3 species each belonging to the family Orchidaceae, Poaceae, Moraceae, Apiaceae, Piperaceae, Caprifoliaceae, 2 species each belonging to the family Anacardiaceae, Araceae, Betulaceae, Rubiaceae, Oxalidaceae, Begoniaceae, Fagaceae, Chloranthaceae, Elaeagnaceae, Myrtaceae, Myricaceae and 1 species each belonging to the family Pteridaceae, Ericaceae, Arecaceae, Cyperaceae, Lauraceae, Primulaceae, Polygonaceae, Clusiaceae, Geraniaceae, Flacourtiaceae, Malvaceae, Saururaceae, Convolvulaceae, Verbenaceae, Oleaceae, Lamiaceae, Musaceae, Nephentheceae, Melastomataceae, Pandanaceae, Passifloraceae, Pinaceae, Plantaginaceae, Urticaceae, Apocynaceae, Brassicaceae, Theaceae, Smilacaceae, Gentianaceae, Taxaceae, Ranunculaceae and Rhamnaceae (Table 1). It was found that leaves are the medicinal plants parts that were most frequently used by the tribal people of these two villages in the treatment of various ailments and diseases followed by the used of fruits, roots, whole plants, seeds, tuber, bark etc. (Fig 2). These plant's parts were prepared using different modes of preparation before they are being rendered safe for usage and consumption. Some were made into a paste and applied externally while others were eaten raw or taken orally as a decoction. It is to be noted that several medicinal plants were also mixed with a variety of other plants or plant parts and other substances like lime before their use. It is a common traditional belief that such mixture enhances the medicinal properties and effectiveness of the medicine in question. Several diseases, ailments and injuries ranging from minor headache, cough, fever, cuts, wounds, fungal infections etc. to major diseases like epilepsy, paralysis, malaria, dysentery, jaundice, menorrhagia, hypertension, tumour, diarrhoea, food poisoning, rheumatism etc. can be cured using traditional medicines and traditional knowledge of plants (Table 1). It has been found that out of the 110 species recorded, 51 of these are wild plants present in nearby forests or grasslands, 40 species are both found in the wild and were also cultivated either as ornamental plants or for their medicinal properties and only 19 of the recorded species are cultivated by the tribal people either as an alternative sources of food, income or for their medicinal

value (Fig 3; Table 1). Further, out of the 110 species which belongs to 92 genera and 56 families, 89 of these are dicot, 18 are monocot, 2 belongs to Gymnosperm and 1 species to pteridophyte (Fig 4, Table 1).

A total of 40 houses containing 238 informants (143 male, 95 female) in the age group of 30-95 years were interviewed during the field visits (Table 2). Of these, 52.94% are illiterate, 24.37% have had primary education, 20.17% have had secondary education, 2.10% have had higher secondary education and 0.42% had a college's degree (Table3). Informant's Consensus factor ( $F_{IC}$ ) was maximum (0.83) for Pulmonary diseases category and minimum (0.16) for those group under others ailments/diseases category (Table4). High  $F_{IC}$  value for pulmonary diseases indicate that only a few plant species had been reported to be used for its treatment while low  $F_{IC}$  value for those ailments that were grouped under the others category (such as fever, cough, cold etc.) indicate that the informants doesn't seem to agree with one another over the use of a particular plant species. Moreover, Fidelity level value was maximum (77.77%) for *Piper beetle* group under the external injury and bleeding ailments category and was minimum (38.46%) for *Asparagus racemosus* group under the Gastrointestinal diseases category (Table5).

Traditional medicines and local practitioners play a very significant role in the healthcare system of tribal people in rural villages located in inaccessible regions with no real access to western medicines or modern health facilities [16, 17]. The tribal people of Sohra and Mawsynram Villages, the two places on Earth receiving maximum annual rainfall have a tremendous knowledge of medicinal plants. This knowledge enabled them to make crude phyto-medicinal extracts to cure various ailments as simple as common cold to as complicated as diabetes and cancer. More often than not, these traditional phyto-medicinal remedies are always associated with traditional prayers, rituals and belief. In

many instances, medicinal remedies were always blessed using traditional beliefs and rituals before they are being given for the treatment of various ailments. The present study revealed that the traditional local healers possessed a substantial knowledge about the use of different plants parts and medicinal plants for different ailments and disease types which has also been supported and corroborated in earlier studies [18]. It is evident from this study that plants like *Piper beetle* was of utmost importance to the tribal people of these two villages as an ethno-medicinal remedy. The high ethno-medicinal status of this species might be due to the fact that it is consumed along with the *Areca* nut almost in a day to day basis which is part of their culture practices. Although few plants were cited by informants during this study, the tribal inhabitants of these two villages seem to lack the knowledge, understanding and ethno-medicinal skills required for the treatment of pulmonary diseases. This could be due to the fact that lungs related diseases are not common ailments for an individual in either of these two villages. In modern societies, very few traditional healer and community elders practice herbal medicines and cure while the younger and adults generation of tribal communities have a very limited knowledge or knows nothing of the used of medicinal plants to cure illness [19]. This trend should be highly discouraged and younger generation of societies should be made aware of the usefulness of such traditional knowledge for future references and possible uses. Owing to the endangered nature of majority of the plant species in the world today, conservation management and sustainable use of locally available and endemic plants species eg *Nepenthes khasiana*, *Pinus keysi* etc. should be taught to the tribal communities so that an awareness may arise among them of the possible usefulness and value of such endemic species in a global platform and the importance to conserve other useful medicinal plant species as well

**Table 1:** Medicinal plants used by the Khasi and War communities of Sohra (Cherrapunjee) and Mawsynram

S.NO	Scientific name	Vernicular name	Family	Habit	Cultivation status	Classification	Part's use	Mode of usage	Disease associated
1	<i>Acorus calamus</i> (L)	Bet/Ryniaw	Araceae	Herb	Wild and cultivated	Monocot	Root, Leaves	Decoction is taken directly	Influenza, Headache Paralysis, Epilepsy Stomach Problem
2	<i>Adenostemma lavenia</i> (L.) Kuntze.	Soh byrthit	Compositae/ Asteraceae	Herb	Wild	Dicot	Leaves	Applied as paste	Cuts and wounds and also treated insect bite
3	<i>Adiantum phillipense</i> (Linn)	Tyrkhang khyllai	Pteridaceae	Herb	Wild	Pteridophyte	Leaves	Paste is applied	Paste of leaves is applied to fractured bones
4	<i>Aegle marmelos</i> (L.) Correa.	Sohbel	Rutaceae	Tree	Wild and cultivated	Dicot	Root, Leaves & Fruits	Decoction is taken orally	Fever, asthma
5	<i>Agapetes variegata</i> (Roxb) D.Don ex G.Don	Dieng soh jalamut	Ericaceae	Shrub	Wild	Dicot	Flowers	Eaten raw	Help relief stress and abdominal constipation
6	<i>Ageratina adenophora</i> (Spreng.) R.M. King & H. Rob.	Kynbat japan	Asteraceae	Herb	Wild	Dicot	Leaves	Applied as paste	Cuts and wounds
7	<i>Ageratum conyzoides</i> (L)	Kynbat myngai	Asteraceae	Herb	Wild	Dicot	Leaves	Paste is applied	Cuts and wounds
8	<i>Aloe barbadensis</i> Miller (L.) Burm.f.	Syntiew shylluait	Liliaceae	Herb	Wild and cultivated	Monocot	Whole plant	Made in the form of paste	Mainly for skin diseases
9	<i>Aloe vera</i> (L.) Burm.f.	U-Phan Khlaw	Liliaceae	Herb	Wild and cultivated	Monocot	Leaves	Made in the form of Paste	Paste applied to areas of fungal

									infection
10	<i>Allium hookeri</i> Thwaites.	Ja-ut	Liliaceae	Herb	Wild	Monocot	Leaves and Tubers	Eaten raw or after slight boiling	Known to boost immunity and help in intestinal diseases
11	<i>Allium sativum</i> (L)	Rynsun	Liliaceae	Herb	Cultivated	Monocot	Bulb	Bulb is fried in oil. It is taken orally.	Use for massaging new born, Cough
12	<i>Allium tuberosum</i> (Roxb)	Jyllang	Liliaceae	Herb	Wild and cultivated	Monocot	Leaves, Whole plant	Leaf decoction is used	Urinary troubles, diuretic, hypertension
13	<i>Alnus nepalensis</i> D. Don	Dieng sam	Betulaceae	Tree	Wild and cultivated	Dicot	Tree bark	Made in the form of paste	Paste applied to areas of fractured bones.
14	<i>Anoetochillus sikkimensis</i> King and Prantl.	Tiew doh-maw	Orchidaceae	Herb	Wild and cultivated	Monocot	Leaves	Made in the form of paste	Paste applied to cuts and wounds
15	<i>Anotis wightiana</i> (Wall. Ex Wight & Arn)	Shkor maina	Rubiaceae	Herb	Wild	Dicot	Whole plant, Leaves	Made in the form of a paste	Antidote for snake bite
16	<i>Antidesma bunius</i> (L.) Spreng.	Sohsyllai	Euphorbiaceae	Tree	Wild and cultivated	Dicot	Leaves	Boiled and then used	Pains in the joint
17	<i>Areca cathecu</i> L.	Kwai	Arecaceae	Tree	Wild and cultivated	Monocot	Nuts	Chew with Piper beetle along with lime	Apply on the cuts
18	<i>Artemesia vulgaris</i> L.	Jaiaw	Asteraceae	Shrub	Wild	Dicot	Whole plant	Dried and used	Malaria
19	<i>Artocarpus heterophyllus</i> Lam.	Soh Phan	Moraceae	Tree	Wild and cultivated	Dicot	Seeds	Boiled crushed and eaten	Cold and fever
20	<i>Asparagus racemosus</i> Willd.	Kynbat niangsohpet	Liliaceae	Herb	Wild	Monocot	Whole plant, Tuber	Juice is extracted and consumed	Indigestion in children, Diarrhoea and dysentery
21	<i>Averrhoa carambola</i> L.	Sohpyrshong	Oxalidaceae	Tree	Wild and cultivated	Dicot	Fruits	Ripe fruits are taken orally	Jaundice, Gallstone, Malaria
22	<i>Baccaurea ramiflora</i> Lour.	Sohmyndong	Euphorbiaceae	Tree	Wild and cultivated	Dicot	Fruits	Eaten raw	Known to ease stomach discomfort
23	<i>Betula alnoides</i> Buch.-Ham. ex D. Don	Dienglieng	Betulaceae	Tree	Wild	Dicot	Roots	Dried and grinded into powder	Indigestion and flatulence
24	<i>Begonia josephi</i> A.DC.	Jajew	Begoniaceae	Herb	Wild	Dicot	Fruits	Dried and used Decoction is taken directly	Food poisoning, Gastric Hemorrhoids ( Piles)
25	<i>Begonia roxburghii</i> A.DC.	Jangew	Begoniaceae	Herb	Wild	Dicot	Fruits, Tuber, Leaves	Decoction is use directly Paste is applied	Measles, Diarrhoea, Dysentery, Cholera
26	<i>Carex baccan</i> Nees (L)	Phlang	Cyperaceae	Herb	Wild	Monocot	Roots	Made into a paste	Fever and cough
27	<i>Castaenia sativa</i> Mill.	Soh-ot phareng	Fagaceae	Tree	Wild and cultivated	Dicot	Nuts	Crushed and mixed with honey	Applied to burns Eaten for stomach ache
28	<i>Castanopsis indica</i> (Roxb. ex Lindl.) A.DC.	Soh-ot rit/dieng soh-stap	Fagaceae	Tree	Wild	Dicot	Nuts	Eaten raw or crushed with honey	Stomach pain
29	<i>Cassia fistula</i> L.	La met	Fabaceae	Tree	Wild and cultivated	Dicot	Bark	Mixed to form a paste and is applied	Stomach pain, Bone setting/Accident
30	<i>Centella asiatica</i> (L) Urb.	Bat syiar	Apiaceae	Herb	Wild	Dicot	Whole plant	Eaten raw	Blood purification, dysentery, diarrhoea,
31	<i>Chloranthus glaber</i> (Thunb.) Makino	Soh Khriemas	Chloranthaceae	Shrub	Wild and cultivated	Dicot	Fruits and Leaves	Made into paste	Applied to fungal infection associated with nails
32	<i>Cinnamomum tamala</i> (Nees & Eberm.)	La tyrppad	Lauraceae	Tree	Wild and cultivated	Dicot	Leaves & Bark	Leaves are fried in oil. Dried and used	Toothache, Gastric, Throat problem
33	<i>Citrus latipes.</i> (Swingle)	Sohkymphor	Rutaceae	Tree	Wild and cultivated	Dicot	Fruits, Leaves	Made into a paste	Joint pain, Gout, Rheumatism,

									Rashes, Ringworm
34	<i>Citrus macroptera</i> Montrouz.	Sohkwit	Rutaceae	Tree	Wild and cultivated	Dicot	Fruits and leaves	Juice from the fruits, boiled leaves	Juice used for fever, boiled water with leaves used for bath during fever
35	<i>Citrus medica</i> (L)	Sohmad	Rutaceae	Shrub	Cultivated	Dicot	Leaves	Leaf decoction is used	Cough and Cold
36	<i>Citrus sinensis</i> (L.) Osbeck.	Soh nairiang	Rutaceae	Tree	Cultivated	Dicot	Fruits	Fruits squeezed into juice	Taken during fever
37	<i>Coix lacryma</i> (L)	Sohriew	Poaceae	Herb	Cultivated	Monocot	Leaves	Use in the form of decoction	Diarrhoea, Dysentery, Fever, Smallpox
38	<i>Colocasia esculenta</i> (L.) Schott	Wang	Araceae	Herb	Wild and cultivated	Monocot	Leaves, Rhizome	Leaves and Rhizomes are consumed	Fever and bone problems
39	<i>Cymbopogon flexosus</i> (Steud.)	Lang sying	Poaceae	Herb	Wild	Monocot	Leaves	Leaf decoction is used	Cough and cold
40	<i>Dendrobium chrysanthum</i> (Lindl)	Tiew lyngskaw	Orchidaceae	Herb	Wild and cultivated	Monocot	Stem	Made into a paste	Bone injuries/Bone fracture
41	<i>Dendrobium moschatum</i> (Buch.-Ham.)	Tiew dieng	Orchidaceae	Herb	Wild and cultivated	Monocot	Whole plant	Made into a paste	Used as ear-drops for ear pain
42	<i>Docynia indica</i> (Wall.) Decne.	Soh phoh heh	Rosaceae	Tree	Wild	Dicot	Fruits	Made into a paste mixed with other plants	Bone injuries/ bone fracture
43	<i>Elaeagnus caudata</i> Schldt. Ex Momiy.	Soh shang heh	Elaeagnaceae	Tree	Cultivated	Dicot	Fruits	Eaten raw or squeezed into juice	Used during common cold
44	<i>Elaeagnus latifolia</i> L.	Soh khlur	Elaeagnaceae	Shrub	Wild and cultivated	Dicot	Fruits	Eaten raw	Relief cough
45	<i>Embelia ribes</i> (Burm..f.)	Jiaryngkai	Primulaceae	Shrub	Wild and cultivated	Dicot	Leaves	Boil and the use	Menorrhagia
46	<i>Emblia officinalis</i> (L)	Sohmylleng	Euphorbiaceae	Tree	Wild and cultivated	Dicot	Fruits	Juice is prepared and consumed directly	Blood pressure and constipation
47	<i>Eriosema himalaicum</i> (Ohashi)	Sohpen	Fabaceae	Herb	Wild	Dicot	Tubers	Made into paste and taken orally	Bad breath
48	<i>Eryngium foetidum</i> (L)	Kynbat ksuid	Apiaceae	Herb	Wild	Dicot	Leaves	Made into paste	Epilepsy
49	<i>Erythrina arborescens</i> (Roxb)	Diengsong	Fabaceae	Tree	Wild and cultivated	Dicot	Leaves	Made into paste	Skin disease for the pig
50	<i>Eucalyptus citriodora</i> (Hook.) K.D. Hill & L.A.S.Johnson.	Kynbat tyrphin	Myrtaceae	Tree	Wild	Dicot	Leaves	Made into paste	Food poisoning
51	<i>Eupatorium adenophorum</i> (L)	Kynbat iong	Asteraceae	Herb	Wild	Dicot	Leaves	Made into paste	Apply on the injured part
52	<i>Eupatorium cannabinum</i> (L)	Kynbat nongrim	Asteraceae	Shrub	Wild	Dicot	Whole plant	Decoction is used	Diarrhoea
53	<i>Eupatorium odoratum</i> (L)	Kynbat phareng	Asteraceae	Shrub	Wild	Dicot	Leaves	Made into a paste	Wound and Stomach problem
54	<i>Fagopyrum esculentum</i> (Moench)	Jarain	Polygonaceae	Herb	Wild	Dicot	Leaves	Cook and eaten	Diabetes, Hypertension, Wound healing
55	<i>Ficus elastica</i> (Roxb.ex Hornem)	Diengjiri	Moraceae	Tree	Wild	Dicot	Leaves	Fried with oil	Ointment is applied for the treatment of body pain, paralysis
56	<i>Flemingia procumbens</i> (Roxb)	Sohphlang	Fabaceae	Herb	Wild and cultivated	Dicot	Tuber, Whole Plant	Eaten raw	Deworming and Stomach related problem
57	<i>Garcinia pedunculata</i> (Roxb. ex Buch.-Ham.)	Sohdanei	Clusiaceae	Tree	Wild and cultivated	Dicot	Fruit, Leaves	Eaten raw and made into a paste	Gastric, Rheumatism
58	<i>Geranium nepalense</i> Sweet	Kynbat lmieng	Geraniaceae	Herb	Wild	Dicot	Leaves	Eaten raw	Toothache, Bleeding gums

59	<i>Gynocardia odorata</i> (R.Br.)	Sohliang	Flacourtiaceae	Tree	Wild and cultivated	Dicot	Seeds	Made into paste	Leprosy, Rheumatism
60	<i>Hibiscus rosa-sinensis</i> (L)	Jajew	Malvaceae	Shrub	Wild and cultivated	Dicot	Leaves and flower	Made into a paste	Boils
61	<i>Houttuynia cordata</i> (Thunb)	Jamyrdoh	Saururaceae	Herb	Wild and cultivated	Dicot	Leaves	Eaten raw	Blood purification, Sores and boil
62	<i>Ipomea uniflora</i> (Burm.f.)	La-tiewroi	Convolvulaceae	Climber	Wild and cultivated	Dicot	Leaves	Consumed directly	Diarrhoea and Dysentery
63	<i>Lantana camara</i> L.	Soh pang khlieh	Verbenaceae	Shrub	Wild and cultivated	Dicot	Flowers, Fruits	Made into a paste	Snake bite
64	<i>Ligustrum lucidum</i> W.T. Aiton	Dieng soh pa iet	Oleaceae	Tree	Wild	Dicot	Fruits	Made into a paste	Bones injuries/bone fracture
65	<i>Lonicera macrantha</i> (D.Don.) Spreng.	Jyrm jrem	Caprifoliaceae	Climber	Wild	Dicot	Roots and Tuber	Dried and made into a paste	Gall stone, Dysentery
66	<i>Manihot esculenta</i> (Crantz)	Phandieng	Euphorbiaceae	Herb	Cultivated	Dicot	Bark and Tuber	Dried and made into paste	Diarrhoea, Diabetes Skin infection
67	<i>Mangifera indica</i> (L)	Sohpieng	Anacardiaceae	Tree	Cultivated	Dicot	Bark	Made into thin paste	Stomach disorder
68	<i>Mentha spicata</i> (L)	Pudina	Lamiaceae	Herb	Wild and cultivated	Dicot	Leaves, Whole plant	Eaten raw and Made into paste	Gastric
69	<i>Meyna laxiflora</i> Robyns.	Soh mon	Rubiaceae	Tree	Cultivated	Dicot	Fruits	Eaten raw or after incubation in raw rice	Diarrhoea, gastric
70	<i>Morus nigra</i> (L)	Soh langdkhur	Moraceae	Tree	Wild	Dicot	Fruits	Eaten raw	Lower body temperature
71	<i>Musa paradisiaca</i> (L)	Pashor kait	Musaceae	Herb	Cultivated	Monocot	Fruits	Cook or Eaten raw	Cholera, Liver problem
72	<i>Myrica esculenta</i> (Buch.-Ham)	Sophie	Myricaceae	Tree	Wild	Dicot	Fruits	Eaten raw	Indigestion in children, Diabetes, Fever
73	<i>Myrica nagi</i> (Thunb)	Sophie nam	Myricaceae	Tree	Wild	Dicot	Fruits	Eaten raw	Indigestion in children, Diabetes, Fever
74	<i>Nepenthes khasiana</i> (Hk.f.)	Tiew rakot	Nepenthaceae	Shrub	Wild	Dicot	Flower, Roots	Dried and grinded into powder	Stomach ache, Eye sores, Asthma
75	<i>Nicotiana tabacum</i> (L).	Duma	Solanaceae	Herb	Cultivated	Dicot	Leaves	Applied directly	Toothache, Skin disease and are use as insecticides
76	<i>Oenanthe javanica</i> (Blume) DC.	Jatira	Apiaceae	Herb	Wild and cultivated	Dicot	Leaves	Eaten raw or cooked	Aid in stomach problems
77	<i>Osbeckia capitata</i> Benth. ex Naudin	Soh lyngktuh	Melastomataceae	Herb	Wild	Dicot	Leaves, Roots	Boil and administer orally	Menorrhagia
78	<i>Oxalis corniculata</i> (L)	Jabuit	Oxalidaceae	Herb	Wild	Dicot	Leaves	Made into paste	Diarrhoea, Dysentery
79	<i>Pandanus fascicularis</i> Lam.	Shlan	Pandanaceae	Tree	Wild	Dicot	Fruits and Bark	Made into a paste	Applied to areas of bone fracture
80	<i>Passiflora edulis</i> (Sims)	Sohbrap	Passifloraceae	Climber	Cultivated	Dicot	Leaves	Grind into a juice	Dysentery
81	<i>Piper betel</i> (L)	Tympew	Piperaceae	Climber	Cultivated	Dicot	Leaves	Made into paste	Minor cuts and wounds
82	<i>Piper griffithii</i> (C.DC.)	Sohmrit khlaw	Piperaceae	Climber	Cultivated	Dicot	Seeds	Grind and mix with honey	Cough
83	<i>Piper nigrum</i> (L)	Sohmrit bam	Piperaceae	Climber	Cultivated	Dicot	Seeds	Grind and mix with honey	Chronic dysentery
84	<i>Pinus kesiya.</i> (Royle ex Gordon)	Kseh khasi	Pinaceae	Tree	Wild	Gymnosperm	Young shoot	Made into paste	Relieve cough in children
85	<i>Plantago erosa</i> (Wall)	Shkor blang	Plantaginaceae	Herb	Wild	Dicot	Leaves	Made into paste	Boils and wound
86	<i>Pouzolzia hirta</i> (Bl.)	Memsleh	Urticaceae	Herb	Wild	Dicot	Roots	Grind and boil in water	Hair tonic and hair growth
87	<i>Potentilla fulgens</i> Wall. ex Sims.	Lynniang	Rosaceae	Herb	Wild	Dicot	Roots	Eaten raw	Strengthen gums and teeth

88	<i>Prunus nepalensis</i> (Ser.) Steud.	Sohiong	Rosaceae	Tree	Cultivated	Dicot	Fruits	Eaten raw	Blood pressure, Fever
89	<i>Psidium guajava</i> (L)	Sohpyriam	Myrtaceae	Tree	Cultivated	Dicot	Leaves	Made into paste	Chronic dysentery
90	<i>Rauwolfia serpentina</i> (L.) Benth. ex Kurz	Tdong pait puraw	Apocynaceae	Shrub	Wild and cultivated	Dicot	Leaves, Roots	Made into paste	High blood pressure, Chicken pox
91	<i>Rhus semilata</i> (Murr)	Sohmluh	Anacardiaceae	Tree	Wild and cultivated	Dicot	Fruits	Made into paste	Cholera, Dysentery
92	<i>Rorippa nasturtium</i> (L.) Hayak	Tyrso – um	Brassicaceae	Herb	Wild	Dicot	Whole plant	Boil, Eat raw	Pneumonia, Pulmonary ailment
93	<i>Rubus elipticus</i> (Sm)	Sohshiah	Rosaceae	Shrub	Wild	Dicot	Fruits, Root	Made into paste	Dysentery
94	<i>Sarcandra glabra</i> (Thunb) Nakai.	Tiew krismas	Chloranthaceae	Shrub	Wild	Dicot	Leaves, Root	Made into paste	Wounds
95	<i>Schima wallichii</i> (Choisy)	Diengngan	Theaceae	Tree	Wild	Dicot	Leaves	Boil and eat	Flatulence
96	<i>Smilax ferox</i> Wall. ex Kunth.	Shiah krot	Smilacaceae	Climber	Wild	Monocot	Fruits	Boil and eat	Cholera, Gastric
97	<i>Sonchus leraceae</i> (L)	Jajew	Asteraceae	Herb	Wild	Dicot	Fruits	Eaten raw	Stomach problem, Fever, Eye problem
98	<i>Solanum khasianum</i> (Clarke)	Sohsiah	Solanaceae	Shrub	Wild	Dicot	Fruits	Eaten raw	Toothache
99	<i>Solanum nigrum</i> (L)	Sohngang	Solanaceae	Shrub	Wild and cultivated	Dicot	Leaves	Juice is extract	Eye ailment
100	<i>Solanum torvum</i> (S.W)	Sohpdok	Solanaceae	Shrub	Cultivated	Dicot	Fruits, Seeds	Made into paste	Toothache
101	<i>Swertia chirata</i> (Wall)	Charita	Gentianaceae	Herb	Wild	Dicot	Leaves, Fruits	Made into paste	Malaria
102	<i>Taxus baccata</i> (L)	Dieng seh blei	Taxaceae	Tree	Wild	Gymnosperm	Leaves	Made into paste	Tumour, Gastric
103	<i>Tamarindus indica</i> (L)	Sohkyntoi	Fabaceae	Tree	Cultivated	Dicot	Leaves, Flower	Boil and eat	Flatulence
104	<i>Thalictrum foliosum</i> (DC)	Jatira khlaw	Ranunculaceae	Herb	Wild	Dicot	Leaves, Roots	Boil and eat	Blood pressure, Boil
105	<i>Thysanolaena maxima</i> (Roxb)	Synsar	Poaceae	Herb	Wild and cultivated	Monocot	Young stem Inflorescence	Made into paste	Boil/ Worms in children
106	<i>Viburnum foetidum</i> Wall.	Sohlang ja	Caprifoliaceae	Shrub	Wild	Dicot	Fruits	Eaten raw	During high fever
107	<i>Viburnum odoratissimum</i> Ker Gawl.	Sohlang eit ksew	Caprifoliaceae	Tree	Wild	Dicot	Fruits	Eaten raw, made into a paste	During high fever, applied to cuts and wounds.
108	<i>Zanthoxylum armatum.</i> (DC)	Jaiur	Rutaceae	Tree	Wild and cultivated	Dicot	Leaves, Seed	Made into paste, Eaten raw	Stomach disorder Insecticide
109	<i>Zanthoxylum khasianum</i> (Hook.f.)	Jaiur khasi	Rutaceae	Shrub	Wild and cultivated	Dicot	Fruits	Dried and used	Cold, cough and fever
110	<i>Ziziphus jujuba</i> Mill.	Soh broi	Rhamnaceae	Tree	Cultivated	Dicot	Fruits	Eaten raw or after drying	High fever, stomach ache.

Table 2: Age and gender distribution of traditional informants

Age groups	Gender		Total respondents	Percentage (%)
	Male	Female		
30-40	33	21	54	22.69
41-50	37	29	66	27.73
51-60	35	19	54	22.69
61-70	12	12	24	10.08
71-80	15	8	23	9.66
81-90	10	5	15	6.30
90>	1	1	2	0.85
Total	143	95	238	100%

Table 3: Educational level of the informants

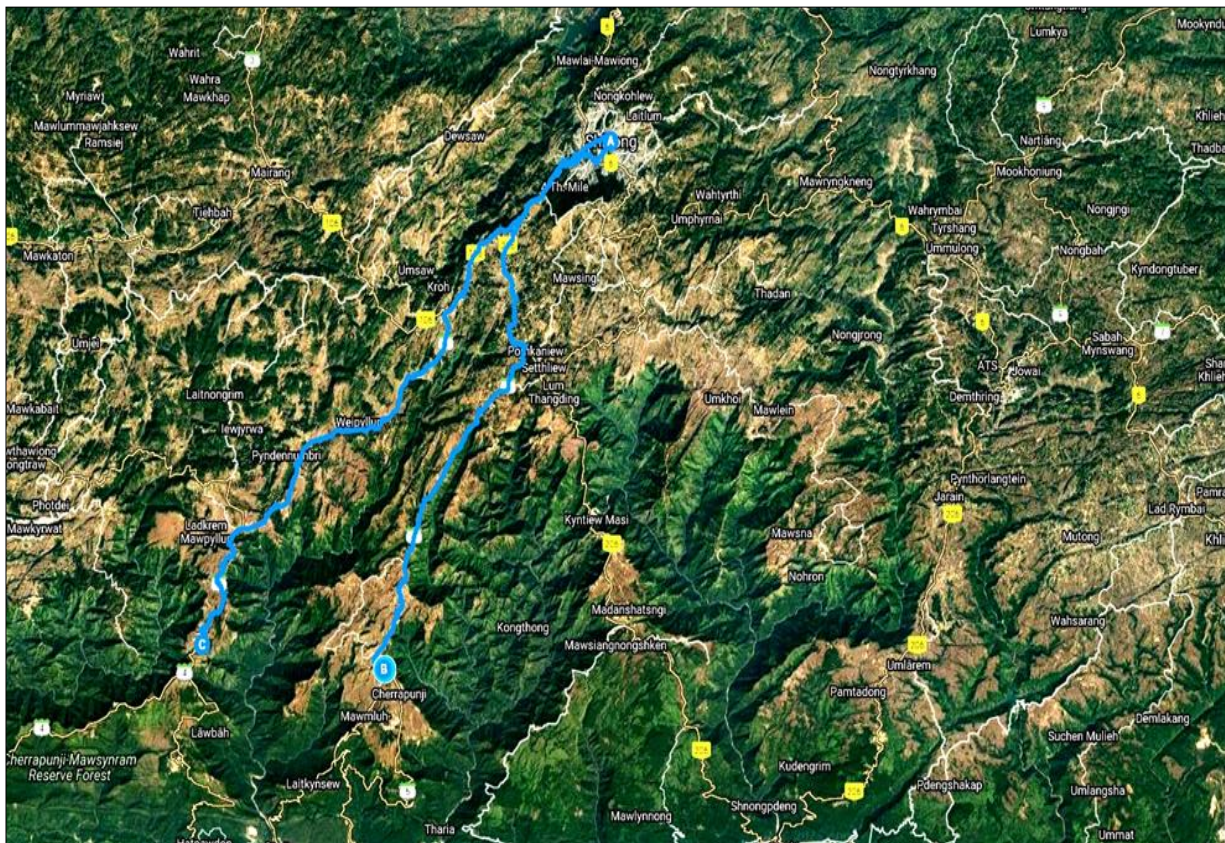
Educational level	Number of individuals	Percentage (%)
Illiterate	126	52.94
Primary	58	24.37
Secondary	48	20.17
Higher Secondary	5	2.10
College	1	0.42
University	-	-
Total	238	100

**Table 4:** Informant’s consensus factor (F<sub>IC</sub>) by diseases category

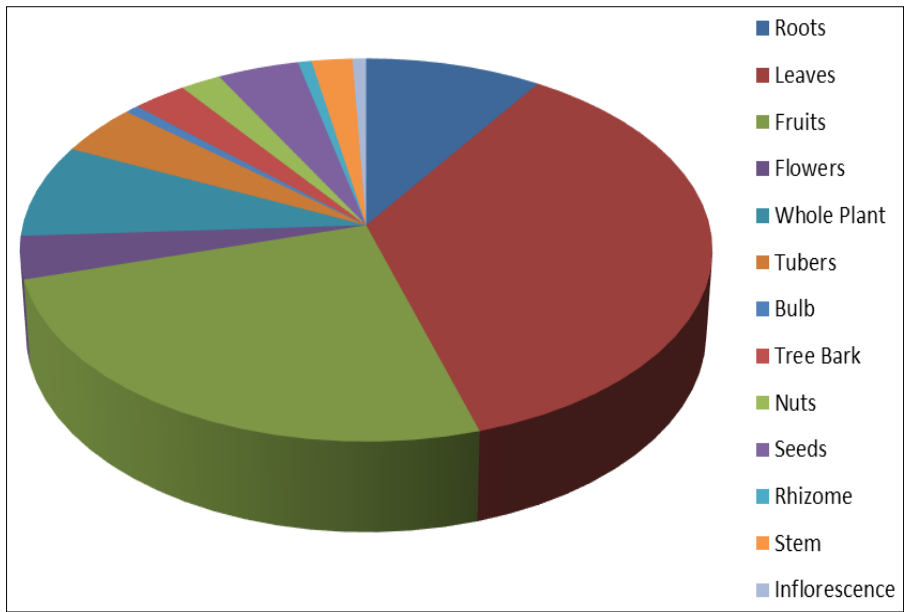
Ailments/Diseases category	Reported uses (N <sub>ur</sub> )	Number of taxa (N <sub>t</sub> )	Informant’s consensus factor (F <sub>IC</sub> )
Antidote	7	4	0.50
Blood related diseases	3	2	0.50
Cardiovascular diseases	21	6	0.75
Dermatological, fungal and bacterial infection	26	19	0.28
External injury and bleeding	57	12	0.80
Gastrointestinal	70	55	0.22
Muculoskeletal and bone fracture	51	17	0.68
Oral Dental and ENT	31	10	0.70
Pulmonary diseases	7	2	0.83
Urinogenital diseases	14	4	0.77
Neurological diseases	5	3	0.50
Respiratory ailments	26	12	0.56
Others	50	42	0.16

**Table 5:** Fidelity level value for the most medicinal plants used

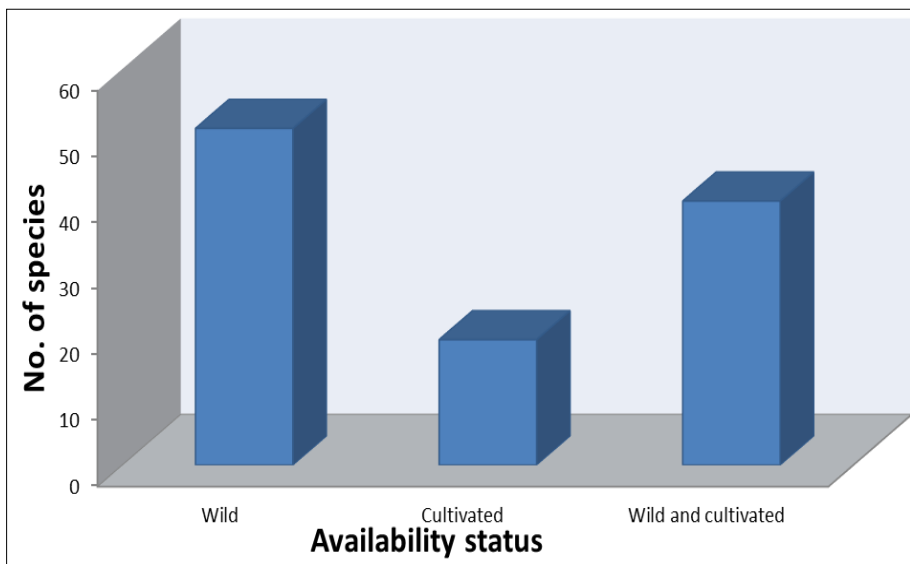
Medicinal Plants	Ailments/Diseases Category	I <sub>p</sub>	I <sub>u</sub>	FL (%)
<i>Agapetes variegata</i>	Gastrointestinal	7	11	63.64
<i>Ageratum conyzoides</i>	External injury and bleeding	9	18	50
<i>Aloe vera</i>	Dermatological, fungal and bacterial infections	17	24	70.83
<i>Asparagus racemosus</i>	Gastrointestinal	5	13	38.46
<i>Centella asiatica</i>	Blood related diseases and Gastrointestinal	11	25	44
<i>Cinnamomum tamala</i>	Oral Dental and ENT and Gastrointestinal	19	32	59.38
<i>Citrus macroptera</i>	Others (fever)	55	72	76.39
<i>Citrus medica</i>	Others (Cough and cold)	55	73	75.34
<i>Eupatorium adenophorum</i>	External injury and bleeding	13	23	56.52
<i>Fagopyrum esculentum</i>	Cardiovascular, Others (Diabetes) and external injury and bleeding	11	21	52.38
<i>Garcinia pedunculata</i>	Gastrointestinal and mucoskeletal and bone fracture	5	7	71.43
<i>Houttyunia cordata</i>	Blood related diseases and Dermatological fungal and bacterial infections	21	38	
<i>Myrica esculenta</i>	Gastrointestinal and others (Diabetes and fever related symptoms)	12	23	52.17
<i>Myrica nagi</i>	Gastrointestinal and others (Diabetes and fever related symptoms)	12	22	54.55
<i>Piper beetle</i>	External injury and bleeding	14	18	77.77
<i>Plantago erosa</i>	Dermatological fungal and bacterial infections and external injury and bleeding	19	29	65.52
<i>Zanthoxylum armatum</i>	Gastrointestinal and others (insectisides)	11	27	40.74
<i>Zanthoxylum khasianum</i>	Others (Cough, cold and fever)	9	19	47.37



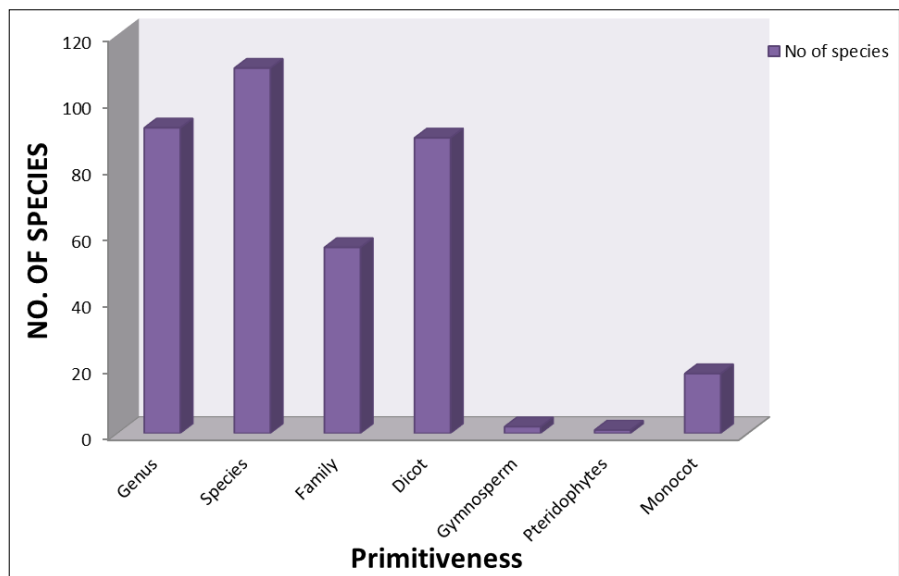
**Fig 1:** Geographical location of the two study sites (A: Shillong, B: Sohra (Cherrapunjee), C: Mawsynram).



**Fig 2:** Pie- chart representation of different medicinal plant's parts frequently used as per recorded data



**Fig 3:** Analysis of documented plant specimens on the basis of their availability status.



**Fig 4:** Numerical analysis of documented medicinal plants according to their taxonomic level.

## Conclusions

The present study could shed some light on the importance of traditionally used medicinal plants in curing various ailments and diseases. Majority of the recorded species viz. *Osbeckia capitata*, *Aloe vera*, *Houttuynia cordata*, *Nepenthes khasiana* etc. had been scientifically proven to possess at least some important medicinal properties which are in line with most of the traditional believes. This tribal knowledge of using plants to cure various ailments and diseases may also be helpful in future medical and pharmaceutical research programmes which could lead to potential discoveries. Moreover, study of traditional knowledge and practices might help in the conservation of slowly eroding local knowledge, practices and locally used medicinal plants making it readily available for the future generations.

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