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Quantitative ethnobotany of medicinal plants used by the Bodo Community of Baksa District, Assam, India

MIJING BORO[1], BARNALI DAS[2], KRISHNA KUMAR BORO[1], MADHUSHMITA NATH[1], PRIYAKSHI BURAGOHAIN[1], SHILPA ROY[1], PARAG JYOTI SARMA[1], SUSHMITA KALITA[1], NAMITA NATH[1,♥]

[1]Department of Botany, Gauhati University. Guwahati University Road, Guwahati 781014, Assam, India. Tel.: +91-361-2570530, ♥email: nathnamita1@gauhati.ac.in

[2]Department of Botany, Pragjyotish College. Santipur Main Road, Guwahati 781009, Assam, India

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Abstract. *Boro M, Das B, Boro KK, Nath M, Buragohain P, Roy S, Sarma PJ, Kalita S, Nath M. 2023. Quantitative ethnobotany of medicinal plants used by the Bodo Community of Baksa District, Assam, India. Biodiversitas 24: 3169-3182.* Plants are the core part of religious and cultural aspects of various ethnic communities of the world. Assam is a homeland of diverse ethnic tribes of Indo-Mongolian origin. The Bodo Community is one of the oldest communities and they are rich in their traditional healthcare knowledge system. The current study aimed to record the data on medicinal plants used by the Bodo Community in Baksa District, Assam, India. Statistical analysis was done by following established formula to find Use Value (UV), Relative Frequency of Citation (RFC), Informant Agreement Ration (IAR) and Informant Consensus (F_{ic}). A total of 129 medicinal plant species were recorded, used in 18 different ailment categories by the Bodo people. *Kalanchoe pinnata* (Lam.) Pers. was the most used plant by the informants (use value 0.69) and also had the highest RFC (0.60). In present survey, the IAR range was from 0-1. The highest Fic value was recorded in the ailment category of Renal and hepatic disorder. The present work provides rich data, as this work, besides documenting the medicinal plants used by the community, also gives proper scientific evaluation of the ethnobotanical data. The work will be helpful for future researchers, academicians and stakeholders to carry out research work in this diverse scientific field of ethnobotany. From the conservation point of view, there is an urgent need to involve local people for the conservation of medicinal plants for the future.

Keywords: Assam, Baksa, conservation, ethnobotany, India, plant resources, quantitative traditional knowledge

INTRODUCTION

Ethnobotany has evolved since the beginning of human civilization, and it is one of the major parts of the traditional knowledge system of human beings. The ethnic people living in the remote places mostly depend on the forest to meet their day-to-day needs (Chopra et al. 1986; Kadhirvel et al. 2010). Through ethnobotanical studies, the obtained information helps us validate the popular plants and their uses by different ethnic communities. These studies contribute to the field of new drug discovery as it provides the basis for various research on bioactive compounds. Further, they help in the systematic study of all plant-derived resources and their conservation (Bolson et al. 2015; Dutra et al. 2016; Choudhury et al. 2017). According to World Health Organisation (WHO), a plant can be considered medicinal if one or more of its parts contain substances that can be used for medicinal purposes or which may be used for synthesis of novel drugs (Nath 2016a,b). As estimated by World Health Organization, about 70-80% of the total human population of developing countries relies on traditional healthcare systems (Shil et at. 2014; Nath 2015). Natural medicine has gained popularity over the last 30 years as there has been a constant increase in the number of people using it. This increase has been observed in all ages, sex and social classes (Miraldi and Baini 2018). In ethnobotanical studies, use of herbal medicine is recorded and the knowledge gathered is transmitted orally from generation to generation (Saraiva et al. 2015; Paredes et at. 2016; Az-Zahra et al. 2021).

The heritage of Indian medicine is very ancient, with its earliest record dating 5000 years back. Prominent classical texts like Rigveda, Atharvaveda, Charak Samhita and Sushruta Samhita have provided evidence that traditional herbal medicine in India has been used since immemorial (Nath et al. 2013). Seventy percent of the Indian rural population still depends on herbal medicines today (Pandey et al. 2013). Plants are the core part of religious and cultural aspects of various ethnic communities too. About 15,000 medicinal plants have been reported in India among which 7,000-7,500 plants are used by the indigenous communities for curing various ailments (Parasuraman et al. 2014). One of the key biodiversity regions in India, the Northeast India has diverse plant species. It also comprises several different ethnic groups, thus making up its population of roughly 8 million (Sharma et al. 2014).

Assam is one of the eight states in North-East India, an embodiment of natural herbal splendor beauty and grace; a part of Himalayan and Indo-Burma region of world's Biodiversity hotspot, assisting approximately about 50% biodiversity of India (Mao and Roy 2016). Due to its unique climate, topography and altitudinal conditions, Assam supports a diverse variety of vegetation (Nath and Deka 2015; Nath et al. 2018). It is recognized as a

significant part of the Indian floristic zone and one of the 12 'Genetic Epicenters' that contribute to the evolution of global flora (Hazarika et al. 2012). Assam, a botanically rich state, is home to a variety of ethnic tribes of Indo-Mongolian descent. Mishing, Bodo, Moran, Chutia, Sonowal kachari, Karbi, Motok, Tai Turung, Tiwa, Dimasha, Rabha, Koch, and Tai Khamyang are among them (Buragohain and Konwar 2007). Ethnomedicinal plants found in the rural areas of Western Assam play a very significant role in healthcare practices among the ethnic tribes (Nath and Deka 2015). Moreover, there is always an intricate relationship between indigenous people and forest resources for their livelihood and sustainability (Nath et al. 2022).

The Baksa District of Assam located is dominated especially by Bodos. The Bodos are one of the sections of the Tibeto-Burman family and are one of the largest ethnolinguistic groups in the state of Assam, India. They have their own traditional culture and linguistic vitality. Due to their centuries-old experience and association with plant communities, they possess fairly good knowledge about the medicinal uses of plants. The indigenous Bodo Community is one of Assam's oldest communities. According to the Indian Constitution, they are classified as a plain tribe, with a population of approximately 2 million people according to the 2011 census (Gupta and Talukdar 2014). The ethnic tribal communities from local fringe villages of Baksa District especially relies upon herbal medicine or natural remedy for any kind of ailments. For the treatment of minor bodily disorders like fever, intestinal worm, cold and cough, headache, jaundice and such, the people of the district frequently used some traditional herbal medicines (Nath 2016a,b). Some information on ethnobotanical observation of these people has been studied and enumerated by a few people (Baro et al. 2014; Das et al. 2014; Baro and Borthakur 2017; Swargiary et al. 2020).

The current study aimed to record the data on medicinal plants used by Bodo Community in Baksa District, proper assessment of traditional knowledge system on the medicinal plants used by Bodo people, and find out the medicinal plants necessity for scientific evaluation in future use and preservation for long-term purposes.

MATERIALS AND METHODS

Study area

Baksa is one of the 35 districts of the state of Assam in Northeastern India. The district is located on the north bank of the river Brahmaputra and below the foothills of the Bhutan. The district comes under the Bodoland Territorial Region (BTR), which is predominantly inhabited by the Bodo people and other indigenous communities of Assam. Baksa District lies between 26°58'08" and 26°83'01" N latitude and 91°42'03" to 91°97'08" E longitudes with a total area of 2,400 square km (Figure 1) (Nath 2015). Baksa District is divided into three sub-divisions, viz-Tamulpur, Salbari and Mushalpur. Physiographically, Baksa District is characterized by two types of landforms, viz. denuded hills in the north and alluvial plain in the south. The main drainage system of the area is represented by various river systems like Manas, Pohumara, Kaldiya, Pagladiya, Puthimari etc. The climate of the Baksa District is sub-tropical, with a warm and humid summertime season and additionally accompanied by way of means of cool and dry wintertime season. The winter temperature drops 10°C, and the summer temperature goes up to 35°C. The average annual rainfall of the district is about 3000 mm. The vegetation of the district is characterized mainly by lush green forest and varieties of sorts of flora and fauna. The Manas National Park stands out as the glaring example of this bio-assorted function of the district.

The study area is mainly dominated by the Bodo people, an aboriginal plain tribal community of Assam. Most of the northern part of the study area comes under forest ranges.

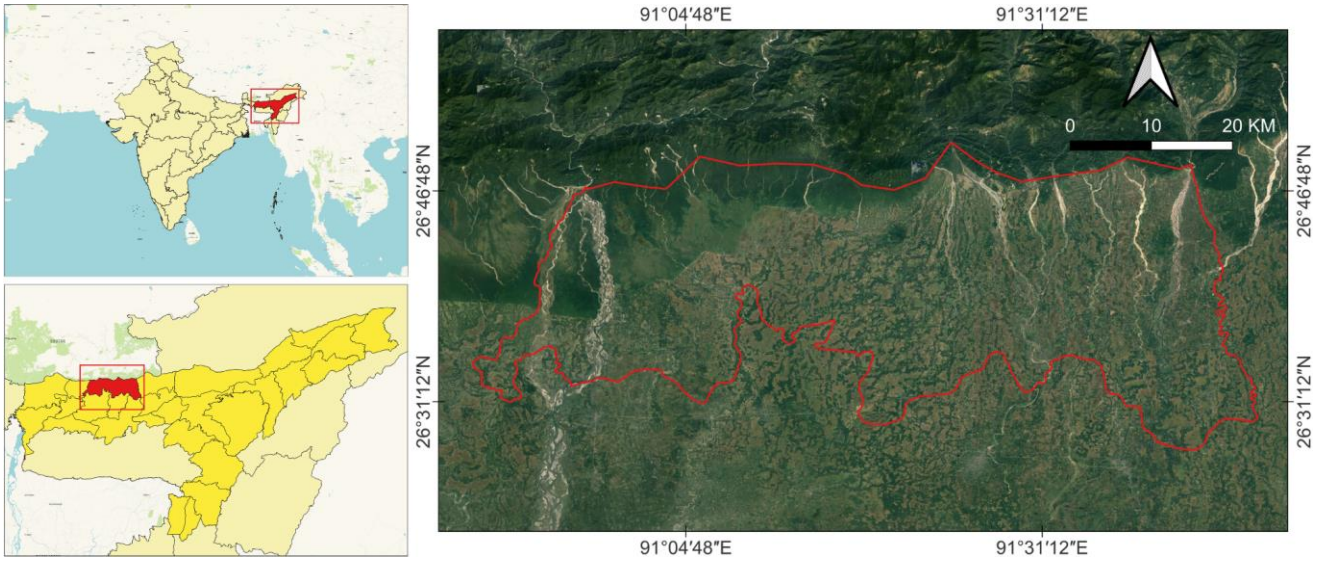

Figure 1. Map of Baksa District, Assam State, India

Demographic profile

As per the 2011 census, the total population in the district is 950,075. Baksa District has a sex ratio of 967 females for every 1000 males. The literacy rate of this district is 70.53%. According to the 2011 census, 38.34% of the population speak Assamese, 36.33% speaks Boro, 17.69% speak Bengali, 2.42% speak Nepali, 1.61% speak Sadri, and 1.47% speak Kurukh, and 2.14% speak others as their first language.

Field survey and data collection

The extensive field survey was conducted from September 2021 to April 2022. The survey was conducted covering several villages of Baksa District, namely- Medaghat, Bhalukdonga, Singrapara, Simliguri, Karemura, Bongaon, Daragaon, Dwimuguri, Baganpara and many other remote villages.

All the relevant information on medicinal plants and their uses used by the Bodo Community of Baksa District were collected following the code of ethics (International Society of Ethno-biology 2006). The data was collected using a specially designed questionnaire through personal interviews and through focused group discussions among the traditional knowledge holders. Details of plants are recorded in the field itself provided by the healers.

In the present study, a total of 43 local Bodo informants with a strong traditional knowledge base were selected for the data collection by consulting the village heads. Interactions with the local people, especially those who were well experienced with the knowledge of local health practices, and selected them as informants through interviews. Data was recorded prior to the collection of traditional knowledge-based information in the local language, i.e., Bodo. Out of 43 informants, 25 were male, and 18 were female.

Frequent field surveys and group discussions were done to gather the information from the informants. Photographs of the medicinal plants were taken, and voucher specimens were collected from the fields as well as from the home gardens of the informants.

Identification of plant collection

The plant specimens were collected with the help of the informants by accompanying them in the field. The voucher specimens were prepared by following the standard method (Jain and Rao 1977). The specimens were identified with the help of available relevant taxonomic literature (Kanjilal et al. 1934-1940; Barooah and Ahmed 2014). The voucher specimens were also compared with the identified specimens at GUBH (Gauhati University Herbarium, Assam) and ASSAM (Botanical Survey of India, Eastern Regional Centre, Shillong). Voucher specimens were then submitted at GUBH. The updated nomenclature of the studied plants was followed with online databases like "POWO (Plant of World Online)," and "IPNI (The International Plant Name Index)." Data like vernacular name, parts used, time of collection, method of preparation of the plant products, dosage and mode of administration of various herbal remedies of the plants were recorded from local healers.

Statistical analysis of ethnomedicinal data

Determination of Use Value (UV)

The Use Value (UV) determines the relative significance of the uses of plant species, i.e., the relative importance of each prescribed medicinal plant was calculated by determining the use value (Phillips et al. 1994; Tardio et al. 2008; Savikin et al. 2013; Zenderland et al. 2019), in order to measure the relative importance of plants used by local healers on a quantitative basis. For existing plant species showing numerous usage reports, the UV value is high, whereas for the species having very few usage reports, the UV value is found to be low (Vitalini et al. 2013). It was calculated using the following formula:

$$UV = \sum U/N$$

Where,

U: Number of use reports mentioned by each informant for the given plant species

N: Number of informants interviewed for the given plant species

Determination of Relative Frequency of Citation (RFC)

The Relative frequency of Citation (RFC) is useful in determining the local importance of each species in the particular study area. This index ranges from 0 to 1 theoretically. It was calculated by using the following formula (Umair et al. 2017).

$$RFC = FC / N \ (0 < RFC < 1)$$

Where,

FC : Number of informants who cited use of plants species

N : Total number of informants in the survey, without considering the use categories

Informants Agreement Ratio (IAR)

The Informant's Agreement Ratio helps to understand the importance of individual species. The value of Informants Agreement Ratio (IAR) value ranges from 0 to 1. '0' indicates the number of ailment categories equals the number of citations given by the informants, and '1 indicates all the participants mentioned the plant species for a particular disease (Thomas et al. 2009). The IAR was calculated by using the following formula:

$$IAR = N_r - N_a / N_r - 1$$

Where,

N_r : Total number of citations recorded for individual taxa

N_a : Number of illness categories treated with this species

Determination of Informants Consensus Factor (F_{ic})

The Informant's Consensus Factor is determined to check out the homogeneity in the information given by the informants of the study area. F_{ic} value ranges from 0 to 1. The F_{ic} value was calculated by the following formula (Trotter and Logan 1986; Heinrich et al. 1998; Singh et al. 2012). Finding out F_{ic} value is a significant tool to carry out various ethnobotanical works (Inta et al. 2013; Singh et al. 2014; Malla et al. 2015).

$F_{ic} = (N_{ur} – N_t) / N_{ur-1}$

Where,

N_{ur} : Number of use report in a particular category of illness by informants

N_t : Number of species of taxa that is used for the treatment of a particular disease category by informants of the study

RESULTS AND DISCUSSION

Demographic features of informants

In the present study, by consulting the village heads, 43 local Bodo informants were thoroughly interviewed. From the survey, we found that male informants (58.14%) were more than female informants (41.86%). The age range of the interviewed informants was 40-79, and the number of informants was higher in older age groups.

Most of the informants had basic education except for only 7 illiterate informants, who were mostly very old. Among the 43 informants, the secondary literary rate showed the highest educational status (30.23 %). The demographic characteristics of the interviewed informants are given in detail in Table 1.

Diversity of medicinal plants

In the present study, a total of 129 medicinal plant species were recorded, which are used in various traditional healthcare practices by the Bodo people. These plant species belong to 58 families and 110 genera (Table 2). Lamiaceae and Fabacaeae contributed the highest number of species, 7 each. Out of the 58 families, there are 43 dicot families, 13 monocot families and 2 pteridophytic families. The collected data were arranged alphabetically by generic and specific name along with their families, vernacular names, mode of preparation and route of application (Table 3).

Most of the reported ethnomedicinal plants were herbs (48.06%), dominating the trees (23.25%), shrubs (20.94%) and climbers (7.75%) habitually (Figure 2). This could be due availability of no-conventional herbs, which are easy to cultivate in home gardens in comparison to trees and shrubs, and also due to their rapid growth. There are other ethnobotanical reports where herbs are the dominant amongst all (Talukdar and Gupta 2014; Gogoi and Nath 2021; Sharma and Lata 2022).

Plant parts used and mode of preparation

The survey recorded 13 different plant parts used in various remedies prescribed by the Bodo healers (Figure 3). The most commonly used plant part were leaves (58.14%). Other plant parts mentioned by the informants were fruit (21.7%), root (12.4%), flower (8.5%), stem (7.75%), bark (6.2%), rhizome (3.88%), twig (1.56%), latex (1.55%), bulb (0.76%), tuber (0.76%), petiole(0.76%) and seed (0.76%). Leaves cause less harm to the mother plant, which ensures the sustainability and conservation of the plant (Panmei et al. 2019). Other workers also found that leaves were the most used plant part, and the local healers prefer leaves due to their accessibility and abundant availability (Kayani et al. 2015; Panmei et al. 2019; Baidya et al. 2020).

Human ailments

In this study, 18 human ailment categories treated by the traditional healers were recorded (Figure 4). The diversity of medicinal plants was highest in Digestive disorders (37) and external injuries(37), followed by cold and fever (34). The lowest diversity was found in the ailment category of Cancer (2). The availability and abundance of a medicinally important plant species also plays an important in the diversity. All the data are tabulated in Table 4.

Quantitative ethnobotanical indices

Use Value

Use value determines the relative importance of each prescribed medicinal plant in order to measure the relative importance of plants used by the local healers on a quantitative basis. In the study, the range of use value was 0.02-0.69 (Table 3). This survey reported *Kalanchoe pinnata* (Lam.) Pers. was the mostly used by the informants, with a use value of 0.69. This is followed by *Musa balbisiana* Colla (0.58). Various studies proved that *Kalanchoe pinnata* has many medicinal properties like hepatoprotective, anti-ulcer, anti-inflammatory, anti-diabetic, anti-hypersensitivity, wound healing, anti-viral, antioxidant, antimicrobial, antifungal, anti-tumor, neuropharmacological and antibacterial activities (Matthew et al. 2013; Phatak and Hendre 2014; Kawade et al. 2014; Roy 2015; Raj Sekhar et al. 2016; Rahman et al. 2019; Singh et al. 2021; Tajudin and Ismail 2022; Pattewar et al. 2013).

Table 1. Demographic features of the informants

Factor	Category	Total no. of Informants	Percentage
Gender	Male	25	58.14
	Female	18	41.86
Age range	40-49	1	2.32
	50-59	15	34.88
	60-69	16	37.21
	70-79+	11	25.59
Education	Illiterate	7	16.27
	Primary	12	27.90
	Middle	10	23.25
	Secondary	13	30.23
	University	1	2.32

Table 2. Diversity of studied plant species

Division	Family	Genera	Species
Dicot	43	85	100
Monocot	13	23	27
Pteridophyte	2	2	2
Total	58	110	129

Table 3. Enumeration of plant species used by the Bodo people of Baksa District, Assam State, India, in ethnomedicinal practices

Scientific name, Voucher number	Family	Common name	Use value	Part used	Application	Mode of preparation	Route of administration	RFC	IAR
Acmella ciliata (Kunth) Cass.; MB079	Asteraceae	Xoru jhari, jhari fisa	0.02	L	Tongue bumps	Paste	Oral	0.02	0
Acmella paniculata (Wall. ex DC.) R.K.Jansen; MB008	Asteraceae	Dangor jhari, jhari geder	0.02	L	Fever	Paste	Oral	0.02	0
Acmella uliginosa (Sw.) Cass.; MB098	Asteraceae	Xoru jhari	0.04	L,F	Tongue bumps, leukoplakia, cough	Paste	Oral	0.04	1
Aegle marmelos (L.) Correa; MB017	Rutaceae	Bel	0.18	L, Fr	Body pain, stomach ache, loose motion, dizziness, high pressure, piles	Juice	Oral	0.11	0.28
Allium sativum L.; MB011	Amaryllidaceae	Sambrang gufur	0.09	Bu	High pressure, fever, bone fracture	Paste	Oral	0.09	0.33
Alocasia indica (Roxb.) Schott; MB025	Araceae	Man thaso	0.04	Rh	High pressure, cough	Vegetable	Oral	0.04	0
Alocasia macrorrhizos (L.) G.Don; MB101	Araceae	Baranakha thaso	0.02	Rh	Gastric	Juice	Oral	0.02	0
Aloe vera (L.) Burm.f.; MB041	Asphodelaceae	Sal rani	0.16	L	Dizziness, fever, skin problem, stomach ache, urine itching	Paste	External	0.06	0.33
Alternanthera brasiliana (L.) Kuntze; MB022	Amaranthaceae	Biholongi	0.04	L	Cut and wounds	Paste	External	0.04	1
Amaranthus viridis L.; MB088	Amaranthaceae	Khutra	0.02	L	Blood purification	Vegetable	Oral	0.02	0
Amaranthus tricolor L.; MB065	Amaranthaceae	Biholyo koroni	0.43	L	Cut and wounds	Paste	External	0.04	1
Ananas comosus (L.) Merr.; MB121	Bromeliaceae	Anaras	0.02	L	Intestine worm, baby indigestion	Juice	Oral	0.06	0.50
Andographis paniculata (Burm.f) Wall.ex.Nees.; MB006	Acanthaceae	Sirotha	0.16	L,F,R	Diabetes, malaria, intestine worm	Juice/vegetable	Oral	0.13	0.66
Areca catechu L.; MB012	Aracaceae	Goi bifang, tamul	0.04	R	Dysentery	Paste	Oral	0.04	1
Artocarpus chama Buch.-Ham.; MB036	Moraceae	Samkothal	0.02	L	Blood cancer	Juice	Oral	0.02	0
Averrhoa carambola L.; MB077	Oxalidaceae	Kordoi, khwrdwi	0.13	Fr	Swollen, jaundice	Vegetable	Oral	0.13	0.6
Azadirachta indica A.Juss.; MB056	Meliaceae	Mahaneem	0.39	L	Diabetes, allergy	Juice/paste	Oral/external	0.34	0.93
Bacopa monnieri (L.)Penneli; MB089	Scrophulariaceae	Brahmi	0.02	L	Intestine worm	Vegetable	Oral	0.02	0
Bambusa tulda Roxb.; MB115	Poaceae	Makhal ouwa	0.04	L sheath	Cut and wounds	Paste	External	0.04	1
Bergera koenigii L.; MB062	Rutaceae	Naraxingho, nwrsing	0.11	L	Body pain, common cold, fever	Vegetable	Oral	0.11	0.5
Brassica juncea (L.) Czern.; MB020	Brassicaceae	Lai	0.04	L, Dry St	Blood purification, cough	Vegetable	Oral	0.04	0
Cajanus cajan (L.) Huth; MB051	Fabaceae	Ahar	0.06	L	Jaundice, fever	Juice	Oral	0.04	0.5
Camellia sinensis (L.) Kiuntze; MB042	Theaceae	Sahpat	0.02	L	Hair fall	Juice	External	0.02	0
Capsicum chinense Jacq.; MB093	Solanaceae	Phalu khepjang, bhoot jolokia	0.02	Fr	Pimples	Paste	External	0.02	0
Capsicum frutescens L.; MB148	Solanaceae	Banlu fisa, kon jolokia	0.02	Fr	Dizziness	Paste	Oral	0.02	0

Carica papaya L.; MB033	Caracaceae	Mwiduful, omita	0.27	L, R, F, Fr	Gastric, hypogalactia, intestine worm, stomach ache, dengue, dysentery, diabetes, high cough	Paste, vegetable	Oral	0.20	0.36
Cassia fistula L.; MB026	Fabaceae	Kunulu	0.02	Fr	Tongue bumps	Paste	Oral	0.02	0
Catharanthus roseus (L.)G.Don; MB031	Apocynaceae	Nayan tora	0.09	L,	Diabetes, cancer	Juice	Oral	0.04	0.66
Centella asiatica (L.) Urb.; MB034	Apiaceae	Bor manimuni	0.30	L,	Stomach ache, dizziness, diarrhea, boil, fever, piles	Vegetable	Oral	0.30	0.58
*Centipeda minima (*L). A .Braun and Asch.; MB049	Asteraceae	Hasutibon	0.02	F	Common cold	Paste	External	0.02	0
Chenopodium album L.; MB072	Amarsanthaceae	Buthua, bhotua	0.04	L	Skin disease, blood purification	Vegetable	Oral	0.04	0
Chromolaena odorata (L.) R.M.King and H.Rob.; MB055	Asteraceae	Jharmoni	0.11	L	Cut and wounds	Paste	External	0.11	1
Chrysopogon aciculatus (Retz.) Trin.; MB083	Poaceae	Santhai	0.02	R	Jaundice	Paste	Oral	0.02	0
Cinnamomum tamala (Buch.-Ham.)T.Nees and C.H.Eberm.; MB123	Lauraceae	Tezpaatt	0.02	L	High pressure	Paste	Oral	0.02	0
Cinnamomum verum J.Presl; MB091	Lauraceae	Dalchini	0.02	B	Asthma	Paste	Oral	0.02	0
Cissampelos pareira L.; MB046	Menispermaceae	Nilkot, tupri lota	0.04	L, R	Fever, loose motion	Paste	External	0.04	0
Citrus aurantifolia (Christn.) Swingle; MB085	Rutaceae	Gol nemu	0.23	Fr, Fr peel, S, L,	Intestine worm, high pressure, wound healing	Paste, juice	Oral	0.20	0.99
Citrus x limon (L.)Osbeck; MB018	Rutaceae	Kaji nemu	0.04	L, Fr	Body pain, intestine worm	Paste, juice	Oral	0.04	0
Clerodendrum infortunatum L.; MB162	Lamiaceae	Mwkhna	0.13	L,	Ringworm, diarrhea, intestine worm	Paste	External	0.09	0.5
Clitoria ternatea L.; MB014	Fabaceae	Aparijita	0.04	F, L	Snake bite, azoospermia	Paste	Oral	0.02	0
Cocos nucifera L; MB045	Araceae	Narikhol	0.04	Fr	Brain booster	Juice	Oral	0.04	0
Colocasia esculanta (L). Schott; MB009	Araceae	Kola kosu, thaso gwswm	0.04	P	Ear allergy, boil	Paste	External	0.04	0
Corchorus capsularis L.; MB023	Malvaceae	Phathw, morapat	0.20	L	Boil, intestine worm, cut and wounds, fever, diabetes	Vegetable, paste	Oral, external	0.16	0.37
Cuminum cyminum L.; MB074	Apiaceae	Jeera	0.02	Fr	Dog bite	Paste	Oral	0.02	0
Curcuma longa L.; MB099	Zingiberaceae	Haldhi	0.06	Rh, L	Diarrhea, skin rejuvenation, intestinal worm	Paste	External, oral	0.06	0
Cuscuta reflexa Roxb.; MB102	Covolvulaceae	Rabon nari	O.02	St	Fever	Paste	External	0.02	0
Cynodon dactylon (L.) Pers.; MB028	Poaceae	Dubori	0.25	Tw, R, L	Dizziness, cut and wounds, azoospermia, jaundice, vitiligo,	Paste, juice	External, oral	0.23	0.6
Cyperus rotundus L.; MB047	Cyperaceae	Motha, koya bon, omakhaya	0.16	L, R	Cut and wounds, stomach ache, diarrhea, piles	Paste	Oral, external	0.16	0.33
Dillenia indica L.; MB015	Dilleniaceae	Ouw tenga	0.04	Fr	Diabetes, pox	Vegetable	Oral	0.04	0
Diplazium esculentum(Retz.)Sw.; MB082	Aspleniaceae	Dhekiya	0.04	L	Cut and wounds, loose motion	Vegetable, Paste	Oral, external	0.04	0

Dracaena trifasciata (Prain.) Mabb.; MB013	Asparagaceae	Jibou bilai	0.02	L	Burning	Paste	External	0.02	0
Drymaria cordata (L.)Wild.ex.Roem.et.Schult.; MB060	Caryophyllaceae	Sanmwjwngkhri, lai jabori	0.06	L, Tw	Cut and wounds, sinus, body pain	Paste, Vegetable	Oral, external	0.06	0
Dryopteris filix-mas (L.) Schott; MB117	Polypodiaceae	Bih dhekiya	0.02	L	Cut and wounds	Paste	External	0.02	0
*Dysoxylum gotadhora (*Buch.-Ham.)Mabb.; MB084	Meliaceae	Bagnal	0.02	B	Boil	Paste	External	0.02	0
Eclipta prostrata (L.) L.; MB069	Asteraceae	Moha bhringoraj, daogang jwla	0.06	L	Hair fall, boil	Paste	External	0.06	o.5
Elettaria cardamomum (L.) Maton; MB134	Zingiberaceae	Elaichi	0.02	Fr	Asthma	Paste	Oral	0.02	0
Euphorbia neriifolia L.; MB027	Euphorbiaceae	Siju	0.16	L, St, La	Cough, asthma, boil, ringworm,	Paste	Oral, external	0.13	o.5
Ficus hispida L. f.; MB004	Moraceae	Dimoru	0.02	L	Ear pain	Paste	External	0.02	0
Ficus religiosa Vahl.; MB095	Moraceae	Agot	0.02	L	Diabetes	Juice	Oral	0.02	0
Garcinia pedunculata Roxb.; MB097	Clusiaceae	Thaikha	0.02	Fr	Stomach ache	Vegetable, Juice	Oral	0.02	0
Hellenia speciosa (J.Koenig) S.R.Dutta; MB070	Costaceae	Debi tokon	0.02	Rh	Urethritis	Paste	Oral	0.02	0
Hibiscus rosa-sinensis L.; MB005	Malvaceae	Joba	0.09	L, F	Pregnancy, cuts and wounds, vitiligo, menstruation pain	Paste	External	0.04	0
Homalomena aromatica (Spreng.) Schott; MB112	Araceae	Gonsana	0.06	P,	High pressure, blood purification	Vegetable	Oral	0.06	o.5
Houttuynia cordata Thunb.; MB103	Saururaceae	Maisundri	0.09	L,	Stomach ache, dysentery	Vegetable	Oral	0.09	o.33
Hydrocotyle moschata G.Forst.; MB024	Araliaceae	Xoru manimuni	0.09	L	Diarrhea, stomach ache, piles, eye redness	Vegetable, Juice	Oral	0.09	0
Impatiens tripetala Roxb. ex DC.; MB039	Balsaminaceae	Dumduga	0.06	L	Wounds healing, bone fracture	Paste	External	0.06	0.5
Ipomoea batatas (L.) Lam.; MB058	Convolvulaceae	Mitha aloo	0.02	R	Fever	Paste	External, oral	0.02	0
Jatropha curcas L.; MB032	Euphorbiaceae	Enda	0.04	La	Tooth decay,	Latex	External	0.04	1
Justicia adhatoda L.; MB003	Axanthaceae	Gufur barsiki	0.02	F	Cough	Decoction	Oral	0.02	0
Kalanchoe pinnata (Lam.) Pers.; MB125	Crassulaceae	Paategoja	0.69	L	Kidney stones, stomach ache, fever, headache, urethritis,	Paste, Juice	External, oral	0.60	0.82
Lasia spinosa (L.) Thw.; MB172	Araceae	Sibru	0.13	L, R	Dizziness, menstruation pain, jaundice, pox	Vegetable	Oral	0.11	o.4
Lawsonia inermis L.; MB135	Lythraceae	Jenthokha	0.04	L	Hair fall	Paste	External	0.04	1
Leucas aspera (Willd.)Link.; MB048	Lamiaceae	Dorun, dharamful	0.13	L	Sinus, nosebleeds,	Paste	External	0.13	0.8
Malva verticillata L.; MB053	Malvaceae	Lapha	0.02	Dry St	Cough	Raw	External	0.02	0
Manilkara kauki (L.) Dubard; MB181	Sapotaceae	Bakul	0.02	B	Tooth decay	Paste	External	0.02	0
Melia azedarach L.; MB137	Meliaceae	Rwmwnsitha	0.02	L	Intestine worm	Vegetable	Oral	0.02	0
Mentha arvensis L.; MB016	Lamiaceae	Podma	0.04	L	Brain booster	Vegetable	Oral	0.04	0
Mimosa pudica L.; MB021	Fabaceae	Lajuki lota	0.02	St	Teeth ache	Paste	External	0.02	0
Momordica charantia L.; MB108	Cucurbitaceae	Tita kerela	0.02	Fr	Diabetes	Vegetable	Oral	0.02	0
Moringa oleifera Lam.; MB117	Moringaceae	Sojina	0.04	L, B	High pressure, boil,	Paste, Vegetable	External, oral	0.04	0
Morus alba L.; MB067	Moraceae	Meskuri	0.06	Fr, L,R	Jaundice, menstruation	Paste	Oral	0.04	0.5

Musa balbisiana Colla; MB073	Musaceae	Athiyakol	0.58	Fr peel, Fr, young plant, L sheath	Diarrhea, cough, fever, allergy, white spot on eyes	Juice	External, oral	0.48	0.83
Musa sanguinea Hook.f.; MB087	Musaceae	Malbhog kol	0.02	R	Piles	Juice	Oral	0.02	0
Musa sapientum L.; MB141	Musaceae	Kach kol	0.02	Fr	Stomach ache	Vegetable	Oral	0.02	0
Musa x chinensis Colla; MB029	Musaceae	Jahaji kol	0.06	F	Low pressure, wounds healing	Vegetable	Oral	0.02	0
*Narenga porphyrocoma (*Hance) Bor; MB136	Poaceae	Ikorabon	0.02	St	White spot on eyes	Paste	External	0.02	0
Nyctanthes arbor-tristis L.; MB064	Oleaceae	Xewali	0.23	Young shoot, L,	Fever, fever, jaundice, joint pain, baby indigestion, intestine worm, malaria	Paste, Vegetable	External, oral	0.18	0.55
Ocimum basillicum L.; MB057	Lamiaceae	Ram thulungsi	0.02	L	High pressure	Juice	Oral	0.02	0
Ocimum tenuiflorum L.; MB096	Lamiaceae	Tulsi, thulungsi	0.51	L	Cough, dizziness, allergy, intestine worm,	Juice	Oral	0.44	0.8
Oryza sativa L.; MB044	Poaceae	Mairong	0.02	Fr	Dog bite	Raw	Oral	0.02	0
Oxalis corniculata L.; MB057	Oxalidaceae	Singrimwikhi, tengesi	0.13	L	Stomach ache, dysentery, small pox, eye redness	Vegetable, Juice	Oral, external	0.13	0.4
Paederia foetida L.; MB075	Rubiaceae	Bhedeilota, padrilewa	0.32	L	Stomach ache, dizziness, body pain, fever, loose motion	Vegetable, Paste	External, oral	0.30	0.69
Peperomia pellucida L.; MB164	Peperomiaceae	Purnowa	0.02	L	Swollen leg	Vegetable	Oral	0.02	0
Phlogacanthus thyrsiformis (Roxb. ex Hardw.) Mabb.; MB068	Acanthaceae	Barsiki bibar	0.25	F	Cough, intestine worm, diarrhea, gastric, baby indigestion	Vegetable, Juice	Oral	0.20	0.7
Phyllanthus emblica L.; MB063	Phyllanthaceae	Amlokhi	0.06	Fr	Diabetes, gastric	Raw	Oral	0.06	0.5
Piper betle L.; MB155	Piperaceae	Phathwi	0.02	L	Bone fracture,	Paste	External	0.02	0
Piper nigrum L.; MB059	Piperaceae	Jaluk	0.04	Fr	Bronchitis, tooth decay	Paste	Oral	0.02	0
Piper retrofractum Vahl; MB037	Piperaceae	Pipili, samfri	0.13	Fr	Bronchitis, sinus, dog bite	Raw, Paste	Oral	0.11	o.25
Pogostemon benghalensis (Burm.f.) Kuntze; MB010	Lamiaceae	Xukolota	0.02	L	Cut and wounds	Paste	External	0.02	0
Portulaca oleracea L.; MB094	Portulacaceae	Sonapuli	0.09	L	Fever,diarrhea, cold sore, dizziness	Paste, Vegetable	Oral, external	0.09	0
Pouzolzia zeylanica (L.) Benn.; MB086	Urticaceae	Nasreng khoro	0.04	L	Boil	Paste	External	0.04	1
Psidium guajava L.; MB078	Myrtaceae	Madhri aam, samfreng	0.23	L	Stomach ache, diarrhea, intestine worm,	Juice	Oral	0.18	0.75
Punica granatum L.; MB168	Lythraceae	Dalim	0.02	Fr	Blood purification	Raw	Oral	0.02	0
Ricinus communis L.; MB130	Euphorbiaceae	Era	0.25	L, St	Vomiting, fever, dizziness, body pain, boil, urine problem	Juice, Paste	Oral, external	0.23	0.5
Rumex acetosa L.; MB071	Polygonaceae	Suka	0.02	L	Stomach ache	Vegetable	Oral	0.02	0
Santalum album L.; MB052	Santalaceae	Chandan	0.02	B	Dizziness	Raw	Oral	0.02	0
Scleromitrion diffusum (Willd.)R.G.Wang.; MB019	Rubiaceae	Dosri aitheng, kharpa jiva	0.06	L	Dizziness, boil,	Juice, Paste	Oral, external	0.06	o.5

Scoparia dulcis L.; MB038	Plantaginaceae	Jestha madhu	0.11	R, L	Urethritis, fever, asthma, jaundice	Paste, Juice	Oral, external	0.09	0.25
Senna occidentalis (L.)Link.; MB054	Fabaceae	Solleng	0.11	L	Jaundice, fever	Vegetable	Oral	0.09	0.75
Sida rhombifolia L.; MB119	Malvaceae	Bamun mara	0.06	L, R	Boil, wounds healing	Paste	External	0.06	0.5
Solanum indicum Roxb.; MB154	Solanaceae	Khunthai	0.04	Fr	Diabetes, cut and wounds	Raw	Oral, external	0.04	0
Solanum tuberosum L.; MB076	Solanaceae	Aloo	0.02	Tu	Burning	Paste	External	0.02	0
Solanum viarum Dunal; MB100	Solanaceae	Beng damoru, ambou fanthao	0.06	R, Fr	Tooth decay, small pox, diabetes	Paste, Raw	Oral, external	0.02	0
Spinacia oleracea L.; MB066	Amaranthaceae	Paleng	0.02	L	Stomach ache	Vegetable	Oral	0.02	0
Spondias pinnata (L.f)Kurz.; MB146	Anacardiaceae	Thaisri, amora	0.16	B, R	Dog bite, gastric, diarrhea	Paste, Juice	Oral, external	0.09	0.33
Stephania japonica (Blume) Forman; MB040	Menispermaceae	Tuprilota	0.02	L	Fever	Paste	External	0.02	0
Syzygium aromaticum (L.)Merr. et L.M.Perry; MB092	Myrtaceae	Loung	0.02	Dry F	Asthma	Paste	Oral	0.02	0
Syzygium cumini (L.) Skeels; MB035	Myrtaceae	Jam	0.02	B	Diabetes	Decoction	Oral	0.02	0
Tabernaemontana divaricata (L.) R.Br. ex Roem. and Schult.; MB050	Apocynaceae	Kathanda	0.09	F	Eye redness, fever	Paste, Juice	External	0.09	0.66
Tamarindus indica L.; MB043	Fabaceae	Thengkhleng,	0.06	Fr	High pressure	Juice	Oral	0.11	1
Terminalia arjuna (Roxb.Ex.DC.)Wight and Arn.; MB007	Combretaceae	Arjun	0.13	B	Gastric, tb, dog bite, burning	Paste, raw	Oral, external	0.11	0.4
Terminalia bellirica (Gaertn.)Roxb.; MB080	Combretaceae	Bhomora	0.11	Fr	Gastric	paste	Oral	0.09	1
Terminalia chebula Retz.; MB061	Combretaceae	Xilikha	0.13	Fr	Gastric	paste	Oral	0.09	1
Tinospora cordifolia (Willd.) Hook.f. and Thomson; MB124	Menispermaceae	Amorlota	0.04	St	Bone fracture	paste	External	0.04	0
Vigna mungo (L.)Hepper; MB132	Fabaceae	Sobai dali	0.02	Fr	Dog bite	vegetable	Oral	0.02	0
Vitex negundo L.; MB081	Lamiaceae	Posotiya	0.04	L	Jaundice, high pressure	vegetable	Oral	0.04	0
Withania somnifera (L.) Dunal; MB177	Solanaceae	Aswagondha	0.02	R	Vitiligo	juice	Oral	0.02	0
Zingiber officinale Roscoe.; MB158	Zingiberaceae	Hijeng,	0.06	Rh	Cough, dog bite,	paste	Oral	0.04	0.5
Ziziphus mauritiana Lam.; MB090	Rhamnaceae	Bogori	0.02	L	Allergy	paste	external	0.02	0

Note: B: Bark, Bu: Bulb, L: Leaf, F: Flower, Fr: Fruit, La: Latex, P: Petiole, Rh: Rhizome, R: Root, S: Seed, St: Stem, Tu: Tuber, Tw: Twig

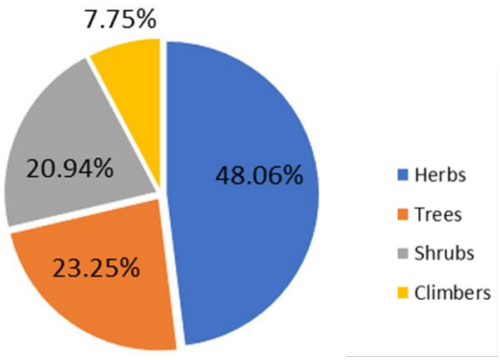

Figure 2. Percentage of different habits of the documented plants

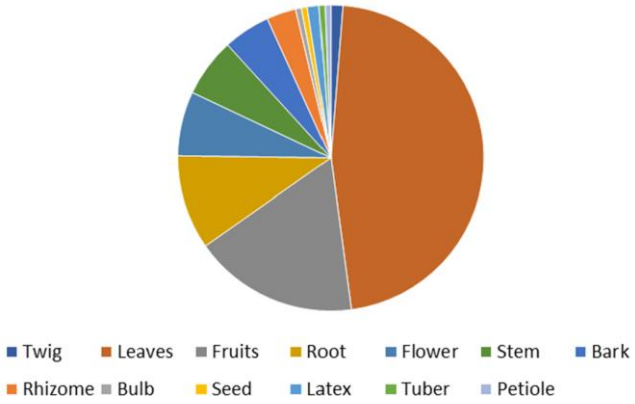

Figure 3. Percentage contribution of plant parts used

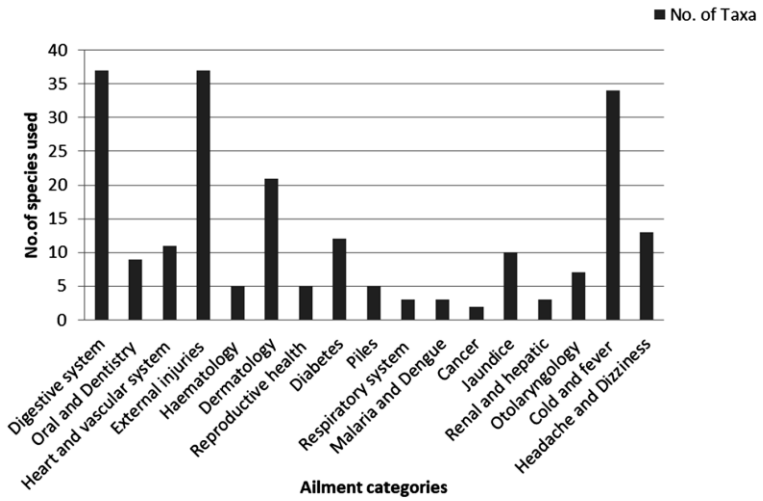

Figure 4. Number of medicinal plant species used for various ailment categories

Table 4. Informant consensus factor (F_{ic}) of the diseases reported by the informants

Disease category	Use reports (N_{ur})	No. of Taxa (N_t)	F_{ic}
1. Digestive system (dysentery, diarrhea, digestion, intestine worm, vomiting, stomach ache, gastric, stomach bulging)	148	37	0.75
2. Oral and dentistry (tooth ache, tooth decay, tongue bumps, leukoplakia)	11	9	0.2
3. Heart and vascular system (low pressure, high pressure)	15	11	0.28
4. External injuries (cut and wounds, boil, wound healings, dog bite, insect bite, burning)	54	37	0.32
5. Haematology (blood purification)	6	5	0.2
6. Dermatology (allergy, ringworm, vitiligo, pimples, rejuvenation, chicken pox, smallpox, hair fall)	31	21	0.33
7. Reproductive health (azoospermia, menstruation pain, pregnancy, hypogalactia)	7	5	0.33
8. Diabetes	20	12	0.42
9. Piles	6	5	0.2
10. Respiratory system (bronkitis, tuberculosis)	3	3	0
11. Malaria and dengue	4	3	0.33
12. Cancer	2	2	0
13. Jaundice	17	10	0.43
14. Renal and hepatic (kidney stone, swollen)	19	3	0.88
15. Otolaryngology (ENT) (nasal bleeding, sinusitis, ear allergy, ear pain)	15	7	0.57
16. Cold and fever (cough, fever, asthma)	74	34	0.54
17. Headache and dizziness	18	13	0.29
18. Others (bone fracture, eye redness, white on eyes, urethritis)	19	15	0.22

Figure 5. A. *Averrhoa carambola,* B. *Acmella paniculata,* C. *Catharanthus roseus,* D. *Clitoria ternatea,* E. *Cuscuta reflexa,* F. *Drymaria cordata,* G. *Euphorbia neriifolia,* H. *Impatiens tripetala,* I. *Mimosa pudica,* J. *Oxalis corniculata,* K. *Phlogacanthus thyrsiformis,* L. *Pouzolzia zeylanica,* M. *Ricinus communis,* N. *Rumex acetosa,* O. *Sida rhombifolia,* P. *Tabernaemontana divaricata*

Musa balbisiana is also a highly valued medicinal plant. It is scientifically proven that this plant has antioxidant, antibacterial, antidysenteric, anti-diabetic, anti-cancer, anti-ulcer, hepatoprotective activities (Daimari and Swargiary 2020; Tin et al. 2016, 2020; Kusuma et al. 2017; Salsabila et al. 2020; Swargiary et al. 2020; Wardati et al. 2018; Zubair et al. 2018; Zakaria et al. 2020). Due to their rich medicinal properties, these plants are used in the treatment of various ailment categories by these indigenous people.In this study, 51 plants had the lowest UV value of 0.02.

Relative Frequency of Citation (RFC)

The collected ethnobotanical data were quantitatively analyzed using the relative frequency of citation (RFC) index. The relative frequency of citation signifies the importance of each species in the particular study area. This index theoretically varies from 0 to 1. In the present study, the RFC range was 0-0.60 (Table 3). The highest relative frequency of citation was found in *Kalanchoe pinnata* (0.60) followed by *Musa balbisiana* Colla. (0.48), *Ocimum tenuiflorum* (0.44), and *Azadirachta indica* (0.34). The values are approximately near the RFC value of 1, indicating that the above-cited plant species had the highest importance in the Baksa District. Significantly *Acmella ciliata*, *Alocasia macrorrhizos*, *Amaranthus blitum*, *Camellia sinensis* etc., showed an RFC value of 0. Some species also had the RFC value close to 0, meaning that these species were the least important in that particular area.

Figure 6. A,B,C. Informants showing various medicinal plants; D,E. Informants with one of the author during survey

Informants' Agreement Ratio (IAR)

The Informants' Agreement Ratio (IAR) is the determination of the importance of individual of individual species. This IAR value is theoretically varies from 0 to 1. In this survey, the IAR ranged from 0 to 1 (Table 3). Several species like *Acmella ciliata*, *Alocasia macrorrhizos*, *Amaranthus blitum*, *Camellia sinensis*, *Artocarpus chama*, *Bacopa monnieri*, *Brassica juncea*, *Capsicum chinense*, *Centipeda minima*, *Citrus x limon* (L.) Osbeck, *Clitoria ternatea*, *Cuscuta cassytoides*, *Dracaena trifasciata*, *Dryopteris filix-mas*, *Ficus hispida* L. f, *Hellenia speciosa* etc. showed IAR value 0. This indicates the number of illness categories equals the number of citations. In contrast, *Acmella uliginosa*, *Alternanthera brasiliana*, *Amaranthus tricolor*, *Areca catechu*, *Bambusa tulda*, *Chromolaena odorata*, *Jatropha curcas*, *Lawsonia inermis*, *Pouzolzia zeylanica*, *Tamarindus indica*, *Terminalia bellirica*, and *Terminalia chebula* showed the IAR value of 1, indicating that all the participants mentioned the plant species for particular disease.

Informants Consensus Factor (F_{ic})

The F_{ic} values ranged from 0 to 0.88, with a mean value of 0.33 (Table 4). The highest F_{ic} value was found in the ailment category of Renal and hepatic disorder (0.88 each), followed by Digestive system (0.75), Otolaryngology (0.57), and Cold and Fever (0.54). The high F_{ic} value indicates the homogeneity in terms of the uses of plants by the common people as they used only one or very few plants for the treatment of specific ailment categories. The lowest F_{ic} value was recorded for Respiratory system(0) and Cancer (0). This was due to disagreement in the selection of taxa between informants for specific ailment categories.

In conclusion, this present study has recorded 129 medicinal plant species used in the treatment of 18 different ailment categories by the Bodo Community of Baksa District of the state of Assam, India. This treasure of traditional knowledge is passed from generation to generation only by means of practical applications without written forms. So, the plants with ethnomedicinal properties must be chemically tested for the presence of

proper bioactive compounds, which will be helpful for drug designing in the pharmaceutical field in the near future. Local people should be trained through conservation education to develop awareness and conservation management strategies for the ethnomedicinal and floristic diversity of Baksa District.

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