

Ethnobotany: The Ethnicity of the Dimasa Kachari, Dima Hasao, Assam, India

Research Article

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Abstract

The Dimasa Kacharis of Dima Hasao, Assam, India have adopted many ethnic ways of using plants, surrounding them, sometimes due to easy availability or poor communication system. But, with modernization, the ethnicity is gradually fading. Thus, it is very important to scientifically document, restore and preserve the knowledge of ethnobotany for greater interest of human society. The extensive interview survey has been carried out among the people of Dimasa Kachari community of 18 villages in Maibang, Langting, Diyungbra and Umrangso of Dima Hasao, Assam from the month of August 2015 to May 2017 following the open-ended questionnaire survey. Sixty-two respondents report a total of 116 plant species and 19 plant parts, of which 74, 60, 22 and 15 species and 13, 12, 11 and 7 plant parts are used for medicinal, edible, cultural and household uses respectively, where some of them are used commonly. These species are of five plant habits—herbs (46 spp.), trees (27 spp.), shrubs (19 spp.), climber (14 spp.) and grasses (10 spp.). A total of 48 ailments (medicinal uses), 11 edible uses, nine cultural uses and ten household uses are recorded. The study reveals a high diversity of ethnically important plants in the ethnic life of Dimasas of Dima Hasao.

Keywords: Indigenous; Plants; Ethnic knowledge; Ethnomedicine; Culture

Introduction

Ethnobotany is a study of the relationship between indigenous or primitive communities of a region and the surrounding environment particularly the plant world [1,2]. In broader sense, Ethnobotany is the study of the biological knowledge, of particular ethnic groups, including medicinal and cultural knowledge about plants and their interrelationships [3]. The ethnic-indigenous communities dwelling in and around many forested areas (especially forest fringe areas) depend on the forest resources for maintaining their livelihoods [4], such ethnic uses are based from medicinal to cultural purposes, from aesthetic to economic purposes, from food to clothing purposes.

The ethnic healthcare system is closely related to the culture of the people and their knowledge of the nature around them [5]. Worldwide, about 80% of the population depends on traditional health care system for their primary healthcare system [6], out of which the population

in developing countries is found more in using traditional medicines (60–90%) than that in developed countries (23–80%) [7-9]. Around 60% of commercially available drugs are extracted traditionally by various indigenous cultures from various natural resources around the globe [10]. Out of the total 4,22,000 known angiosperms, more than 50,000 are used for medicinal purposes [11]. Some authors like Prescott and Prescott (1990:365–374) and Rapaport and Drausal (2001:375–382) estimated that there are around 27,000 plant species of possible food resources in the planet and 103 plant species used as resources for 90% of the world food supply. Besides, many plants are widely used in different worships, some are considered sacred while many others as taboo and symbol of evil, likely based on tale and folklore [12-15].

India comprises of 427 tribal groups out of which more than 130 major tribal groups are present in North-East India [16]. The district Dima Hasao comprises of many beautiful ethnic communities,

Dimasa Kachari, Zeme Naga, Hmar, Kuki, Biata, Hrangkhoh, Khelma, Jaintia, Vaiphei, Rongmei, Lushai and Karbi, who live harmoniously together with several other groups like the Assamese, Bengalis, Nepalis, etc. who are mostly government employees, traders, living in urban and semi-urban areas [17]. Out of total population of 2,13,529 and population density of 44 individuals per square kilometres, which is the lowest in Assam, the total population of Dimasa Kachari is 64,881, constituting 32.90% of total population of Dima Hasao. The term 'Dimasa' comprises of three Dimasa words ('DI' meaning 'water', 'MA' meaning 'great' and 'SA' meaning 'son'), thus literally 'Dimasa' means 'the son of a Great River' or 'the son of the Brahmaputra' (since the Brahmaputra is the largest and the longest river in Assam; the Dimasas consider themselves to be the descendants of the river Brahmaputra). The Dimasa Kachari, linguistically, belongs to the Tibeto-Burman group and have a prominent Mongoloid features belonging to Indo-Mongoloid (Kirata Family) [18-22].

The ethnic tribes (Dimasa Kachari as one such) of the district are gifted with the knowledge of ethnobotanical use of flora including ethnomedicine and other uses as staple food, household materials, vegetables, traditional purposes, spiritual beliefs, etc. [23]. The ailments are cured or being tried to be cured using the plant parts (root, leaves, stem, bark and so on) by the tribal or indigenous people from the ancient time till today and such practices are passed through oral communication from generation to generation without any proper documentation [24-26].

Although in today's world of modernisation the Dimasas happen to cure themselves with modern medicine and get themselves adapted to modernisation, still there are many areas of the district where the local people depend on the ethnic ways of living. Since most of the villages are situated far from mainland of the district and are inaccessible to transport system due to poor road connectivity, the villagers find it more convenient to practice traditional ethnic remedies, food and culture within their localities. Even though, few healthcare centres and shopping centres are present in some areas of the district, they lack good and hygiene medicinal facilities. Thus, ethnic lifestyles are practiced in such areas due to easy availability and cultural acceptability of the resources and poor economic conditions [24].

Although in Assam many related works are studied among the Assamese Community [27], Karbi community [28-30], Mising community [31], Bodo community [32,33], Rabha community [34], Hajong community [35] and within Dima Hasao district, Jaintia community [36-38], Zeme Naga community [36,37,39], Hmar community [37], Vaiphei community [37], Biata community [37] and Dimasa Kachari community [21,22,36,37,40,41]. For the better understanding in the field of ethnobotany, the present study was conducted, which not only provide them with ethnomedicines but also act as an important resource for various daily household and cultural needs.

Methodology

Study Area

The present study was carried out at Maibang, Langting, Diyungbra and Umrangso of Dima Hasao district of Assam (Figure 1).

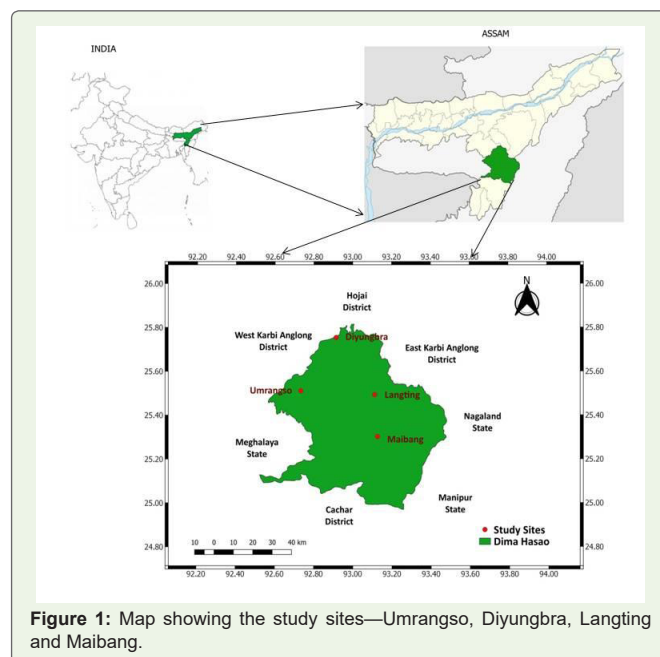


Figure 1: Map showing the study sites—Umrangso, Diyungbra, Langting and Maibang.

Dima Hasao, earlier known as North Cachar Hills, is one of the only two hill districts of Assam, other being Karbi Anglong. Situated north to the Barak Valley and with Barail Range as its main range, the major portion of the district is covered by hills and lesser regions with plains. Being a part of the Indo-Burma, one of the 36 hotspots of the world and one of the four hotspots of India, Dima Hasao is garlanded by alluring hills with its headquarter, Haflong—"Switzerland of the East" and "Second Shillong". The highest mountain peak of Assam, Mount Thumjang, is situated in the district [42]. Situated at the southern part of Assam between 92°37'–93°17' E longitude and 25°3'–25°47' N latitudes with an altitude of 600–900 meters asl (eastern) and 1000–1866 meters asl (northern) and covering an area of 4890 sq. km and temperature range of 10° C to 14° C (minimum) and 24° C to 30° C (maximum), Dima Hasao is bounded by Nagaland and Manipur states in the east, Cachar district of Assam in the south, Meghalaya state and West Karbi Anglong district in the west and Hojai and East Karbi Anglong districts in the north. The main rivers of the district are Kapili, Diyung, Dehangi, Jatinga, Jenam, Mahur and Langting, all originating from the Borail Range [43]. **Maibang** (Dimasa words, MAI—rice grain and BANG—plenty), situated at the bank of river Mahur, is a sub-division of the Dima Hasao. **Langting** (Karbi word, LANGTING—Clear Water or Clear River, thus, "Langting" means "the clear river flow"), also known as Langting Hasin, is a small town located at the bank of the river Langting. **Diyungbra** (Dimasa words, DI—water and YUNG—large) is a small town situated at the bank of the river Diyung, which mark boundary between Dima Hasao and West Karbi Anglong. **Umrangso** (Pnar words, UMRANGSO—red water or red river) is a small and the only industrial town of Dima Hasao situated at the bank of the river Kapili.

Methods

Sampling Method

The extensive study had been carried out through field observations

Table 1: No. of interviewees in respective villages.

| Town (No. of interviewees) | Maibang (23) | Langting (25) | Diyungbra (19) | Umrangso (17) |
|----------------------------|------------------|----------------|----------------|------------------|
| | Hajong (7) | Shibraipur (5) | Baraima (6) | Lonkhu (6) |
| Villages within each town | Khaothimdisa (5) | Laibong (4) | Hadingma (6) | Dishabra (5) |
| (No. of interviewees) | Gidingpur (4) | Sengol (6) | Tinali (3) | Saindao Raji (2) |
| | Khunaapara (4) | Mitherdisa (4) | Rajbari (5) | Dongjen Raji (4) |
| | Saiding (3) | Pamphughat (5) | | |

Table 2: Demographical representation of interviewees.

| Variable | Category | No. of Interviewees | Percentage |
|------------------------------------|-----------------------------------|---------------------|------------|
| Sex Ratio | Male | 36 | 43% |
| | Female | 48 | 57% |
| Age Group (in years) | 30–39 | 12 | 14% |
| | 40–49 | 22 | 26% |
| | 50–59 | 25 | 30% |
| | 60–69 | 11 | 13% |
| | 70–79 | 8 | 10% |
| | 80 and above | 6 | 7% |
| Education level | Illiterate | 17 | 20% |
| | Lower Primary | 11 | 13% |
| | Middle English | 23 | 27% |
| | High School | 20 | 24% |
| | Matriculation | 10 | 12% |
| | Higher Secondary | 3 | 4% |
| Occupation | Goanbura | 18 | 21% |
| | Farmer | 22 | 26% |
| | Greengrocer | 14 | 17% |
| | Traditional medicine practitioner | 11 | 13% |
| | Forest personnel | 9 | 11% |
| | Housewife | 4 | 5% |
| | Teachers | 6 | 7% |
| Total number of interviewees is 84 | | | |

and interrogation with the local people following purposive sampling method [44]. The interviewees were selected based on their ethnicity and availability of the ethnobotanically important plants. The selected interviewees include Goanburas (Village Head), traditional medicine practitioner, forest personnel, farmers, green-grocers and other local inhabitants (Table 2). For the purpose of excellent learning in-depth information, the interviewees having age more than 30 years were preferred [45].

Data Collection and Species Identification

Open-ended questionnaire surveys were used to collect information about the ethnobotanical uses among the Dimasa Kacharis of the selected study areas [44]. Each of the four study sites were visited four times a year from August, 2015 to May, 2017 and required data were collected during all four seasons from 18 ethnic villages situated within four towns, Maibang, Langting, Diyungbra and Umrangso, five villages from Maibang and Langting each, four villages from Diyungbra and Umrangso each (Table 1). Gaonbura of

each and every village was visited firstly, with whose permission and help the appropriate interviewees were questioned. In addition, the green-grocers were interviewed in the local markets. The interviews were done in local language and the species names were recorded in local names (Dimasa Kachari). Ethnobotanical knowledge, including local names of ethnobotanically important plants, their present availability, various uses, useful plant parts and preparation process, along with the information of interviewees were recorded in note books and data revealed were transcribed for analysis.

Herbaria of collected plant species were prepared and submitted in the Department of Forestry, North Eastern Regional Institute of Science and Technology, Arunachal Pradesh. Identifications were done with the help of experts either from the prepared herbaria or the photographs captured during field observation.

Data Analysis

Following the collection and identification, tabulation of the scientific name, English name, vernacular name, family and habits of plant species; plant parts used and procedure of preparation for ethnobotanical uses (medicinal, edible, cultural and household) and voucher number of the vouchered specimen, along with the interviewees' information and the study areas were done. Comparison of four ethnobotanical uses based on number of plant species and used plant parts and based on overlapping plant species and used plant parts was prepared.

Results

Interviewees Information

A total of 84 interviewees participated; firstly the Gaonburas (Village Head) and the elderly persons were interviewed followed by traditional medicine practitioners, green-grocers, farmers, forest personnel, housewives and school teachers; the highest number of interviewees were farmers (26%), whereas, housewives were the lowest (5%) (Table 2). Out of the total four towns, the highest number of interviewees was documented from Langting (30%), followed by Maibang (27%), Diyungbra (23%) and lowest from Umrangso (20%). These towns comprise of 18 small villages and the highest number of interviewees was documented from Hajong (8%) and the lowest from Saindao Raji (2%) (Table 1). The female interviewees were higher in number (57%) than the males (43%). Considering the age group of the interviewees, the highest number of interviewees recorded was between 50–59 years of age and the lowest, between 80–89 years. In addition, majority of the interviewees were farmers and had mostly academically qualified their middle standard in terms of education (Table 2).

Ethnobotanical Uses

Diversity of Plant Species: A total of 116 plant species, belonging to 48 families and 101 genera, are documented from 18 different ethnic villages of four towns—Langting, Maibang, Diyungbra and Umrangso of Dima Hasao district of Assam (Table 3). Among 48 families, highest number of species is recorded from Poaceae i.e eight species, followed by Fabaceae (9 spp.), Rutaceae (7 spp.), Malvaceae (6 spp.), Asteraceae, Lamiaceae, Moraceae and Solanaceae (5 spp. each), Amaranthaceae (4 spp.), Acanthaceae, Amaryllidaceae,

Table 3: The ethnobotanical knowledge of Dimasa Kachari community, Dima Hasao

| Family | Botanical name / Voucher number | Vernacular name 'Dimasa Kachari' (Habit) | Ethno- botanical Uses | Mode of use |
|----------------|--|--|----------------------------------|--|
| Acanthaceae | <i>Andrographis paniculata</i> (Burm.f.) Nees / Parbo 153 | Sirota (H) | Medicinal | Decoction/paste/powder/smash. Le/Sh for diarrhea, dysentery |
| | <i>Justicia gendarussa</i> Burm.f. / Parbo 185 | Khim-atha (S) | Medicinal | Smash Le/Sh for bleeding, burns |
| | <i>Phlogacanthus thyrsoiflorus</i> Nees / Parbo 103 | Aalusho (S) | Medicinal Edible | i)Boil FI for stomachache, high pressure ii)Boil and smash FI/Le as vegetable |
| Amaranthaceae | <i>Celosia argentea</i> L. / Parbo 207 | Khimsagajao (H) | Cultural | Offer FI to God in a Dimasa traditional puja (Madai Huba) |
| | <i>Achyranthes aspera</i> L. / Parbo 135 | Samshungi (H) | Medicinal | Smash Ro and the juice squeezed out cures jaundice |
| | <i>Alternanthera brasiliana</i> (L.) Kuntze / Parbo 172 | Bishola (H) | Medicinal | Smash Le for burns, bleeding |
| | <i>Amaranthus viridis</i> L. / Parbo 248 | Khutra (H) | Edible | Stewed Le/St with fermented fish for vegetable, boil Le/St for fodder |
| Amaryllidaceae | <i>Allium cepa</i> L. / Parbo 142 | Sangprang gajao (H) | Edible Cultural | i)Fry/boil Bu/St for flavoring ingredient ii)Bu is put on top of the vessel cover that contains fermenting rice for rice wine (Judima) |
| | <i>Allium sativum</i> L. / Parbo 158 | Sangprang gupu (H) | Medicinal Edible | i)Smash and heat Bu with mustard oil for cold ii)Fry/boil Bu/St for flavoring ingredient |
| | <i>Hippeastrum reginae</i> (L.) Herb. / Parbo 104 | Khimlili (H) | Medicinal | Smash Co for stomachache |
| Apiaceae | <i>Centella asiatica</i> (L.) Urb. / Parbo 191 | Mikharing (H) | Medicinal Edible | i)Raw/smash Le for jaundice, gastritis ii)Boil Le for vegetable |
| | <i>Eryngium foetidum</i> L. / Parbo 122 | Bakhorbilati (H) | Edible | Smash/chop Le for vegetable/flavoring ingredient |
| Apocynaceae | <i>Alstonia scholaris</i> (L.) R. Br. / Parbo 180 | Bongkhlongphang (T) | Cultural | Be/Br is cut and made into musical instrument (Muri) |
| | <i>Marsdenia jenkinsii</i> Hook.f. / Parbo 205 | Thajjora (C) | Medicinal | Smash Fr for fracture |
| | <i>Rauvolfia serpentina</i> (L.) Benth. ex Kurz / Parbo 177 | Argamwati (S) | Medicinal | Ro/Le is fed raw for snakebite, dogbite, piles, stomachache; but poison for dogs |
| Araceae | <i>Homalomena aromatica</i> (Spreng.) Schott / Parbo 123 | Gondai (H) | Medicinal Edible | i)Protruded organ in rectal prolapse is pushed back with the help of tender Le ii)Stew Le with fermented fish and tamarind for vegetable |
| Araliaceae | <i>Trevesia palmata</i> (Roxb. ex Lindl.) Vis. / Parbo 146 | Khimthaudzi (T) | Edible | Boil and smashed Fr/FI with fish for vegetable |
| Arecaceae | <i>Areca catechu</i> L. / Parbo 210 | Gowai (T) | Edible Cultural | i)Raw/dried Fr chewed with betel leaf ii)Offer Fr in traditional puja (MadaiHuba) |
| | <i>Cocos nucifera</i> L. / Parbo 228 | Nadikol (T) | Medicinal Edible Household | i)Bath with coconut water from its Fr for smallpox, chicken-pox ii)Fr is taken when matured iii)Dried leaflets of Le tied together for broom |
| Asphodelaceae | <i>Aloe vera</i> (L.) Burm.f. / Parbo 137 | Gritkumari (H) | Medicinal | Apply inner leaf gel from Le for skin allergy, skin rashes, wound |
| Asteraceae | <i>Blumea lanceolaria</i> (Roxb.) Druce / Parbo 249 | Jegaore (H) | Edible | Chop or smash Le with fermented fish as vegetable |
| | <i>Chromolaena odorata</i> (L.) R.M.King & H.Rob. / Parbo 166 | Samkhabli (H) | Medicinal | Smash Le for bleeding |
| | <i>Mikania micrantha</i> Kunth / Parbo 194 | Dukhalai (C) | Medicinal | Smash Le/St for bleeding |
| | <i>Tagetes erecta</i> L. / Parbo 255 | Khimdakim (H) | Medicinal | Smash Le and its juice, thereafter, is put in navel to cure UTI |
| | <i>Tridax procumbens</i> (L.) L. / Parbo 138 | Sam khamaothai (H) | Medicinal | Smash FI for toothache |
| Athyriaceae | <i>Athyrium filix-femina</i> (L.) Roth / Parbo 120 | Birsilai (H) | Medicinal | Le is put beneath bed as bedbug repellent; when rubbed with Le cures wound |
| | <i>Diplazium esculentum</i> (Retz.) Sw. / Parbo 264 | Daomalai (H) | Edible | Fry Sa/BI as vegetable |
| Basellaceae | <i>Basella alba</i> L. / Parbo 219 | Mephrai (C) | Medicinal Edible | i)Boil Le/St for jaundice ii)Boil/fry Le/St for vegetable |

| | | | | |
|----------------|--|--------------------------|----------------------------------|---|
| Brassicaceae | <i>Brassica rapa</i> L. / Parbo 269 | Yaulaisa (H) | Edible Cultural | i)Fry/boil Le with rice powder as vegetable ii)Se is sprinkle/tie in cloth in traditional spells (Phrenba) |
| Bromeliaceae | <i>Ananas comosus</i> (L.) Merr. / Parbo 173 | Laihammuri (H) | Medicinal Edible | i)Raw Fr for digestion, calculus ii)Fr is taken when ripe |
| Cannabaceae | <i>Cannabis sativa</i> L. / Parbo 211 | Ganja phang (H) | Medicinal | Fry Le with rice powder for headache |
| Cannaceae | <i>Canna indica</i> L. / Parbo 143 | Thalairu (H) | Medicinal | Boil Rh for lactation |
| Caricaceae | <i>Carica papaya</i> L. / Parbo 221 | Goyaphol (H) | Medicinal Edible Household | i)Boiled Fr Piles ii)Ripe Fr as fruit; boil Fr as vegetable iii)Its Fr juice as detergent |
| Combretaceae | <i>Terminalia bellirica</i> (Gaertn.) Roxb. / Parbo 160 | Babraithai (T) | Edible | Matured Fr as wild nuts |
| Convolvulaceae | <i>Cuscuta reflexa</i> Roxb. / Parbo 230 | Dukhalugun (C) | Medicinal | Boil WP and its stock is fed for jaundice |
| Crassulaceae | <i>Bryophyllum pinnatum</i> (Lam.) Oken / Parbo 199 | Khimwaiblai (H) | Medicinal | Raw Le as medicine for dysentery, diarrhea, gas of both human and cattle |
| Cucurbitaceae | <i>Cucurbita maxima</i> Duchesne / Parbo 155 | Khaokhlumonglai (C) | Medicinal Edible | i)Fry FI with egg for balanitis ii)Fry/stew Le/St/Fr/Se with fermented fish as vegetable |
| | <i>Lagenaria siceraria</i> (Molina) Standl. / Parbo 203 | Laotai (C) | Household | Dry, empty and use Fr as vessel to serve 'Judima' |
| | <i>Luffa cylindrica</i> (L.) M.Roem. / Parbo 195 | Pronthai (C) | Edible Household | i)Fry/stew Fr with fermented fish as vegetable ii)Dry Fr, remove seeds and cover to use as scrubber |
| Euphorbiaceae | <i>Jatropha curcas</i> L. / Parbo 184 | Radaokhlong gupu (S) | Medicinal | Directly put Ps on the sore tongue to cure sore tongue |
| | <i>Jatropha gossypifolia</i> L. / Parbo 174 | Radaokhlong gajao (S) | Medicinal | Directly put Ps on the sore tongue to cure sore tongue |
| | <i>Ricinus communis</i> L. / Parbo 256 | Radaolai (S) | Edible | Feed raw and tender Le to Eri silkworm as fodder |
| Fabaceae | <i>Acacia farnesiana</i> (L.) Willd. / Parbo 115 | Gokul (S) | Medicinal | Smash Ro for jaundice, wound |
| | <i>Acacia concinna</i> (Willd.) DC. / Parbo 257 | Sujimikhri (S) | Medicinal | Boil Le/Sh and soup is fed for cold |
| | <i>Albizia myriophylla</i> Benth. / Parbo 147 | Thembra (S) | Cultural | Powder Ba, mix with rice powder and make biscuit, which is again mixed with cooked rice in 'Judima' preparation |
| | <i>Cajanus cajan</i> (L.) Millsp. / Parbo 261 | Khaokhlem (S) | Medicinal | Smash tender Le for UTI |
| | <i>Senna sophora</i> (L.) Roxb. / Parbo 270 | Metheb (S) | Edible | Boil Le/St and feed to pig as fodder |
| | <i>Entada rheedii</i> Spreng. / Parbo 229 | Suthai (C) | Medicinal Cultural | i)Smash Fr for wound, boil ii)Powder Fr and mix in water as sacred |
| | <i>Mimosa pudica</i> L. / Parbo 167 | Sam gablao (H) | Medicinal Cultural | i)Smash WP and put on the 'boil' to cure it ii)Believed that if one plays with Le makes one forgetful |
| | <i>Parkia speciosa</i> Hassk. / Parbo 251 | Bairethai (T) | Medicinal Cultural | i)Fry/boil Fr with fermented fish for gas ii)Its Fr/WP is believed unholy (Believed in ancient days its leaves were used to keep pork meat, which is unholy) |
| | <i>Tamarindus indica</i> L. / Parbo 259 | Tintri (T) | Medicinal Edible | i)Mix ripe Fr with jaggery for stomachache; boil Le for cold ii)Raw or ripe Fr |
| Lamiaceae | <i>Clerodendrum glandulosum</i> Lindl. / Parbo 102 | Mishimao (S) | Medicinal Edible | i)Boil Le cures high pressure; but bad for patient with low pressure ii)Boil Le as vegetable |
| | <i>Leucas aspera</i> (Willd.) Link / Parbo 234 | Sam sheebing (H) | Medicinal | Sap from Le is poured into goat's infected eyes to cure the infection |
| | <i>Mentha spicata</i> L. / Parbo 266 | Pudina (H) | Medicinal Edible | i)Smash Le for stomachache ii)Smash Le as vegetable |
| | <i>Ocimum americanum</i> L. / Parbo 220 | Bahanda (H) | Edible | Smash/add raw Le to curry as flavoring ingredient |
| | <i>Ocimum tenuiflorum</i> L. / Parbo 176 | Tulsi (H) | Medicinal Cultural | i)Smash Le and its juice is mixed with honey for cough ii)Water, when mixed with its Le and a coin, is considered sacred |

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|----------------|--|----------------------|----------------------------------|--|
| Malvaceae | <i>Abelmoschus esculentus</i> (L.) Moench / Parbo 237 | Bendi (H) | Medicinal Edible | i)Boil Fr for gastritis ii)Fry/boil Fr as vegetable; Se fermented as 'Enzang' |
| | <i>Bombax ceiba</i> L. / Parbo 246 | Bonjuphang (T) | Household | Seed hair fibres of Fr put inside a stitched cloth and make into pillow & mattress |
| | <i>Gossypium arboreum</i> L. / Parbo 267 | Khunthlai (S) | Household | Bo put inside stitched cloth and make into pillow & mattress; use in death ceremony too |
| | <i>Hibiscus sabdariffa</i> L. / Parbo 271 | Tekhlaomikhri (H) | Edible | Boil/raw Cal as vegetable; Cal fermented as 'Enzang' |
| | <i>Sida acuta</i> Burm.f. / Parbo 127 | Jarap (S) | Household | Cut St, dry and tie together and use as broom |
| | <i>Sida rhombifolia</i> L. / Parbo 216 | Sam jarap (S) | Medicinal | Ro is tied around abdomen with the root just above navel to cure navel displacement |
| Meliaceae | <i>Azadirachta indica</i> A.Juss. / Parbo 223 | Neem (T) | Medicinal Edible | i)Boil/smash Le for skin allergy, skin rashes, wound, chickenpox, smallpox, malaria ii)Fry Le as vegetables |
| | <i>Melia azedarach</i> L. / Parbo 226 | Thaimodo (T) | Cultural | Boil Fr and the stock is applied to thread in weaving |
| Moraceae | <i>Artocarpus heterophyllus</i> Lam. / Parbo 130 | Thaiphlung (T) | Edible | Fry/smoke/boil Fr/Se as vegetable; ripe fleshy part of Fr is taken raw |
| | <i>Broussonetia papyrifera</i> (L.) L'Hér. ex Vent. / Parbo 260 | Tingurlai (T) | Edible | Boil Le, Sh as fodder to pig; ripe fruit is taken |
| | <i>Ficus hispida</i> L.f. / Parbo 140 | Khandao (T) | Medicinal | Burnt Le and the juice is squeezed into ear to cure earache |
| | <i>Ficus religiosa</i> L. / Parbo 252 | Praphang (T) | Cultural | WP is believed to be a Numen of Deities |
| | <i>Streblus asper</i> Lour. / Parbo 134 | Khande (T) | Medicinal Cultural | i)Smash Le/Sh and feed to cure stomachache ii)WP is believed to be a Numen to protect a child, so a traditional puja is performed in favor of the newly born baby |
| Moringaceae | <i>Moringa oleifera</i> Lam. / Parbo 268 | Sorjona (T) | Edible Cultural | i)Fry/boil Le/FI/Fr with or without rice powder as vegetable ii)Smash Ba and use for fishing |
| Musaceae | <i>Musa balbisiana</i> Colla / Parbo 119 | Lai-yung (H) | Medicinal Edible Cultural | i)Boil Fr for dysentery; boil/fry Fr cures low hemoglobin; tender Le use to push back protruded organ in rectal prolapse ii)Fry/stew FI and Sh with fermented fish as vegetable; Ripe Fr is taken iii)Chop/smash Fr and fermented to prepare Banana wine |
| | <i>Musa × paradisiaca</i> L. / Parbo 156 | Kaskola (H) | Medicinal Edible | i)Fry/boil Fr for hemoglobin level ii)Fry Fr as vegetable |
| Myrtaceae | <i>Psidium guajava</i> L. / Parbo 192 | Sukhrem (T) | Medicinal Edible | i)Smash Le and eaten for dysentery ii)Ripe Fr is taken |
| Nymphaeaceae | <i>Nymphaea rubra</i> Roxb. ex Andrews / Parbo 201 | Panibar (H) | Edible | Smash Se as vegetable |
| Oxalidaceae | <i>Averrhoa carambola</i> L. / Parbo 245 | Khamranga (T) | Medicinal Edible | i)Raw Fr for gastritis, hypertension ii)Raw Fr is taken |
| | <i>Oxalis corniculata</i> L. / Parbo 128 | Thikrisa (H) | Medicinal Edible Household | i)Smash WP and mix its juice with palm candy for diarrhea, dysentery, UTI ii)Stew WP with fermented fish as vegetable iii)Rub brass utensils with WP as detergent |
| Phyllanthaceae | <i>Bridelia stipularis</i> (L.) Blume / Parbo 227 | Sbaothai (C) | Edible | Raw Fr as wild fruit |
| | <i>Phyllanthus emblica</i> L. / Parbo 161 | Hamlaithai (T) | Medicinal Cultural | i)Soak, smash and squeeze juice from Ba and Fr for jaundice, diabetes ii)WP is believed Numen to protect newly born, for whom a traditional puja is done |
| Pedaliaceae | <i>Sesamum indicum</i> L. / Parbo 236 | Sheebing (H) | Medicinal Edible | i)Powder Se and feed with curry for piles ii)Powder/direct Se as flavoring ingredient |
| Pinaceae | <i>Pinus kesiya</i> Royle ex Gordon / Parbo 149 | Bonthau (T) | Household | Be/Br can be directly use as fire Igniter (kindler) |
| Piperaceae | <i>Piper betle</i> L. / Parbo 263 | Mitzi (C) | Edible Cultural | i)Chew Le with <i>Areca catechu</i> ii)Offer Le to God in traditional puja |
| Poaceae | <i>Bambusa tulda</i> Roxb. / Parbo 144 | Wahshi (G) | Edible | Fry/boil Sh with/without rice powder as vegetable; fermented Sh as 'Miyamikri' |
| | <i>Cymbopogon nardus</i> (L.) Rendle / Parbo 206 | Tirisi (G) | Medicinal | WP is planted near and around house as insect repellent |

| | | | | |
|------------------|---|------------------------|------------------------|--|
| | <i>Cynodon dactylon</i> (L.) Pers. / Parbo 117 | Dhubri (G) | Medicinal Cultural | i)Smash WP and use for toothache ii)Offer Sh to God in traditional puja |
| | <i>Imperata cylindrica</i> (L.)Raeusch. / Parbo 171 | Thireelai (G) | Household | Cut St/Le, tie and use as thatched roof |
| | <i>Melocanna baccifera</i> (Roxb.) Kurz / Parbo 152 | Wahtzi (G) | Medicinal Household | i)Burn and powder Le to cure wound in dog ii)St is cut in required pieces for fence; cut in internode keeping one side open and the other closed for cooker, vessel |
| | <i>Oryza sativa</i> L. / Parbo 189 | Maisa (G) | Medicinal Edible | i)Water remain, after the Se is washed, cure white discharge ii)Stew Se and taken as staple food |
| | <i>Oryza sativa</i> L. / Parbo 188 | Maiju (G) | Edible Cultural | i)Steam Se and served as special dish in 'Bushu Dima' ii)Sweet 'Judima' is produced when its Se fermented with <i>Albizia myriophylla</i> |
| | <i>Saccharum officinarum</i> L. / Parbo 151 | Guroo (G) | Medicinal Household | i)Juice squeezed from St for UTI, jaundice ii)Left over, after squeezing out juice, use St as Firewood |
| | <i>Saccharum spontaneum</i> L. / Parbo 200 | Dubung (G) | Cultural | Dry St, cut in required pieces and tie up to make the instrument (Kharam-dubung) |
| | <i>Thysanolaena latifolia</i> (Roxb. ex Hornem.) Honda / Parbo 181 | Balangshi (G) | Household | Cut Fl/St, dry and tie up together as broom |
| Portulacaceae | <i>Portulaca grandiflora</i> Hook. / Parbo 164 | Khimdhubri (H) | Cultural | WP is believed as bad omen if it happens to root inside a house |
| Rubiaceae | <i>Paederia foetida</i> L. / Parbo 106 | Samkibu (C) | Medicinal Edible | i)Raw/boiled Le for diabetes, dysentery, gas, hemoglobin level, low pressure ii)Fry Le with flour as vegetable |
| Rutaceae | <i>Aegle marmelos</i> (L.) Corrêa / Parbo 178 | Belthai (T) | Medicinal Edible | i)Raw Fr with seeds for dysentery, diarrhea ii)Raw/smoke Fr is taken |
| | <i>Citrus aurantifolia</i> (Christm.) Swingle / Parbo 213 | Gol-leebu (T) | Medicinal Edible | i)Ferment Fr with salt for stomachache ii)Raw Fr is taken |
| | <i>Citrus maxima</i> (Burm.) Merr. / Parbo 111 | Reba (T) | Medicinal Edible | i)Raw Fr with salt for hypertension ii)Raw Fr is taken |
| | <i>Citrus latipes</i> (Swingle) Yu.Tanaka / Parbo 139 | Jamber (T) | Medicinal Edible | i)Squeezed juice from Fr for calculus ii)Dry/raw Fr peel as flavoring ingredient |
| | <i>Citrus limon</i> (L.) Osbeck / Parbo 186 | Leebu (T) | Medicinal Edible | i)Raw Fr peel and pulp is fed for parasitic worms ii)Raw Le, Fr peel as flavoring ingredient; raw Fr is taken |
| | <i>Citrus sinensis</i> (L.) Osbeck / Parbo 258 | Hondra (T) | Edible Household | i)Ripe Fr is taken ii)Dry, powder peel of Fr as face mask |
| | <i>Murraya koenigii</i> (L.) Spreng. / Parbo 272 | Norsingha (T) | Medicinal Edible | i)Fry Le for diabetes ii)Fry/add raw Le in a curry as flavoring ingredient |
| Saururaceae | <i>Houttuynia cordata</i> Thunb. / Parbo 126 | Mojokhamao (H) | Medicinal Edible | i)Smash Le with fermented fish for muscles pain, joint pain ii)Smash Le/St with fermented fish as edible |
| Scrophulariaceae | <i>Mecardonia procumbens</i> (Mill.) Small / Parbo 243 | Khangkhairigu (H) | Medicinal | Fry Le/St with an organic egg for menorrhagia |
| Smilacaceae | <i>Smilax perfoliata</i> Lour. / Parbo 157 | Sidzigubulai (C) | Medicinal | Use Le as a feeding plate for the baby with excess urination |
| Solanaceae | <i>Capsicum chinense</i> Jacq. / Parbo 169 | Morsaigibir (H) | Medicinal Edible | i)Boil/fry/raw Fr in required amount for gas ii)Cook/raw/fermented Fr as spice |
| | <i>Capsicum annuum</i> L. / Parbo 239 | Morsaiberma (H) | Edible Cultural | i)Cook/raw/fermented Fr as spice ii)Put Fr above the cover of a vessel with fermenting rice for 'Judima' preparation |
| | <i>Datura stramonium</i> L. / Parbo 131 | Khimdong (H) | Medicinal | Fry Le/FI with flour for headache |
| | <i>Solanum erianthum</i> D. Don / Parbo 238 | Laismu (S) | Household | While steaming Maiju, Le is kept between two vessels to prevent air passage |
| | <i>Solanum myriacanthum</i> Dunal / Parbo 148 | Panthao-shurang (S) | Medicinal | Heat Fr (not burn) and vapor is directed into effected part (no internal use) for toothache |
| Urticaceae | <i>Pouzolzia zeylanica</i> (L.) Benn. / Parbo 179 | Jambrulai (H) | Medicinal | Smash Le and use to cure boil |
| | <i>Sarcochlamys pulcherrima</i> Gaudich. / Parbo 240 | Misagi (S) | Medicinal Edible | i)Boil Le and feed to cure dysentery and recover mother's health after childbirth ii)Stew Le/Sh with fermented fish as eaten |
| Verbenaceae | <i>Lantana camara</i> L. / Parbo 242 | Samgari (S) | Edible | Ripe Fr is taken as a sweet wild fruit |

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|---------------|--|-----------------|---------------------|---|
| Vitaceae | <i>Cayratia trifolia</i> (L.) Domin / Parbo 110 | Durejeh (C) | Edible | Boil Le/St as fodder |
| | <i>Cissus quadrangularis</i> L. / Parbo 129 | Yaujora (C) | Medicinal | WP is smashed and tied in fractured body part to cure it |
| Zingiberaceae | <i>Alpinia nigra</i> (Gaertn.) Burt / Parbo 212 | Dera (H) | Edible | Boil/fry St/Fr as vegetable |
| | <i>Curcuma longa</i> L. / Parbo 254 | Silikhdi (H) | Medicinal Edible | i)Smash Rh and put around the wound ii)Dry, powder and put Rh in a curry as flavoring & coloring ingredient |
| | <i>Zingiber officinale</i> Roscoe / Parbo 107 | Hajing (H) | Medicinal Edible | i)Smash, boil and feed Rh for cold, immunity ii)Smash Le/Rh as flavoring ingredient, spice; stew with fermented fish as vegetable |

Abbreviations: H herb, S shrub, T tree, C climber, G grass, Le leaf, Sh shoot, Fl flower, Ro root, St stem, Bu bulb, Co corm, Be bole, Br branch, Fr fruit, Sa stalk, Bl blade, Se seed, Rh rhizome, WP wholeplant, Ps plantsap, Ba bark, Bo boll, Ca calyx

Apocynaceae, Cucurbitaceae, Euphorbiaceae and Zingiberaceae (3 spp. each), Apiaceae, Arecaceae, Athyriaceae, Meliaceae, Musaceae, Oxalidaceae, Phyllanthaceae, Urticaceae and Vitaceae (2 spp. each) and Araceae, Araliaceae, Asphodelaceae, Basellaceae, Brassicaceae, Bromeliaceae, Cannabaceae, Caricaceae, Cannaceae, Combretaceae, Convolvulaceae, Crassulaceae, Moringaceae, Myrtaceae, Nymphaeaceae, Pedaliaceae, Pinaceae, Piperaceae, Portulacaceae, Rubiaceae, Saururaceae, Scrophulariaceae, Smilacaceae and Verbenaceae (1 sp. each). Out of recorded 101 genera, Citrus has the highest number of species of five, Solanum, Capsicum, Saccharum, Oryza, Musa, Ficus, Sida, Ocimum, Acacia, Jatropha and Allium have two number of species each and the remaining 89 genera have one species each.

The four ethnobotanical uses, viz. medicinal, edible, cultural and household, are studied from 116 collected plant species. Out of 116 species, 74 species (64%) are used for medicinal purpose, 60 species (52%) for edible, 22 species (19%) for cultural and 15 species (13%) for household purposes (Figure 3). Many of the plant species are found commonly used for all the four ethnobotanical uses, for example, *Musa balbisiana*, *Phlogacanthus thyrsiflorus*, *Citrus sinensis*, *Oxalis corniculata*, *Melocanna baccifera*, *Piper betle*, *Mimosa pudica*, *Basella alba*, *Psidium guajava*, *Houttuynia cordata*, etc. It is found that the total number of ethnobotanical uses is 78—48 types of ailments (62%, medicinal uses), 11 types of edible uses (14%), nine types of cultural uses (11%) and ten types of household uses (13%) (Figure 4, Table 3). The relation between the four ethnobotanical uses (medical, edible, cultural and household) and the plant species on the basis of the total number of documented plant species and overlapping plant species used is shown in Figure 5. Out of 116 species, 32 species for medicinal purpose (27%), 18 species for edible purpose (15%), seven species for cultural purpose (6%) and eight species for household purpose (7%) are exclusively used. The common species used for medicinal and edible purpose are 29 (25%), for medicinal and cultural purpose are seven (6%), for medicinal and household purpose are two (2%), for edible and household purpose are two (2%), for edible and cultural purpose are seven (6%), for medicinal, edible and cultural purpose is only one (1%), for medicinal, edible and household purpose are three (3%). There are no common species used for cultural and household purpose (CH), for medicinal, cultural and household purpose (MCH), for edible, cultural and household purpose (ECH) and for all four ethnobotanical uses (MECH) (Figure 5).

Habits of Plant Species: Five different habits of documented

plant species are observed—herb, shrub, tree, climber and grass. There are 46 species of herbs (40%), 19 species of shrubs (16%), 27 species of trees (23%), 14 species of climber (12%) and ten species of grass (9%) (Figure 2). The highest number of plant species is recorded to be herbs followed by trees, shrubs, climbers and by grass. Among 101 recorded genera, 42 genera of herbs (41%), 15 genera of shrubs (15%), 22 genera of trees (22%), 14 genera of climber (14%) and eight genera of grass (8%). None of the genera is recorded to have more than one plant habit, each and every genus comprise of only one plant habit—all the five plant species in genus Citrus are trees, two species of Sida genus are shrubs and so on (Table 3). Out of total 48 families, herbs are documented from 27 families (56%), shrubs from nine families (19%), trees from 15 families (31%), climber from 11 families (23%) and grass from one family, Poaceae (9%). It is recorded that a family may consist of more than one plant habit—Apocynaceae

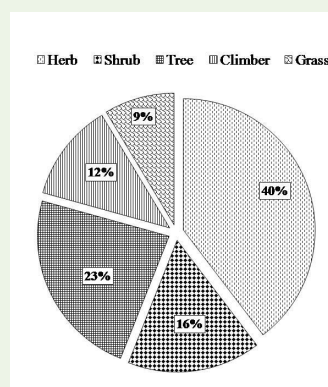


Figure 2: Percentage of five plant habits recorded.

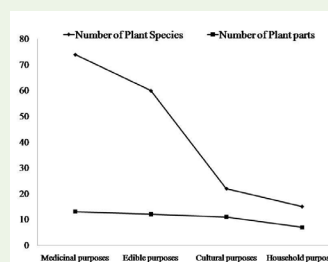
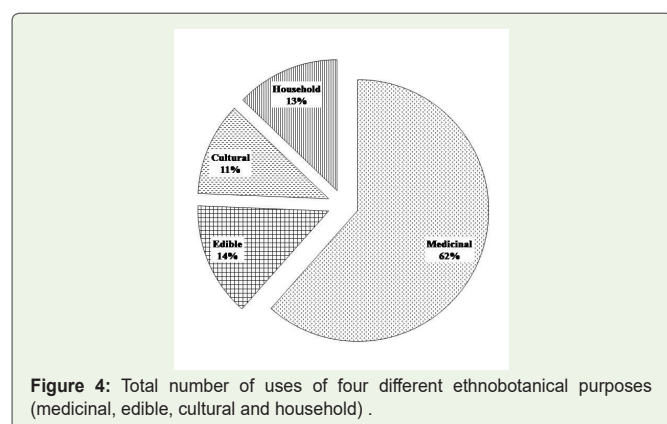


Figure 3: Types of ethnobotanical uses (medicinal, edible, cultural and household) against the number of plant species and number of used plant parts.

Table 4: Recorded plant species used as ethnomedicine by various communities of Assam, Northeast India.

| Sl. No. | Name of Community | Total No. of Recorded Plants | Author |
|---------|--|------------------------------|-------------------------|
| 1 | Dimasa community of Dima Hasao | 74 | In Present study |
| 2 | Assamese community of Assam | 85 | Saika et.al. 2006 |
| 3 | Boro community of Goalpara | 30 | Basumatary et al. 2004 |
| 4 | Boro community of Baksa | 19 | Das and Singh 2017 |
| 5 | Hajong community of Goalpara, Kamrup, Darrang, Sonitpur, Lakhimpur, Dhemaji and Nagaon | 36 | Sharma et al. 2012 |
| 6 | Rabha community of Kamrup | 30 | Das and Teron 2014 |
| 7 | Karbi community of Karbi Anglong | 38 | Baidya et al. 2020 |
| 8 | Karbi community of Karbi Anglong | 18 | Jain and Borthakur 1980 |
| 9 | Karbi community of East Karbi Anglong | 72 | Mipun et al. 2019 |
| 10 | Jaintia community of Dima Hasao | 39 | Sajem and Gosai 2006 |
| 11 | Dimasa community of Dima Hasao | 16 | Nath and Jain 2015 |
| 12 | Dimasa community of Dima Hasao | 25 | Tamuli and Sharma 2010 |
| 13 | Dimasa community of Dima Hasao | 5 | Rout et al. 2009 |
| 14 | Jaintia community of Dima Hasao | 6 | Rout et al. 2009 |
| 15 | Zeme community of Dima Hasao | 5 | Rout et al. 2009 |
| 16 | Hmar community of Dima Hasao | 2 | Rout et al. 2009 |
| 17 | Vaiphei community of Dima Hasao | 2 | Rout et al. 2009 |
| 18 | Biate community of Dima Hasao | 1 | Rout et al. 2009 |

**Figure 4:** Total number of uses of four different ethnobotanical purposes (medicinal, edible, cultural and household) .

is recorded with tree, shrub and climber, or may consist of only one habit—Basellaceae is recorded only with climber and Poaceae is recorded only with grass (Table 3).

Plant Parts

For various ethnobotanical purposes, a total of 19 plant parts are documented to be used, such as leaf, fruit, stem, whole plant, shoot, seed, flower, rhizome, root, bark, bulb, bole, branch, bolls, calyx, corm, stalk, blade and plant sap. Out of total 78 ethnobotanical uses, including medicinal, edible, cultural and household purposes, 45 number of uses are done from leaves, 35 uses from fruits, 15 uses

Table 5: Recorded plant species used as edible by various communities of Assam, Northeast India.

| Sl. No. | Name of Community | Total No. of Recorded Plants | Author |
|---------|--|------------------------------|---------------------------|
| 1 | Dimasa community of Dima Hasao | 60 | In Present study |
| 2 | Bodo community of Baksa | 19 | Das and Singh 2017 |
| 3 | Mising community of Sonitpur, Lakhimpur, Dhemaji, Dibrugarh, Tinsukia, Sibsagar, Jorhat and Golaghat | 30 | Sharma and Pegu 2011 |
| 4 | Rabha community of Kamrup | 45 | Das and Teron 2014 |
| 5 | Karbi community of East Karbi Anglong. | 67 | Mipun et al. 2019 |
| 6 | Assamese community of Dima Hasao | 14 | Medhi and Borthakur 2012 |
| 7 | Dimasa community of Dima Hasao | 198 | Medhi and Borthakur 2012 |
| 8 | Hmar community of Dima Hasao | 151 | Medhi and Borthakur 2012 |
| 9 | Hrangkhoh community of Dima Hasao | 23 | Medhi and Borthakur 2012 |
| 10 | Kuki community of Dima Hasao | 42 | Medhi and Borthakur 2012 |
| 11 | Mizo community of Dima Hasao | 37 | Medhi and Borthakur 2012 |
| 12 | Jaintia community of Dima Hasao | 14 | Medhi and Borthakur 2012 |
| 13 | Vaiphei community of Dima Hasao | 2 | Medhi and Borthakur 2012 |
| 14 | Zeme Naga community of Dima Hasao | 124 | Medhi and Borthakur 2012 |
| 15 | Nepali community of Dima Hasao | 36 | Medhi and Borthakur 2012 |
| 16 | Zeme Nagas of Mahur, Dima Hasao | 83 | Medhi and Borthakur 2013a |
| 17 | Dimasa community of Dima Hasao | 134 | Medhi et al. 2014 |
| 18 | Hmar community of Dima Hasao | 76 | Medhi et al. 2014 |
| 19 | Hrangkhoh community of Dima Hasao | 26 | Medhi et al. 2014 |
| 20 | Kuki community of Dima Hasao | 15 | Medhi et al. 2014 |
| 21 | Mizo community of Dima Hasao | 13 | Medhi et al. 2014 |
| 22 | Jaintia community of Dima Hasao | 10 | Medhi et al. 2014 |
| 23 | Vaiphei community of Dima Hasao | 1 | Medhi et al. 2014 |
| 24 | Zeme Naga community of Dima Hasao | 79 | Medhi et al. 2014 |
| 25 | Nepali community of Dima Hasao | 9 | Medhi et al. 2014 |

from stems, 11 uses from whole plants, ten uses from shoots, nine uses from seeds, eight uses each from flowers and rhizomes, seven uses from roots, four uses from barks, three uses from bulbs, two uses each from boles, branches, bolls and calices, and one use each from corms, stalks, blades and plant sap (Figure 7). Out of 19 used plant parts, 13 parts (68%) are used for medicinal purpose, 12 parts (63%) for edible purpose, 11 parts (58%) for cultural purpose and seven parts

(37%) for household purpose (Figure 3). Most of the recorded plant parts are used commonly among four ethnobotanical purposes—leaf, flower, stem, fruit, whole plant are used in all four ethnobotanical purposes, shoot, bulb and seed are used in medicinal, edible and cultural purposes, bole and branch for cultural and household purposes, rhizome for medicinal and edible purposes, bark for medicinal and cultural purposes; while fewer plant parts are used only for one purpose—root, corm and plant sap for medicine, stalk, blade and calyx as edible, boll for household purpose (Figure 6).

The relation between the four ethnobotanical uses and the used plant parts on the basis of the total number and overlapping plant parts used is illustrated in Figure 6. Out of total 19 plant parts, three plant parts as medicine, three parts as edible and one part for household are used. One part for medicine and edible, one part for medicine and cultural, two parts for cultural and household, three parts for medicine, edible and cultural, and five parts for medicinal, edible, cultural and household are commonly used. But no part is recorded used for cultural only (C), commonly for medicine and household (MH), for edible and household (EH), for edible and cultural (EC), for medicinal, cultural and household (MCH), for edible, cultural and household (ECH), and for medicinal, edible and household (MEH) (Figure 6). Among various uses of total 19 plant parts, leaf is found to be used in highest number (i.e. 45 uses) and corm, stalk, blade and plant sap are used in least number (i.e. for one use) ethnobotanically (Figure 7).

Process of Preparation

Many processes of medicine preparations are carried out traditionally. Smashing of leaf, shoot, root, bulb, corm, rhizome, fruit, flower, bark or whole plant is most followed process to cure ailments like diarrhea, bleeding, burns, jaundice, wound, cold, immunity, fracture, UTI, stomachache, gastritis, boil, diabetes, cough, toothache, skin allergy, skin rashes, chickenpox, smallpox, malaria, dysentery, muscle pain and joint pain. Boiling is another process where few plant parts like flower, rhizome, leaf, stem, fruit, whole plant or shoot are boiled and consume to treat stomachache, high pressure, jaundice, gastritis, gas, cold, piles, lactation, skin allergy, skin rashes, wound, chickenpox, smallpox, hemoglobin level, dysentery, rectal prolapse, diabetes, low pressure, childbirth and immunity. Some plant parts like fruit, leaf and root are taken raw to cure diseases like digestion, calculus, gastritis, hypertension, parasitic worm, rectal prolapse, jaundice, snakebite, dog-bite, dysentery, diarrhea, piles, gas, stomachache, low pressure, diabetes and hemoglobin level. For the treatment of few diseases, headache, diabetes, gas, hemoglobin level, balanitis, lactation and menorrhagia, plant parts like leaf, fruit, flower, stem and rhizome are fried and taken in meal. Taking bath with coconut water may cure chickenpox and smallpox. Few skin problems, skin allergy, skin rashes and wounds can be treated by applying gel from the leaves. Placing of leaves of certain species beneath the bed may keep the bedbug away. Many other processes like applying plant sap, tying the root for navel displacement, squeezing out the juice from leaf, stem or fruit, fermenting *Citrus aurantiifolia* for stomachache were also documented (Table 3).

In case of edible purpose, many of the plant species are taken as vegetables, fruits, flavoring ingredients, coloring ingredients and

chewable. Stems, leaves, fruits, seeds, flowers, shoots and whole plants are stewed or simply boiled either with or without fermented fish (naphlam) and served as vegetables. Even raw leaves, seeds and flowers are either smashed or chopped and are prepared as chutneys. In some cases, stalks, blade, bulb, stem, leaves and flowers are fried and fed. To feed as fodder for eri silkworm, tender *Ricinus communis* leaves are plugged and served, while for pig leaves and stems are boiled. Raw or dried fruit of *Areca catechu* is chewed with betel leaf. Seeds are smoked, powdered or taken directly as vegetable or flavoring ingredient. Seeds of *Abelmoschus esculentus* and *Hibiscus sabdariffa* as 'enzang' and bamboo shoot (miya) of *Bambusa tulda* as 'miyamikhri' are fermented and stored. Rice (maisa) is steamed and taken as staple food, while glutinous rice (majju) is steamed and served in the festival (Bushu Dima) as a special dish. Lastly, matured fruits of *Terminalia bellirica* are taken as wild nuts and ripe fruits of *Lantana camara* and *Bridelia stipularis* as wild fruits (Table 3).

The Dimasa Kacharis conduct many traditional pujas (Madai Huba) or religious Hindu pujas where offerings of flowers, fruits, leaves and shoots of various plants to Deities are made; they even sprinkle mustard seeds or tie in a cloth in a traditional spell (Phrenba); sometimes they conduct puja with a tree species as their Deity, for they believe either the plant is a Numen or few plants to be a Numen (*Ficus religiosa*) for the protection of the child (e.g. *Streblus asper*, *Phyllanthus emblica*); some believe *Parkia speciosa* to be sacrilegious, powdered seeds of *Entada rheedii* and leaves of *Ocimum tenuiflorum* are considered for purification and sacred. Besides, the Dimasas believe rooting of *Portulaca grandiflora* inside a house to be a bad omen for the members of the house. Two traditional musical instruments—'kharam dubung', prepared from the dried stems of *Saccharum spontaneum* and 'Muri', prepared from the bole and branches of *Alstonia scholaris*. Judima (rice wine) has a vital role in Dimasa culture in the preparation of which the bark of *Albizia myriophylla* is dried, powdered and mixed with rice powder, which is then made into biscuits and sundried. The cooked rice is spread in a clean mat and is allowed to cool; once cooled, a part of the biscuit is mixed with, which is then stored in a closed container allowing to ferment. The onion and chilli are kept on top of the container cover. Known to very less, some part of Dimasas even prepare banana wine where banana fruit are simply chopped or smashed and kept in a closed container and allowed to ferment. Few traditional clothes of Dimasas are made in handloom, while traditional cloth, 'rihthap', is made of erisilk, when fruits of *Melia azedarach* are boiled and its thick stock is used in brushing the thread in the loom (Table 3).

Various household materials like broom, detergent, vessel, cooker, scrubber, pillow, mattress, igniter (or kindler), thatched roof, fence, firewood, facemask and cooking materials are prepared from various plant parts of different species. Leaflets of *Cocos nucifera*, stems of *Sida acuta* and flowers and stems of *Thysanolaena latifolia* are dried and tied up together in a bunch and used as broom. Raw fruits of *Carica papaya* and whole plants of *Oxalis corniculata* have cleansing properties (as detergent) which are used to clean utensils, especially the brass utensils. Fruits of *Lagenaria siceraria* are dried and emptied by removing their seeds and used as kettles for serving judima (rice wine); a *Melocanna baccifera*, when cut in its internode keeping one side open and the other closed, used as vessel or cooker for vegetables,

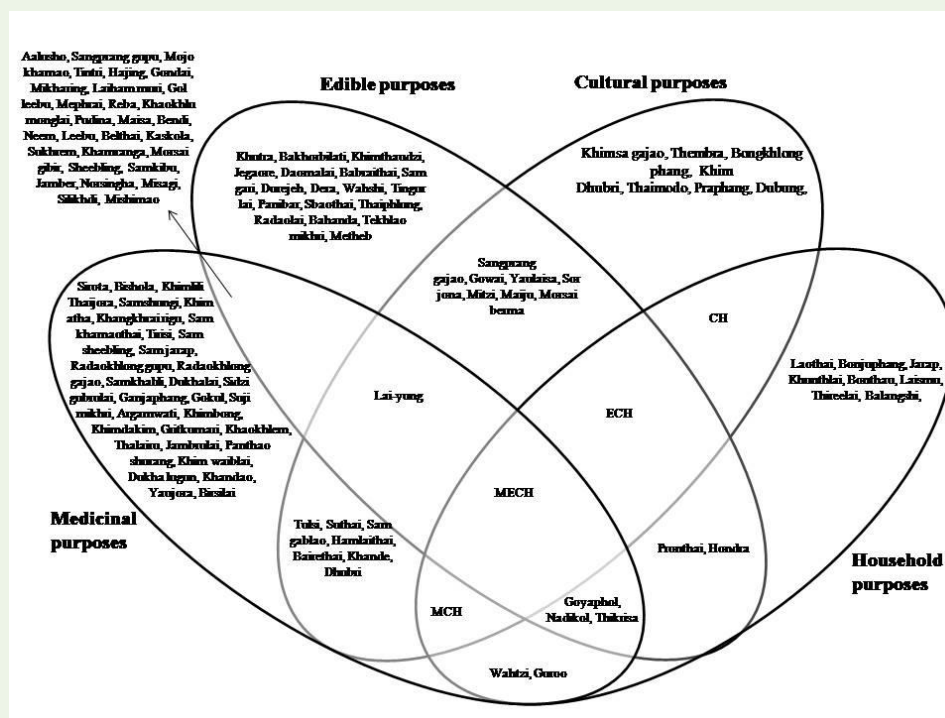


Figure 5: Venn diagram showing total number and overlapping plant species among four different ethnobotanical purposes.

Abbreviations: CH cultural & household purpose, ECH edible, cultural & household purpose, MCH medicinal, cultural & household purpose, MECH medicinal, edible, cultural & household purpose.

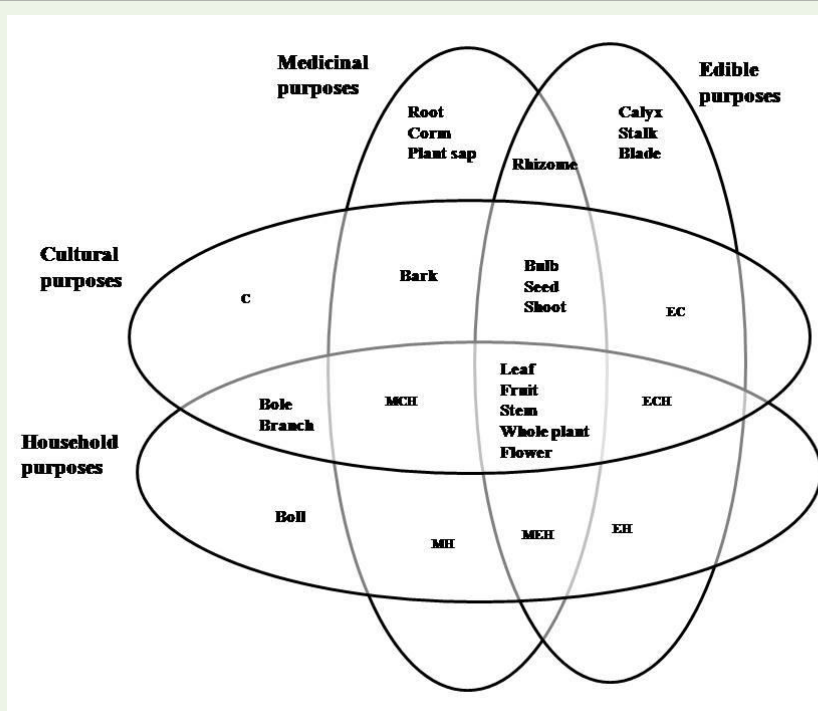
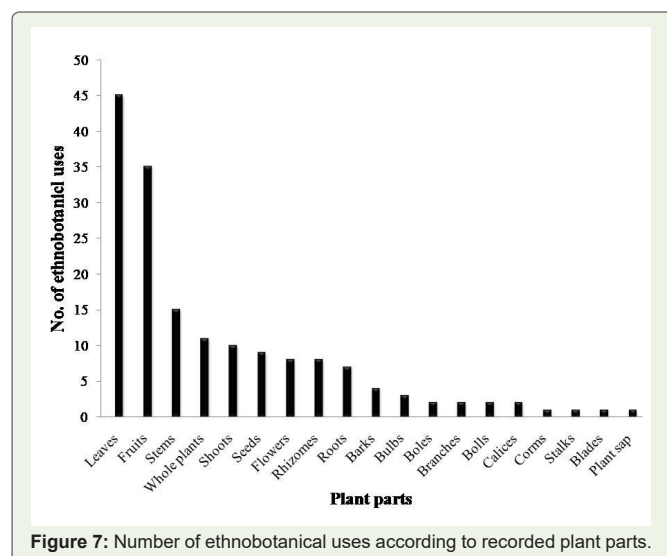


Figure 6: Venn diagram showing total number and overlapping plant parts among four different ethnobotanical purposes

Abbreviations: C cultural purpose, MH medicinal & household purpose, EH edible & household purpose, EC edible & cultural purpose, MCH medicinal, cultural & household purpose, ECH edible, cultural & household purpose, MEH medicinal, edible & household purpose.



rice, tea or water; leaves of *Solanum erianthum* are used as cooking materials—when glutinous rice is steamed in two utensils (one above the other), the leaves are placed between the gaps of the two utensils to block air passage, thus vaporization helps rice to cook faster. Dried *Luffa cylindrica* is used as scrubber, a toilet material, by removing its seeds and cover. Even pillows and mattress are stitched with the seed hair-fibres of *Gossypium arboreum* and *Bombax ceiba*. Leaves of *Imperata cylindrica* are tied in a bunch and used to make roof of a hut. The bole and branches of *Pinus kesiya* are cut into smaller pieces and used as igniter (or kindler). Even peels of *Citrus sinensis* and left-overs of *Saccharum officinarum* after squeezing out its juice, are used as facemask and firewood respectively (Table 3).

Discussion

The present study has brought into light the list of 116 plant species that are ethnobotanically important for the Dimasa-Kachari community of Dima Hasao, Assam. Most of the ethnobotany subject was studied based on medical values, followed by edible, cultural, religious and cosmetics [27,31,34,36-38,46-49]. In present study, the ethnobotany is mainly categorized into four different purposes—medicinal, edible, cultural and household.

Many works were carried out to limelight the importance of plant species used as ethnomedicine by various communities of Assam (Table 4). Saikia et al. (2006) has reported the highest number of plant species (85 species) used as ethnomedicine by Assamese community, little higher than recorded in the present study (74 species) (Figure 3, Table 3, Table 4). While Mipun et al. (2019) has recorded 72 species among the Karbis, almost similar to the present study. The rest of studies listed in Table 4 have reported lower number of plant species as ethnomedicine with the lowest of one plant species used by Biate community of Assam. Considering the various studies done in Assam, Medhi and Borthakur (2012) have recorded higher number of plant species (198 species) consumed by Dimasas of Dima Hasao as edible in compare to present study which documented only 60 edible species among the Dimasas (Figure 3, Table 3, Table 5). However, similar finding to the present study is 67 species as edible forest products

of the Karbis [30]. In this study we reported total of 22 plant species used for a range of cultural purposes (Figure 3, Table 3). Sharma et al. (2012) had documented higher number of species (36 plants) used by the Hajong community, along with Medhi and Borthakur (2013b) findings of 34 species among the Dimasas. A few plant species, 5 species and 37 species were recorded by Das and Teron (2014) and Jain and Borthakur (1980) among the Rabha and Karbi community respectively. In Assam, various plants have various household purposes—Haflongbar and De (2017) studied the traditional way of classification of 161 plant species among the Dimasas; Das and Teron (2014) recorded 41 species among Rabha community and Mipun et al. (2019) recorded 32 species among Karbis, where the plant number are higher than the documented in the present study: 15 plant species are recorded for various household uses (Figure 3, Table 3). Jain and Borthakur (1980) had reported very few species (four species) for recreation used by the Karbis.

Out of 116 documented plants, few plant species are used commonly among the four purposes (Figure 5). Most plants are found useful for treating many ailments with highest number (eight) for the treatment of dysentery and lowest (one) is used in immunity, menorrhagia, muscle pain, joint pain, cough, eye infection, digestion, insect repellent, excess urination, low pressure, balanitis, parasitic worms, bedbug repellent, earache, malaria, childbirth, navel displacement, snake bite, dog bite, lactation and white discharge. Besides treating human beings, few plant species are also used as ethnomedicines for domesticated animals—raw leaves of *Bryophyllum pinnatum* are fed to cattle to cure its upset stomach and plant sap of *Leucas aspera* cures an eye infection of goat. There are few plants that are adverse for both human and animal—consumption of *Clerodendrum glandulosum* leaves worsen the condition of low blood pressure patients, whereas consumption of the same is beneficial for high blood pressure patients; *Rauvolfia serpentina* is poisonous for dogs. Among the four different ethnobotanical uses, it is to note that from the recorded plant species, the ethnic culture of Dimasas is popular for the use of ethnomedicine (48 ailments), followed by edible purpose (11 uses), then household (ten uses) and then by cultural uses (nine uses) (Figure 4). Out of many crops grown, rice is mostly cultivated followed by maize, sesame, mustard, melons, pumpkin, ginger, turmeric, etc. *Oryza sativa* has a varietal nomenclature whose generic term is 'mai' and varietal taxa are 'maisa' and 'maiju' [40,50]. The harvest festival, 'Bushu Dima', of the Dimasa Kachari community is celebrated annually in the month of January.

Although almost all the local inhabitants acquire the ethnobotanical knowledge, but it is mostly recorded from the people with 30 years of age or more, as they are more experienced and possess traditional knowledge, skill and wisdom. Most of the interviewees' age ranged from 30–59 years and very few between 60–89 years. This shows that ethnic knowledge is acquired from 30 years and increase as they grow older. Again the number of interviewees is noted to decrease after 60 years and became least between 80 and above years, it must be likely due to increased death rate from 60–89 years. Most of the interviewees are farmers, thus closely related to wild flora and have better-off ethnobotanical knowledge (Table 2).

One of the factors responsible for the increase in ethnobotanical

practice among the Dimasas is that they live remotely from the mainland of the state. Medhi and Borthakur (2012) mentioned that the communication system in the district of Dima Hasao is of 'bottleneck communication' with the inhabitants preferring to live undisturbed and far away from the 'market economy'. There are very few medical centers in the villages or sometimes not having any. Since civil hospitals and other medical facilities are found in the mainland, people face difficulties to access such facilities, allowing them to practice and follow the uses of some home-made and herbal remedies to cure ailments. Although with the upcoming of modern facilities, due to the availability of ethnomedicinal resources and ancestors' knowledge, the ethnic way of treatment is found to be encouraged among the inhabitants and are found to be effective in curing many diseases. Besides this, the Dimasas depends on natural resources for their various daily purposes like edible, cultural and household needs, for their ethnicity encourage them to acquire their daily needs from their surrounding (huge diversity and abundance of floral species) due to the easy availability of the resources since times immemorial. In case of edible purposes, most of the wild plants are consumed as organic vegetables and thus preferred more. A certain sect of Dimasa Kacharis regard *Entada rheedii* and *Ocimum sanctum* as sacred, *Phyllanthus emblica*, *Ficus religiosa* and *Streblus asper* as 'Numen' and hence these are being worshipped; while some other Dimasas do not have such beliefs.

It has been observed that in course of time, the idea of ethnobotany is dwindling. It might have been due to the fact that modern medicine facilities become easily available to some accessible areas in course of time. Some also believe that the dwindling of the ethnic knowledge may be due to decrease in the availability of species and sometimes extinction. Such an example is of 'Mojongphong' (local name in Dimasa), which was a herb species consumed as vegetable but presently, the species and its identification could not be found. 'Khim-ridi' and 'Khim-balao' (local name in Dimasa), are also such examples used in death ceremony and hardly available at present. *Albizia myriophylla* (themra) is another example, which is used for the preparation of local liquors, rice wine (judima) and distilled liquor (juharo), from rice. *Albizia myriophylla* is found on a rare basis and hence only the interior villagers are observed selling them very rarely. The Dimasas, like any other ethnic groups of Dima Hasao, depends mainly on Jhum or Slash and Burn cultivation or Shifting cultivation ('Padaaing Haagong', in Dimasa) is the major agricultural practice among the ethnic groups of Dima Hasao, which also plays a vital role in climate change of the district [37,38]. Moreover, the ethnomedicinal knowledge among the community is regarded secret and passed-on only to family members orally from one to next generation, never to be shared to someone other than the family members [27]. By such, they maintain to keep the importance and demand of the particular family among the community and it remain confined to the family. Thus, this family bound ethnobotanical knowledge remain unshared and vulnerable, likely to vanish in near future. The biodiversity of the district is also disturbed to some extent due to National Highway 54 (E) and Lumding Silchar Broad Gauge passing throughout the district. In spite of disturbed biodiversity, forest of Dima Hasao is enriched with wild flora and fauna. Hajong Lake, a unique oxbow lake, situated at Hajong village at the outskirts of Maibang, within Langting-Mupa Reserve Forest, is famous for the presence of its unique species of *Nilssonia formosa*, an endangered

species. Few places of Dima Hasao, viz. Jatinga, Doiheng and Umrangso, are famous for migratory birds (e.g. *Falco amurensis*), in favor of which a festival called Falcon Festival is organized every year at Umrangso any convenient day from the month of August to November.

Although the ethnicity of the Dimasa Kacharis encourages them to heal various ailments successfully, it would be much better if the medicinal properties of the documented plant species be tested. Thereon, the application of the ethnomedicinally important plants would be broader, reaching out to larger number of population. Thus, the ethnobotanical knowledge of the indigenous people of Dima Hasao should have immediate and proper scientific documentation, preservation and conservation thereof for their future sustainability [37,38].

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