



## Study on folk remedies using medicinal plants by Karbi tribe of West Karbi Anglong District, Assam, India

Barnali Das<sup>a,b,\*</sup>, Gulapi Tissopi<sup>a</sup>, Nilakshee Devi<sup>a</sup> & Namita Nath<sup>a</sup>

<sup>a</sup>Department of Botany, Gauhati University, Gopinath Bordoloi Nagar, Jalukbari, Guwahati, Assam 781 014, India

<sup>b</sup>Department of Botany, Pragjyotish College, Guwahati 781 009, India

\*E-mail: barnalidas448@gmail.com

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The present study was conducted to document the indigenous knowledge on folk medicines of the Karbi tribe in three remote villages of West Karbi Anglong district, Assam. A total of 80 ethnomedicinal plants recorded were used in treatment of 31 different ailments. Data were collected through restructured questionnaire and quantitative analysis was done. Herbaceous plants occupied the maximum numbers and leaves were the most used plant part among the other parts. The  $F_{ic}$  value ranged from 0.74-1, and the used value (UV) ranged from 0.02-1.2; *Azadirachta indica* was found to be have the highest UV. The study has revealed the pattern of people-plant interactions in the region and the importance of plant medicines playing a vital role in the health care practices and survival of the forest dwellers. There is utmost need of documenting the ethnomedicinal practices of Karbi tribe as they are passing those knowledge generations after generations only by means of practical utilizations without proper pharmacopoeia.

**Keywords:** Assam, Ethnobotany, Folk, Herbal, Karbi, North East

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Since millions of years plants have been playing an important role in human society. Ethnobotany deals with the straight association between man and plants. It is an anthropocentric approach to botany which is concerned with collecting information about plant species and their uses<sup>1</sup>. However, the concept of ethnobotany has undergone several changes, today ethnobotany is mentioned as a broad field of science of human interactions with plants and the ecosystem and it is a multidisciplinary science.

More than 50% of the pharmaceutical drugs are rooted in ethnomedicine<sup>2</sup>. The fundamental or primary source for any discovery of natural or synthetic drugs is the ethnomedicinal study<sup>3</sup>. Ethnobotany is predominantly practiced by the tribal and rural people of the world to cope with the lesser medical facilities availability. Herbal medicines are considered to be proficient among many ethnic or indigenous communities<sup>4</sup>. Plant parts are being used in various forms like decoction, powder, infusion, poultice etc., in traditional health care system<sup>5</sup>.

North-East India is diversified by various bio resources and has different tribal communities living

in harmony. Assam is the centre of NE region and a hub for many ethnic communities. Studies have been done by various groups on different tribes of Assam<sup>6-11</sup>. The Karbi ethnic group of the state Assam is rich in indigenous knowledge and is believed by the local people that Karbis had migrated from the Kuki-Chin area of Western Myanmar<sup>12</sup>.

Jain and Barthakur initiated the ethnomedicinal studies of the Karbi tribe<sup>13-15</sup>. This ethnic community mainly depends on agriculture based on shifting cultivation. These people consider traditional medicine as the primary healthcare source due to its easy accessibility, low cost and a safer option<sup>16</sup>. The local people use the wild plants for religious purposes also<sup>17,18</sup>.

### Materials and Methods

#### Study area

The present study area is located at West Karbi Anglong District of Assam (Fig. 1). The area is blended with hills and plains covering an area of 3,035 sq. Km and is located between 25° 33' N to 26° 35' N in latitude and 92° 10' E to 93° 50' E in Longitude. The hill district is composed with good drainage and

\*Corresponding author

river systems like- Kopili, Amrengh, Borpani, Langpi and many tributaries like Amlong, Langkarom, Am-ih etc. The population of the district is predominantly tribal. The major tribal ethnic groups are the Karbis, Bodos, Tiwas, Dimasas, Garos, Hmar, Khasis pnar and Sakachep.

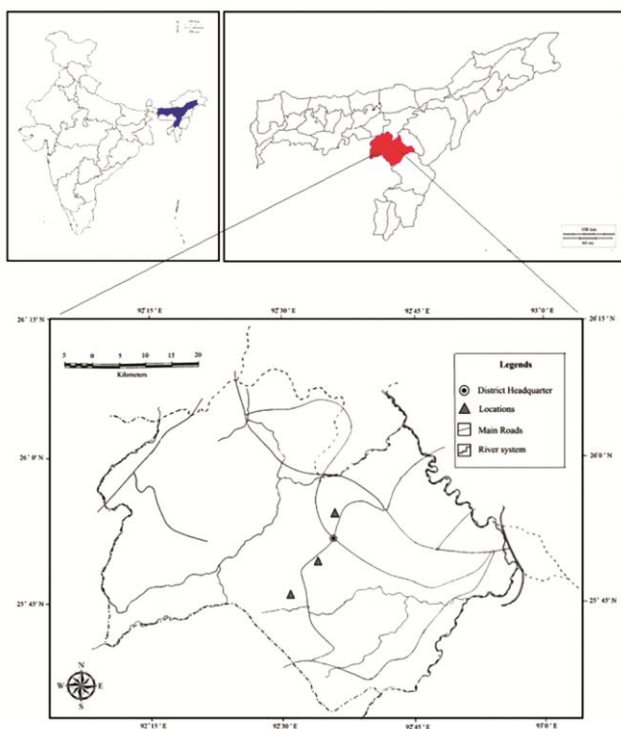


Fig. 1 — Map of West Karbi Anglong District

**Data collection**

The survey was carried out during January-July of 2019. Three remote area villages Amlong, Ronghang rongbong and Umchera were selected for the study. Ethnomedicinal data of plants were documented through specially designed questionnaires and personal observation of actual plant used by the people. By taking prior consent, informants were selected by consulting the Village Head; a total of 59 informants were interviewed, of which 27 were traditional healers and rest 32 informants were local people (teacher, farmer, housewife etc.).

Frequent field study and group discussions were also arranged for collecting information (Photoplate 1). Interactions with the local people specially those who were well experienced with the knowledge of local health practices and selected them as informants through interview. Photographs and voucher specimens of the medicinal plants were collected from the fields as well as from home gardens (Photoplate 2).

**Taxonomical identification and preservation of plant specimens**

Herbarium specimens were prepared by following the standard method<sup>19</sup>. They were then identified by consulting relevant literatures<sup>20-22</sup> and by comparing with the identified specimens at GUBH (Gauhati University Herbarium, Assam) & ASSAM (Botanical Survey of India, Eastern Regional Centre, Shillong). Voucher specimens were then submitted at GUBH. Information on the plants such as local name, parts



Photoplate 1 — A, B, C- Author with respondents and local healers; D- During demonstrations



Photoplate 2 — A- *Eleutherine bulbosa*, B -*Kaempferia rotunda*, C- *Morus nigra*, D-*Saurauia napaulensis*

used, time of collection, and method of preparation of the plant products, dosage and mode of administration of various herbal remedies were recorded from local healers.

### Quantitative ethnobotany

#### Informant consensus factor ( $F_{ic}$ )

The informant consensus factor ( $F_{ic}$ ) helps in determining the homogeneity in the ethnomedicinal information reported from the traditional informants of the study area. The  $F_{ic}$  was calculated by using the following formula<sup>23,24</sup>.

$$F_{ic} = N_{ur} - N_t / N_{ur} - 1$$

Where,  $N_{ur}$  refers to the number of use-reports for a particular ailment category and  $N_t$  refers to the number of species used for a particular ailment category by all informants.

#### Use value (UV)

The relative importance of each plant species known locally to be used as herbal remedy is reported as use value (UV) and it was calculated using the following formula<sup>25</sup>.

$$UV = \Sigma U / N$$

Where, UV refers to the use value of a species, U refers to the number of use reports cited by each informant for a given plant species and N refers to the total number of informants interviewed.

## Results and Discussion

### Demographic features of Informants

59 informants were interviewed by consulting the village head. It was observed that female informants (69.49%) were more than male informants (30.51%). There were 27 traditional healers, who gave us most of the data and also demonstrated a few methods. We interviewed informants from the age range 40-80 years; as anticipated the older people had vast ethnobotanical knowledge than the younger ones. The common people included in the survey were housewives, farmers, teachers etc. The demographic characteristics of the interviewed informants are given in details in the Table 1.

### Diversity of medicinal plants

The present study brings to light the existence of the traditional practice of folk remedies through

medicinal plants by the local people of West Karbi Anglong. From the study, a total of 80 species from 75 genera & 48 families were recorded and documented (Table 2). The family Asteraceae was represented by highest number of species (6 species). The abundance of Asteraceae members in folk remedies has also been recorded in other ethnomedicinal works<sup>26-28,29</sup>. The uses of medicinal plants along with their scientific name, family, vernacular name, use value, mode of administration etc., are tabulated in Table 3.

Habitually the recorded medicinal plants fall under 4 groups- Trees- (23 species; 28.75%), Shrubs (20 species; 25%), Herbs (32 species, 40%) and Climbers (5 species; 6.25%). Data is represented in Figure 2. Herbs are abundant and easily available by the local people. The uses of herbs in folk remedies are also reported in other works around the world<sup>8,27,29-31</sup>.

### Plant parts used and mode of preparation

12 different plant parts were used in herbal medicine preparation excluding whole plant use (Fig. 3). Leaves (52.5%) are frequently used by the community in formulation of the remedies as

Table 1 — Demographic features of the informants

Variable type	Categories	Number of Informants
Gender	Male	18
	Female	41
Age group	40-50	09
	50-60	20
	60-70	23
	70-80	07
Education	Literate	21
	Illiterate	38
Category of Informants	Traditional healer	27
	Common people	32

Table 2 — Diversity of medicinal plants

Division	Sub-division	No. of Families	No. of genera	No. of Species
Angiosperms	Dicot	36	58	63
	Monocot	11	16	16
Gymnosperms	-	1	1	1

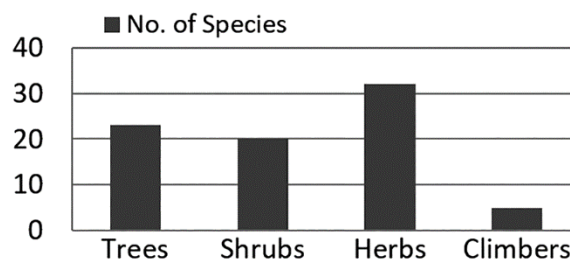


Fig. 2 — Habit wise representation of medicinal plants

Table 3 — Medicinal plants used by Karbi tribe of West Karbi Anglong, Assam, India

Scientific name and voucher no.	Family	Habit	Karbi name	Parts used	UV	Ailments	Mode of administration
<i>Acacia sinuata</i> (Lour.) Merr. GT018	Fabaceae	Climber	Hanche	Leaf	0.36	Mushroom poisoning, vomiting	Decoction is consumed after boiling the leaves.
<i>Acmella paniculata</i> (Wall.ex DC.) R.K. Jansen GT071	Asteraceae	Herb	Bap soki	Flower buds	0.29	Toothache	Buds are taken directly and apply to the teeth.
<i>Acorus calamus</i> L. GT041	Acoraceae	Herb	Lang abap	Leaf	0.36	Digestion problem	Decoction is consumed after boiling the leaves.
<i>Allium sativum</i> L. GT060	Amaryllidaceae	Herb	Harsun kelok	Bulb	0.69	Ringworm, kidney stone, cough and cold.	Paste is applied in infected area; advised to consume raw with meal; fried with oil and consumed before sleep
<i>Alternanthera brasiliiana</i> (L.) Kuntze GT047	Amaranthaceae	Herb	Ram lokhon	Leaf	0.25	Cuts and wounds	Leaf paste is applied on cut and bruise.
<i>Ananas comosus</i> (L.) Merr. GT020	Bromeliaceae	Herb	Parok jangphong	Leaf shoot	0.24	Urinal problem, Jaundice	Young leaf shoot is grinded and drink along with water.
<i>Anoectochilus roxburghii</i> (Wall.) Lindl. GT056	Orchidaceae	Herb	Aram abap	Whole plant	0.22	Aseptic boils	Paste is applied on the swollen area.
<i>Averrhoa carambola</i> L. GT023	Oxalidaceae	Tree	Torte	Young shoot, Fruits	0.10	Jaundice	Boiled with other medicinal plants in water; decoction is taken twice a day for 4-7 days
<i>Azadirachta indica</i> A. Juss. GT016	Meliaceae	Tree	Neem	Leaf	1.2	Scabies, malaria, chicken pox	Leaf is boiled and used for bathing; fried leaves are taken daily in malaria
<i>Bidens frondosa</i> L. GT085	Asteraceae	Herb	Nunthe	Leaf	0.03	Scabies	Leaf paste is applied on infected area.
<i>Camellia sinensis</i> var. <i>assamica</i> (J.W. Mast.) Kitam. GT059	Theaceae	Shrub	Saa	Young shoot	0.12	Sore of Eyes	Shoots are boiled and eyes are washed with the infusion
<i>Capsicum frutescens</i> L. GT021	Solanaceae	Shrub	Birik angkur	Root	0.07	Toothache	Roots are grinded and applied on the cavities.
<i>Careya arborea</i> Roxb. GT051	Lecythidaceae	Tree	Loring	Bark	0.08	Blood dysentery	Boiled in water with leaf shoots of <i>Psidium guajava</i> , decoction is taken after food for 3 days
<i>Carica papaya</i> L. GT030	Caricaceae	Tree	Mensopi	Leaf latex	0.27	Ringworm, toothache	White latex from leaf is applied in infected area. Roots –make a paste and apply to toothache.
<i>Centella asiatica</i> (L.) Urb. GT072	Apiaceae	Herb	Chong amok	Leaf	0.05	Jaundice	Boiled with other medicinal plants in water; decoction is taken twice a day for 4-7 days
<i>Chromolaena odorata</i> (L.) R.M. King & H. Rob. GT038	Asteraceae	Shrub	Bap jorman	Leaf	0.59	Cuts and wounds	Leaf paste is applied in cuts.
<i>Cinnamomum tamala</i> (Buch.-Ham.) T. Nees & C.H. Eberm. GT019	Lauraceae	Tree	Tejpat	Leaf	0.10	Urinary problem	Grinded leaf is mixed with water and infusion is taken

(Contd.).

Table 3 — Medicinal plants used by Karbi tribe of West Karbi Anglong, Assam, India (*Contd.*)

Scientific name and voucher no.	Family	Habit	Karbi name	Parts used	UV	Ailments	Mode of administration
<i>Cinnamomum verum</i> J. Presl. GT031	Lauraceae	Tree	Thengkeching	Bark	0.12	High fever	Paste is applied on the forehead
<i>Citrus grandis</i> L. GT008	Rutaceae	Tree	Ruibap	Flower bud	0.15	Jaundice	Boiled flower buds are consumed
<i>Clerodendrum colebrookianum</i> Walp. GT053	Verbenaceae	Shrub	Pharklum	Leaf	0.20	High pressure	Decoction is consumed after boiling the leaves
<i>Colocassia esculenta</i> (L.) Schott GT028	Araceae	Herb	Henru ke-ik	Root	0.17	Bee bite	Paste is applied in affected areas
<i>Cordyline fruticosa</i> (L.) A. Chev. GT061	Asparagaceae	Shrub	Chorleng	Leaf	0.05	Blood dysentery	Decoction is consumed after boiling the leaves
<i>Crassocephalum crepidioides</i> (Benth.) S. Moore GT024	Asteraceae	Herb	Bap tongdik	Leaf	0.15	Cuts and wounds	Paste is applied on cuts
<i>Croton caudatus</i> Geiseler GT063	Euphorbiaceae	Shrub	So-ik	Root	0.25	Piles	Paste is applied on the infected area
<i>Curcuma longa</i> L. GT010	Zingiberaceae	Herb	Tharmit	Rhizome	0.36	Ringworm, scabies, Blood dysentery	Paste is applied on infected area; Boiled rhizome is consumed for 1 month
<i>Cymbopogon citratus</i> (DC.) Stapf. GT067	Poaceae	Shrub	Citronella	Leaf	0.10	Urine problem	Powdered leaf is mixed with water and the infusion is taken
<i>Dichrocephala bicolor</i> Schldtl. GT085	Asteraceae	Herb	Namphakhi	Leaf	0.05	Diarrhoea	Grinded leaf is mixed with water and infusion is taken
<i>Dillenia indica</i> L. GT027	Dilleniaceae	Tree	Plimplam	Fruits	0.17	Diarrhoea	Fruit soup is taken during diarrhoea
<i>Drymaria cordata</i> (L.) Willd. ex Schult. GT049	Caryophyllaceae	Herb	Nongrongman	Leaf	0.07	Ringworm	Paste is applied on infected area
<i>Eleutherine bulbosa</i> (Mill.) Urb. GT057	Iridaceae	Herb	Hantaine	Bulb	0.22	Blood Dysentery, Diarrhoea	Boiled bulbs are consumed
<i>Euphorbia nerifolia</i> L. GT028	Euphorbiaceae	Shrub	Mirido	Whole plant	0.11	Ringworm	White latex is applied in infected area
<i>Gmelina arborea</i> Roxb. ex Sm. GT040	Verbenaceae	Tree	Phang kurbau	Fruits	0.10	Foot infection	Paste is made along with 2 leaves of <i>Ricinus communis</i> and applied in the infected area at night
<i>Gnetum gnemon</i> L. GT055	Gnetaceae	Tree	Hanthu	Leaf shoot	0.20	Diabetes	Boiled shoots are consumed as vegetable
<i>Hellenia speciosa</i> (J. Koenig) S.R. Dutta GT073	Costaceae	Shrub	Ai-upo	Leaf and tuber	0.29	Urinal problem, kidney stones	Leaves and tubers are boiled and consumed
<i>Hibiscus acetosella</i> Welw. ex Hiern. GT045	Malvaceae	Herb	Hanserong ke-er	Leaf	0.37	Cholera, Vomiting	Boiled leaves are consumed
<i>Hibiscus sabdariffa</i> L. GT013	Malvaceae	Shrub	Hanserong	Leaf	0.14	Bee bite	Paste is applied in infected area

*(Contd.)*

Table 3 — Medicinal plants used by Karbi tribe of West Karbi Anglong, Assam, India (*Contd.*)

Scientific name and voucher no.	Family	Habit	Karbi name	Parts used	UV	Ailments	Mode of administration
<i>Hibiscus rosa-sinensis</i> L. GT004	Malvaceae	Shrub	Joba	Leaf and flower	0.59	Hairfall, jaundice	Grinded leaves are applied in hair; petals are boiled and decoction is consumed
<i>Houttuynia cordata</i> Thunb. GT058	Saururaceae	Herb	Hankabut	Whole plant	0.44	Diarrhoea, food poisoning	decoction is consumed by boiling the whole; it is consumed as raw in food poisoning
<i>Hylocereus undatus</i> (Haw.) Britton & Rose GT015	Cactaceae	Shrub	Bap jora	Whole plant	0.41	Bones fracture	Paste is used as aid to fractures
<i>Hypericum japonicum</i> Thunb. GT077	Hypericaceae	Herb	Bap kani	Whole plant	0.05	Jaundice	Boiled with other medicinal plants in water; decoction is taken twice a day for 4-7 days
<i>Jatropha gossypifolia</i> L. GT054	Euphorbiaceae	Shrub	Longle pharche ke-er	Leaf	0.07	Nerve	Leaf is warmed in fire and use to massage the body.
<i>Justicia gendarussa</i> Burm.f. GT081	Acanthaceae	Shrub	Chekchiri	Leaf	0.31	Joint pain, Malaria	Paste is applied and massage with it; leaves boiled with <i>Rauwolfia serpentina</i> and decoction is taken after food for 7 days in Malaria
<i>Kaempferia rotunda</i> L. GT075	Zingiberaceae	Herb	Mir lochan	Rhizome	0.31	Snake bite, spider bite	Paste is applied in infected area
<i>Kalanchoe pinnata</i> (Lam.) Pers. GT031	Crassulaceae	Herb	Meh abap	Leaf	0.19	Kidney infection, burning	Leaf is consumed directly in kidney infection; paste is applied in fire burning area.
<i>Macaranga peltata</i> (Roxb.) Müll. Arg. GT044	Euphorbiaceae	Tree	Lothunghar inghu	Bark	0.05	Food poisoning	Powder of dried bark is consumed
<i>Mangifera indica</i> L. GT026	Anacardiaceae	Tree	Tharve	Bark	0.08	Jaundice	Body is massaged with fresh bark in case of jaundice patients.
<i>Maranta arundinacea</i> L. GT022	Marantinaceae	Herb	Rui loru	Rhizome	0.17	Increase milk in mother	Boiled rhizome is consumed
<i>Melastoma affine</i> D. Don GT037	Melastomaceae	Shrub	Bikbik	Stem	0.08	Urinal problem	Grinded stem is mixed with water and decoction is consumed
<i>Melia azadirachta</i> L. GT040	Meliaceae	Tree	Han tepli	Leaf	0.22	Scabies	Leaf is boiled with water and use in for bathing
<i>Micromelum minutum</i> (G. Forst.) Wight & Arn. GT034	Rutaceae	Tree	Theng hanso	Leaf	0.15	Intestinal worm	5-6 leaves boiled with 5-6 leaves of <i>Morinda angustifolia</i> ; decoction is taken after dinner for 5 days
<i>Mikania scandens</i> (L.) Willd. GT005	Asteraceae	Climber	Rikang vo-um	Leaf	0.17	Diarrhoea, blood dysentery	Grinded shoots mixed with water and infusion is taken
<i>Mimosa pudica</i> L. GT033	Mimosaceae	Herb	Bap therak	Root	0.19	Boils	Root paste is used for boils and infected area.
<i>Morinda angustifolia</i> Roxb. GT078	Rubiaceae	Shrub	Ritheng	Leaf	0.15	Intestinal worm	5-6 leaves boiled with 5-6 leaves of <i>Micromelum minutum</i> ; decoction is taken after dinner for 5 days

*(Contd.)*

Table 3 — Medicinal plants used by Karbi tribe of West Karbi Anglong, Assam, India (Contd.)

Scientific name and voucher no.	Family	Habit	Karbi name	Parts used	UV	Ailments	Mode of administration
<i>Morus nigra</i> L.	Moraceae	Tree	Inglet	Fruits	0.29	Diabetes	Fruit juice is consumed
<i>Nelsonia canescens</i> (Lam.) Spreng. GT014	Acanthaceae	Herb	Pokvai adovai	Leaf	0.14	Delivery problem	Boiled leaves are consumed
<i>Ocimum americanum</i> L. GT043	Lamiaceae	Herb	Lopong	Leaf	0.25	Insect bite	Paste is applied in infected area
<i>Ocimum tenuiflorum</i> L. GT017	Lamiaceae	Herb	Tulsi	Leaf	0.10	Sore of eyes, scabies,	One drop of leaf extract applied in the eye; Grinded leaves are used for bathing
<i>Oldenlandia corymbosa</i> L. GT011	Rubiaceae	Herb	Volongkom akeng	Whole plant	0.05	Jaundice	Boiled with other medicinal plants in water; decoction is taken twice a day for 4-7 days
<i>Oroxylum indicum</i> (L.) Benth. ex Kurz GT079	Bignoniaceae	Tree	Nupakban	Bark	0.12	Jaundice	Bark is boiled in water with sugar and decoction is consumed
<i>Oryza sativa</i> L. GT064	Poaceae	Herb	Sang	Grains	0.14	Allergy cause by insect,	Chewed grains are applied in the infected area
<i>Oxalis corniculata</i> L. GT029	Oxalidaceae	Herb	Vothung mekbop	Leaf	0.17	Sore of eyes	Grinded leaf is mixed with water and the extract is applied in eyes.
<i>Paederia foetida</i> L. GT068	Rubiaceae	Climber	Bapnemthu	Leaf	0.12	Nerve	Leaf is warmed and body is massaged with it
<i>Parkia speciosa</i> Hassk. GT052	Fabaceae	Tree	Themuke	Seed	0.15	Intestinal worms	Boiled seeds are consumed with meal
<i>Passiflora edulis</i> Sims GT074	Passifloraceae	Climber	Sobarat	Leaf	0.14	Diabetes	Boiled leaves are consumed
<i>Persicaria chinensis</i> (L.) H. Gross GT046	Polygonaceae	Herb	Kalap	Leaf	0.37	Boil and removing of insect hair.	Paste is applied in infected area
<i>Phyllanthus emblica</i> L. GT050	Phyllanthaceae	Tree	Thelu	Fruits	0.44	Diarrhoea, vomiting	Boiled, raw or dried fruits are consumed
<i>Phyllanthus niruri</i> L. GT042	Phyllanthaceae	Herb	Longle thelu	Whole plant	0.10	Jaundice	Boiled with other medicinal plants in water; decoction is taken twice a day for 4-7 days
<i>Pogostemon benghalensis</i> (Burm.f.) Kuntze. GT076	Lamiaceae	Herb	Hanbipo	Leaf	0.32	Headache	Paste is applied in the forehead
<i>Prunus persica</i> (L.) Batsch GT012	Rosaceae	Tree	Sophomihom	Leaf	0.12	Ringworm	Paste is applied in the infected area
<i>Psidium guajava</i> L. GT065	Myrtaceae	Tree	Suprim	Leaf shoot	0.25	Diarrhoea	Leaf shoots are consumed directly
<i>Rauvolfia serpentina</i> (L.) Benth.ex Kurz. GT080	Apocyanaceae	Shrub	Methan krokdi	Leaf	0.56	Blood dysentery, Nerve, Malaria	leaves are boiled with <i>Justicia gendurussa</i> and decoction is taken after food for 7 days in Malaria
<i>Rhaphidophora honkongensis</i> Schott GT025	Araceae	Climber	Hansangbi	Leaf	0.15	Kidney stone	Boiled leaves are consumed.

(Contd.)

Table 3 — Medicinal plants used by Karbi tribe of West Karbi Anglong, Assam, India (*Contd.*)

Scientific name and voucher no.	Family	Habit	Karbi name	Parts used	UV	Ailments	Mode of administration
<i>Ricinus communis</i> L. GT007	Euphorbiaceae	Shrub	Ingki-an	Leaf	0.27	Lactation, foot infection	Leaves are heated in fire and use in massage
<i>Rothea serrata</i> (L.) Steane and Mabb. GT036	Verbenaceae	Shrub	Phelang riho	Flower bud	0.19	High pressure	Decoction is consumed after boiling the leaves
<i>Saccharum officinarum</i> L. GT009	Poaceae	Herb	Nok	Stem, leaf shoots	0.19	Jaundice	1 spoon of juice is boiled with other medicinal plants in water; decoction is taken twice a day for 4-7 days
<i>Saurauia napaulensis</i> DC. GT048	Actinidiaceae	Tree	Ompler	Bark	0.15	Snake bite	Infected area is covered with the paste for five days.
<i>Solanum aculeatissimum</i> Jacq. GT087	Solanaceae	Shrub	Ingsu bokbok	Fruits	0.02	Toothache	The smoke of burnt fruit is allowed to reach the cavities
<i>Syzygium cumini</i> (L.) Skeels GT066	Myrtaceae	Tree	Jangmi	Seed	0.25	Diabetes	Grinded dried seeds are mixed with water and consumed
<i>Tamarindus indica</i> L. GT032	Fabaceae	Tree	Tanteli	Fruit	0.10	High pressure	Fruit pulp is mixed with water and consumed
<i>Zingiber officinale</i> Roscoe GT003	Zingiberaceae	Herb	Hanso	Rhizome	0.88	Allergy, cough and cold, Digestion.	Paste is applied in affected area; In cough, tea is prepared by adding ginger and consumed

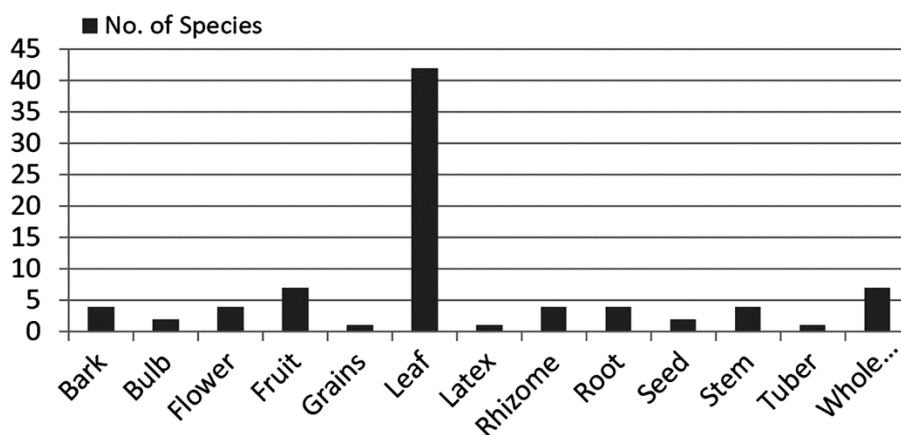


Fig. 3 — Different plants parts used in preparation of medicines

compared to other plant parts. Local healers prefer the use of leaves in their treatment as they are easily accessible than the other parts of plant. Moreover, it helps in conservation as well as survival of the plant species<sup>32</sup>. In this survey, the usage of other plant parts such as Bark (7.5%), Bulb (7.5%), Flower (7.5%), Fruit (7.5%), Grain (7.5%), Latex (7.5%), Tuber (7.5%), Rhizome (7.5%), Roots (7.5%), Seeds (7.5%), Stem (7.5%), Whole plant (7.5%) were also mentioned by the informants. Similar findings were recorded in other studies where leaves were used more than other plant parts<sup>33-35</sup>.

#### Human ailments

In this study, a total of 31 human ailment categories treated by the traditional healers were recorded (Fig. 4). There was less diversity of plant species in treatment of a specific ailment except for jaundice (12), blood dysentery (07), diarrhoea (07), insect bite (06), and ringworm (06). The availability of a medicinal plant species also plays an important factor here. All the data are tabulated in Table 4.

#### Quantitative ethnobotanical indices

The  $F_{ic}$  values ranged from 0.74 to 1 with a mean value of 0.87 (Table 4). The highest  $F_{ic}$  value was



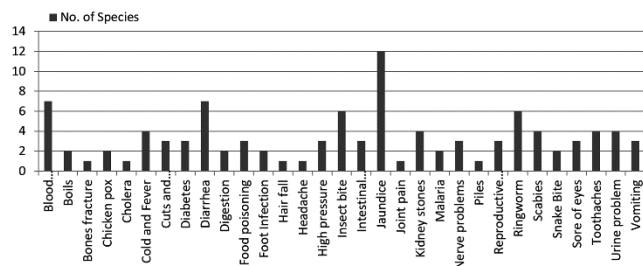


Fig. 4 — Percentage contribution of medicinal plants used for various ailments

Table 4 — Ailment categories

Diseases/ailments	No. of use report ( $N_{ur}$ )	No. of species ( $N_p$ )	$F_{ic}$
Blood Dysentery	24	07	0.74
Boils	43	02	0.98
Bone fracture	24	01	1
Chicken pox	51	02	0.98
Cholera	12	01	1
Cold and Fever	57	04	0.95
Cuts and wounds	59	03	0.97
Diabetes	52	03	0.96
Diarrhea	57	07	0.89
Digestion	48	02	0.98
Food poisoning	17	03	0.87
Foot Infection	12	02	0.90
Hair fall	29	01	1
Headache	19	01	1
High pressure	29	03	0.93
Insect bite	56	06	0.91
Intestinal worms	27	03	0.92
Jaundice	54	12	0.79
Joint pain	18	01	1
Kidney stones	21	04	0.85
Malaria	39	02	0.97
Nerve problems	21	03	0.90
Piles	15	01	1
Reproductive health (Delivery problem, Lactation)	28	03	0.93
Ringworm	49	06	0.90
Scabies	37	04	0.92
Snake Bite	15	02	0.93
Sore of eyes	21	03	0.90
Toothaches	27	04	0.88
Urine problem	31	04	0.90
Vomiting	37	03	0.94

recorded for 5 ailment categories- bone fracture, hair fall, headache, joint pain and piles with a score 1. The lowest  $F_{ic}$  value was recorded for blood dysentery (0.74) followed by jaundice (0.79). Generally, the  $F_{ic}$  of indigenous knowledge for treatment of any disease depends on the accessibility of the plant in that area<sup>36</sup>.

The range of UV from this study was 0.02-1.2 (Table 3). The plant species *Azadirachta indica* was found to be mostly used (1.2) followed by *Zingiber*

*officinale* (0.88) by the informants. The lowest UV value was recorded 0.02 of *Solanum aculeatissimum*. *A. indica* is a widely studied medicinal plant especially in Indian subcontinent which is proved to have antibacterial, anti-inflammatory properties with various bioactive components<sup>37</sup>. This plant is also beneficial for oral and dental care as it is rich in antioxidants<sup>38</sup>. *Z. officinale* is highly medicinal as it has antidiabetic, antimicrobial, hepatoprotective, antioxidant properties<sup>39-42</sup>. The high UV means high number of use reports of a specific plant mentioned by the informants<sup>43</sup>. The low UV value may be due to scarce availability of that plant species in that locality<sup>44</sup>. Though some of the plant species have low UV values, they have significant roles in the indigenous knowledge to cure any specific disease.

### Conclusion

This present study has recorded 80 medicinally important plants used in 31 different ailment categories by the Karbi community of West Karbi Anglong district of Assam. Most of them were herbaceous in nature and leaves were the mostly used plant part in preparation of various decoction, infusion, paste, etc. Traditional medicine is an integral part of the health care practices of people in this region as they have poor access to modern health care system. There is dearth of good roads, telephone network, dispensary, pharmacy and hospital nearby; so people depend upon the plants surrounding them for emergency aid and curing diseases like jaundice, malaria, skin problems, fever, food poisoning, spider bite & snakebite etc. This study reveals the existence of the rich local knowledge of medicinal plants among the Karbis for almost all ailments. The study also reveals the pattern of people-plant interactions in the region and the importance of plant medicines playing a vital role in the health care practices and survival of the forest dwellers. Traditional knowledge of medicinal plants is acquired by man long before the modern medicine discovery. The practices may not satisfy the scrutiny of modern science but cannot be discarded as well. Traditional practices need not necessarily be replaced by modern ones but can be encouraged for the benefit of rural folk. Ethnobotanical study can contribute towards the documentation of traditional knowledge and can also provide potential leads for discovering active therapeutic agents.

The Karbi community treasured their knowledge on traditional healing of diseases by using native plant

species, handed down from their ancestors and will be handed over to their upcoming generations. Unfortunately they did not document their abilities of folk remedies. Earlier works also reveal that there is no such pharmacopoeia for direction<sup>17,19,20,22,37</sup>. The information about prescription, pharmacology, remedies towards diseases, diagnosis, etc. of the age-old tribal medicine system are still lying unclaimed in different parts of the district West Karbi Anglong. The traditional knowledge of herbal medicine practiced among the Karbi Community of the villages of West Karbi Anglong district should be conserved through its documentation before it gets lost from the Karbi societies forever.

We are aware that the present study was not extensive. So it is important to carry out more ethnobotanical studies to make a comprehensive work on the indigenous knowledge of the people of West Karbi Anglong. It will also help in scientific evaluation of traditional practices of plants along with the conservational aspects of the species and traditional knowledge.

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### Conflict of Interest

Authors have no conflict of interest.

### Author's Contributions

GT did the field survey; BD prepared the manuscript along with GT; ND and NN helped in identification of plant species and supervised the whole work.

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