Three models to illustrate plant-people relationships in the medicinal plant hotspots of North East India

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Research

Abstract

Background: Many indigenous communities inhabit the forests on which they rely. In India, there are many tribe-level plant use records for health treatments but no systematic assessment of the species-level frequency of use or purposes of use across indigenous groups. This paper makes such assessments for North East India.

Methods: We did a systematic review of published literature resulting in the identification of a final set of 255 publications for analysis and synthesis.

Results: Medicinal plants used by the North East Indian communities in the Himalayan and Indo-Burma hotspots are often used to cure more than one ailment, with phytochemical analysis and clinical tests documenting the efficacy of many species. High-frequency used plant species across indigenous groups were *Ageratum conyzoides, Centella asiatica, Clerodendron colebrookianum, Houttuynia cordata, Oroxylum indicum, Spilanthes paniculata, Paederia foetida, Psidium guajava,* and *Zingiber officinale*. We also identified 51 lesser-used species common to more than one indigenous group. Delving into the relationships between plants, tribes, ailments, and locality allowed the identification of three models of people-plant relationships: Plant-Ailment-Tribe; Ailment-Plant-Tribe; and Plant-Locality-Tribe.

Conclusions: A large number of indigenous groups using a large number of medicinal plants are found in North East India: uses across groups can be described in three models of people-plant relationships relevant to studying and understanding ethnobotanical realities in other locations.

Keywords: Ethnomedicinal plants, frequency use classification, intercultural use, multi-therapeutic attributes

Background

The high rate of human population growth in India put plant populations at risk of overexploitation due to human interference, habitat fragmentation, and deforestation, including through the expansion of agricultural lands (Cincotta *et al.* 2000). However, the rural households reliant on environmental resources require sustainable supplies of plant resources to maintain incomes and health. The indigenous groups in North East India continue to practice their own culture and customs, including consuming wild-harvested foods and medicinal plants. Many groups retain traditional ethnobotanical knowledge, which evolved over generations of experience and practice (Lalramnghinglova & Jha 2000).

While many ethnobotanical studies have been conducted in the region, there have been recent calls for additional studies (Lokho & Narsimhan 2013), not least as ethnobotanical knowledge is disappearing as it remains confined to the elders, with younger generations displaying low interest in such knowledge (Aziz *et al.* 2017, Majid *et al.* 2019, Raj *et al.* 2018).

North East India has a high concentration of indigenous groups, with 225 tribes in eight states making up 7.7% of the country's area, against 450 tribes in the 3,287,263 km^2 of the remaining country (Chatterjee *et al.* 2006, Lokho & Narsimhan 2013). The north-eastern states of Arunachal Pradesh, Assam, Meghalaya, Mizoram, Manipur, Nagaland, Sikkim, and Tripura lie in two of the global Indian hotspots (Himalaya and Indo-Burma) between 21°34 N to 29°50 N latitude and 87°32 E to 97°52 E longitudes (Mao *et al.* 2009, Myers *et al.* 2000) thus also having high floral and faunal diversity (Chettri *et al.* 2010, Dattagupta & Gupta 2016).

The objective of this review is to analyse and systematise the ethnobotanical knowledge of medicinal plants across indigenous groups in the north-eastern states focusing on: (i) What is treated with what: Identification and frequency of use of plant species in traditional herbal healing across indigenous groups, (ii) What is used most commonly: different uses of the same species across indigenous groups, (iii) What is treated most commonly: different ailments treated with the same species across indigenous groups, and (iv) Drawing this knowledge together in models that could be replicated for analysis elsewhere.

Materials and Methods

While much work has been done on ethnomedicinal plant use in indigenous groups in the eastern Himalayan and Indo-Myanmar region, cross-cultural plant use - the commonalities of use across groups - has not been analysed in detail. Therefore, a systematic review of cross-cultural medicinal plant use was undertaken inspired by reviews related to medicinal plant consumption and conservation (Larsen & Olsen 2007, Smith-Hall *et al.* 2012). We followed the PRISMA (Preferred reporting items for systematic reviews and meta-analyses) systematic review methodology (Boucher *et al.* 2020, Maki *et al.* 2018, Mihailescu & Soares 2020), Fig. 1. This involved identifying, screening, excluding, and including the most relevant literature (Moher *et al.* 2009). Using the google search engine, we combined the keywords NTFP, tribal livelihood, tribal health care, cross-culture medicine, ethnobotany, and ethnomedicine with the geographical boundary of the reviewed states: Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura, and North-east India. This provided records from (i) blogs, (ii) newsprint and multi-media, (iii) official government department pages, and (iv) digital databases (e.g., ResearchGate, JSTOR, ScienceDirect, and CAB Direct). Grey literature, duplicates, papers with a different geographical scope, or falling outside the observation period (2000-2020) were removed, resulting in a total of 255 publications for inclusion in the review (Supplementary Tables 1 and 2). They included 233 journal articles, 13 conference records and book/thesis chapters, and three government reports. Altogether, 611 authors were involved in the research included in this review.

When analysing the data to identify the most used species across indigenous groups, we followed Jha (2017) who suggested a classification based on demand by indigenous group, distinguishing High, Moderate, and Limited demand groups. As demand is difficult to estimate, we here used the proxy of frequency of use, distinguishing Highly used plant species (documented use in ≥ 20 indigenous groups), Moderately used plants (≥ 10 and < 20 indigenous groups), Uncommonly used plants (≥ 5 and < 10 indigenous groups) and Rarely used plants (< 5 indigenous groups).

Results and Discussion

The 255 studies included results on only 51 of the 146 main tribes inhabiting the study region (Supplementary Table 1). Clearly, there is need for additional work on plant uses in the area, with very limited work so far undertaken in Nagaland, Meghalaya, and Mizoram. Some tribes were studied multiple times: Monpa, Apatani, Adi, and Nyishi in Arunachal Pradesh; Mishing, Kachari, Bodo, and Hamar in Assam; Mao Naga, Tangkhul Naga, and Chothe in Manipur; Mizo and Khasi in

Meghalaya; Mizo in Mizoram; Naga in Nagaland; Bhutia and Lepcha in Sikkim; and Tripuri and Chakma in Tripura. Existing studies have thus focused on the larger indigenous groups (Ali & Das 2003). An overview of the distribution of indigenous groups and studies is provided in Fig. 2.

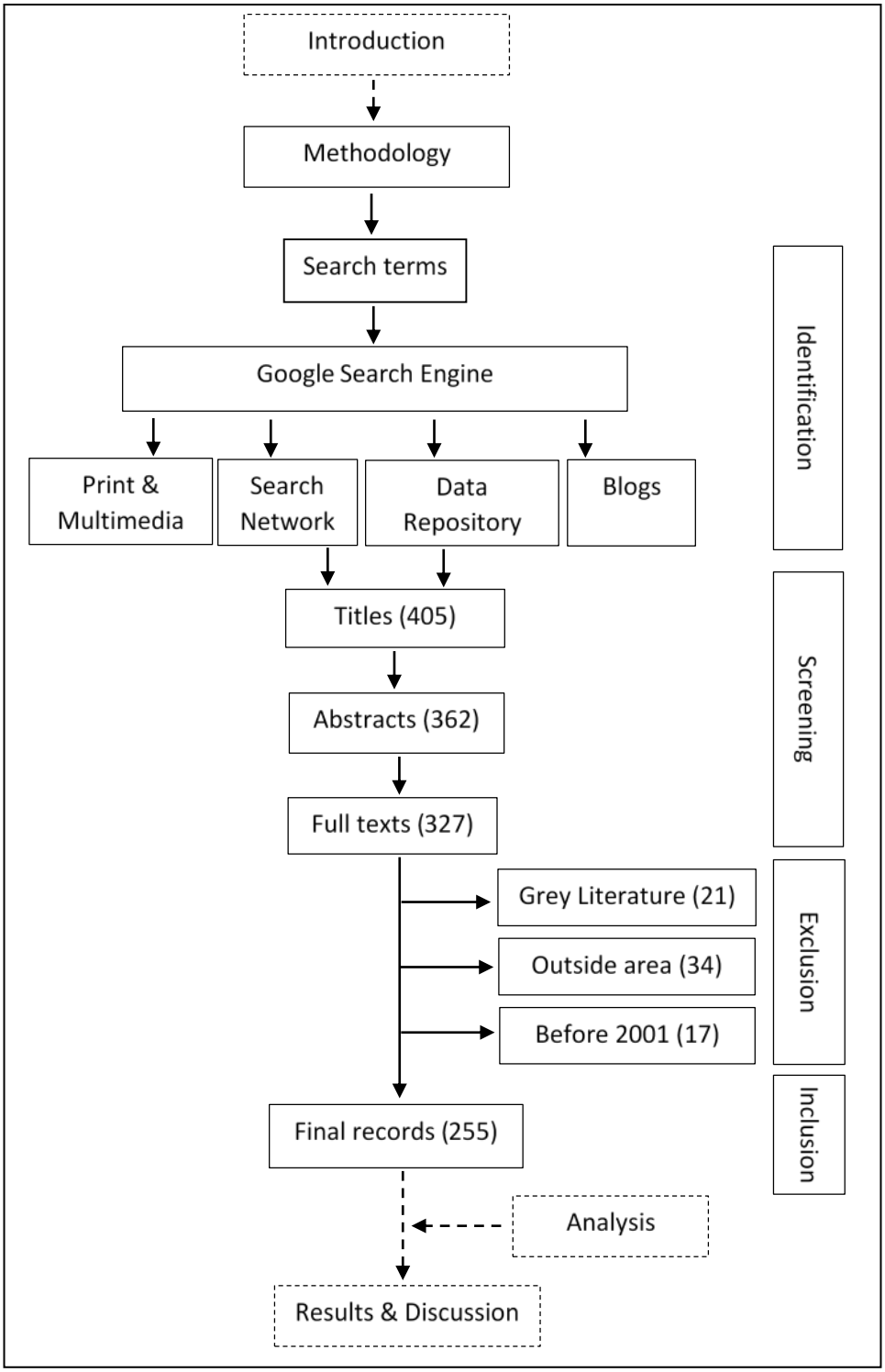

Figure 1. A modified flow chart for systematic review, based on Maki *et al.* (2018). Dashed items are pre and post methodology activities.

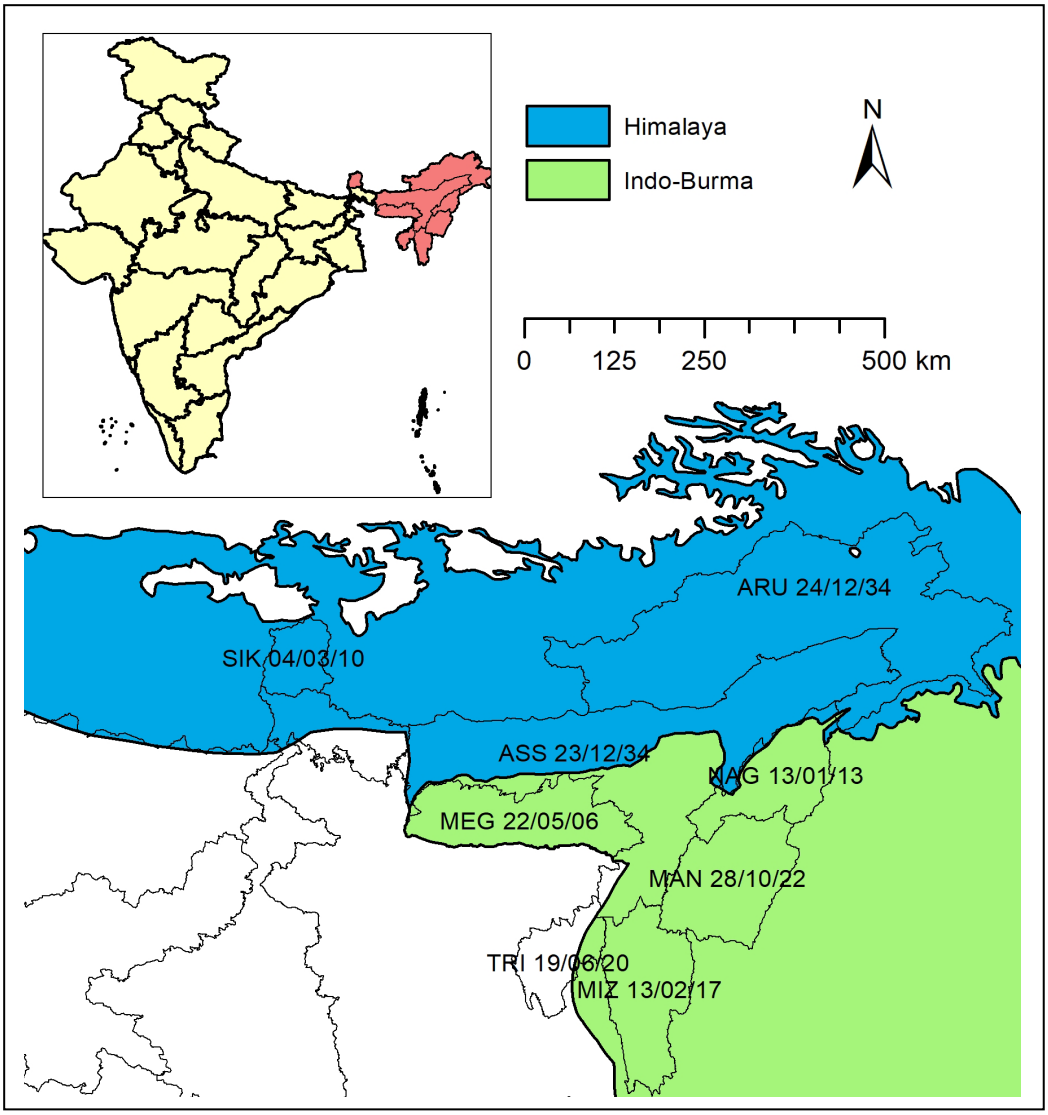

Figure 2. Location of the north-eastern hill states in India. These states (ARU = Arunachal Pradesh, ASS = Assam, MAN = Manipur, MEG = Meghalaya, MIZ = Mizoram, NAG = Nagaland, SIK = Sikkim and TRI = Tripura) fall in Himalaya and Indo-Burma biodiversity hotspots. Labels (XXX 00/00/00) indicate state, total number of indigenous groups, number of studied indigenous groups, and number of studies per state. The approximately 262,000 km^2 area is distributed as 54%, 42%, and 4% in the Himalaya hotspot (blue), Indo-Burma hotspot (green), and outside the hotspots (white), respectively.

What is treated with what: Identification and frequency of use of plant species in traditional herbal healing across indigenous groups

The studies (Supplementary Tables 1 and 2) document that all the studied indigenous groups use environmental products to treat minor and major ailments, including ailments treated by allopathic medicine. The indigenous groups use herbs, shrubs, trees, and a wide variety of plant parts, including leaf, bark, root, tuber and rhizome, petiole, fruits, tender shoots, whole plant, flower, and seed (Singha *et al.* 2016). The products are used to cure different groups of ailments such as gastrointestinal disorders, fever, cold, cough and sore throat; musculoskeletal disorders; injuries; dermatological infections; respiratory system disorders; nutritional disorders; and poisoning (Uprety *et al.* 2016). The studies document treatment of snake bites, asthma, blood clotting, blood pressure, blood impurity, body pain, bone fracture, bronchitis, cancer, cholera, colic pains, conjunctivitis, constipation, cough and cold, dandruff, diabetes, diarrhoea, dysentery/blood dysentery/chronic dysentery, dyspepsia, ear diseases, epilepsy and other mental ailments, eradication of lice, fever, fire and hot water burns, gastritis, gonorrhoea, hair loss, headaches, heart disorders, hysteria, indigestion, inflammations, influenza, intermittent fever, jaundice, joint pain, leprosy, liver cirrhosis, liver disorders, lupus, measles, pain suffering, piles, pimples, pneumonia, post-natal stomach pain, rheumatism and gout, scabies, scrofula, sinusitis, skin rashes, skin troubles, sleep disorder, stomach bloating, stomach ache, stomach ulcer, stroke, throat pain, tongue ulcers, tonsillitis, tooth decay, toothache, tuberculosis, urinary problems, worms, and wounds. This list is not exhaustive as it pertains to only the highly used plant species.

Highly used plant species

Hynniewta (1987) in Mao *et al.* (2009) reported plant species used for the treatment of ailments in the north-eastern states, including 200 plant species for 44 ailments in Arunachal Pradesh, 286 species for 40 ailments in Assam, 526 species for 83 ailments in Nagaland, 194 species for 50 ailments in Tripura, and 834 used species in Meghalaya. Nath & Borah (2011) mentioned about 1050 angiosperms used in North East India. However, our review suggested that only nine medicinal plant species (in eight families) were 'Highly used', namely, *Centella asiatica* (L.) Urban (Apiaceae), *Ageratum conizoides* L. (Asteraceae), *Houttuynia cordata* Thunb (Saururaceae), *Psidium guajava* L. (Myrtaceae), *Oroxylum indicum* (L.) Vent (Bignoniaceae), *Clerodendron colebrookianum* Walp. (Verbenaceae), *Spilanthes paniculata* Wall. ex DC. (https://indiabiodiversity.org/species/show/265475) (Asteraceae), *Zingiber officinale* Rosc. (Zingiberaceae) and *Paedaria foetida* L. (Rubiaceae). An overview of these findings is presented in Supplementary Table 2. Almost all species have been subjected to some degree of pharmacological research; the three exceptions are *Eleagnus pyriformis*, *Piper mullesua*, and *P. pedicillatum* (Salehi *et al.* 2020).

Plant products are widely used for a range of indications by the indigenous groups by tradition. Traditional medicinal knowledge is socially desirable, economically affordable, sustainable, and involves minimum risks and procedures (Singh *et al.* 2010). However, it needs clinical evidence of therapeutic property to be accepted at a larger scale as part of established systems of medicine the safety and efficacy of herbal products is a prerequisite for inclusion in markets (Sahoo & Manchikanti 2013). Many traditionally used plant species have been subjected to phytochemical, experimental, and clinical investigations. The literature surveyed found many reports supporting the use herbal treatments as practiced by the indigenous people in the study area. An overview of the review is presented in the Supplementary Tables 1 and 2 providing state, tribes, number of species used, frequency of indigenous group use, plant name and parts used, distribution of use to indigenous groups and states, ailments treated, and references. Table 1 provides an overview of information on the three most used plant species including indigenous use and pharmacognosy. Details on the six other highly used plant species are presented as Supplementary Material 3 (Synthesis of knowledge of six highly used medicinal plant species in North East India).

Table 1. An overview of the three most used plant species by tribes in North East (States) India.

Plant name	Part being used	Disorders / ailments / health care	Tribe name	State name
Centella asiatica (L.) Urban	Leaves, roots shoot, whole plant	Abdominal pain and constipation, blood purifier and gastric disorder, chronic dysentery, cuts, diarrhoea and dysentery, digestive power and appetite, dysentery, enrich memory, general cooling purposes, general health care, health tonic against leprosy, high blood pressure, inflammation, jaundice, jaundice and stomach ache, stomach ache, stomach pain and dysentery, stomach ulcers and leprosy, tuberculosis, stomach disorders, wounds	Adi, Aka, Apatani, Khampati, Monpa, Nyishi, Wancho	Arunachal Pradesh
			Bodo, Chorei, Chothe, Chutia, Dimasa, H'mar, Jaintia, Kachari, Lushai, Mishing, Rajbongshi, Rangias	Assam
			Mao-Naga, Tangkhul-Naga, Thadou	Manipur
			Garo, Jaintia, Khasi	Meghalaya
			Mizo	Mizoram
			Phom-Naga, Sangtam, Ao	Nagaland
			Limboo, Lepcha,	Sikkim
			Chakma, Halam, Mandwi, Manipuri,	Tripura
Ageratum conyzoides L.	Fresh leaves, stem, twigs, whole plant	Antidiarrhoeic, antidysenteric, antihelmintic, blood clotting, blood dysentery, cancers, colitis, conjunctivitis, fresh cuts, diabetes, inflammations, headaches, relieve pain, spasm, wound healing	Adi, Aka, Apatani, Galo, Idu, Memba, Monpa, Lisu, Padam, Singpho, Tagin, Tangsa	Arunachal Pradesh
			Ahom, Dimasa, Riang, Vaiphei,	Assam
			Jaintia, Khasi	Meghalaya
			Naga, Phom-Naga	Nagaland
			Lepcha	Sikkim

			Chakma, Halam, Mandwi, Tripuri	Tripura
			Tangkhul-Naga, Thadou	Manipur
			Mizo	Mizoram
Houttuynia cordata Thunb	Leaves, shoots, stem, root, whole plant	Anti-cancer, anti-tumour, bone fracture, bronchitis, cholera, constipation, cough, dysentery, eye troubles, gonorrhoea, headache, improve appetite, indigestion, jaundice, loose motion, measles, piles, pneumonia, sinusitis, skin disease, sleeping disorders, stomachache, stomach disorder, stomach ulcer, tonsillitis	Adi, Apatani, Bugun, Galo, Lisu, Mishing, Monpa, Nishi, Padam, Singpho	Arunachal Pradesh
			Ahom, Ao, Barman, Bodo, Garo, Goreswar, Kachari, Khasi, Mishing, Phom, Sangtam, Santal, Sumi	Assam
			Tribes of Meghalaya	Meghalaya
			Mao-Naga,	Nagaland
			Manipuri, Thadou	Manipur
			Tripuri	Tripura

Note: References are provided in Supplementary Tables 1 and 2

***Centella asiatica* (L.) Urban**

Adi use the whole plant for stomach ache (Kagyung *et al.* 2010, Rethy *et al.* 2010), apply leaf paste on the forehead for general cooling purposes, eat leaves for stomach pain and dysentery (Gibji *et al.* 2011). The Nishi administer fresh plant juice with honey to cure stomach ulcers and leprosy (Deb *et al.* 2009). The Apatani eat this plant with salt and chilly or salad as a blood purifier and remedy for gastric disorder. Leaves are taken to cure abdominal pain and relief constipation. Fresh leaves and stems are taken to increase digestive power and promote appetite (Bhuyan 2015, Jha 2016, Kala 2005, Srivastava *et al.* 2010, Yakang *et al.* 2013). They also take leaf juice for jaundice and stomach-ache or raw leaf for diarrhoea and dysentery (Tilling *et al.* 2015). They use plant extract mixed with water as a health tonic against leprosy, tuberculosis, and dysentery (Khongsai *et al.* 2011). The Khampati consume plant extract mixed with honey on an empty stomach every morning to treat chronic dysentery and high blood pressure and enrich memory (Sen *et al.* 2008). The Mishing use paste mixed with *Hydrocotyle javanica* for general health care (Bhuyan 2015). The Wancho cure stomach-ache and dysentery using the whole plant (Wangjen *et al.* 2011). The Aka treat jaundice using leaves and roots (Gibji *et al.* 2011). The Monpa use the whole plant in stomach disorders, cuts, wounds, and inflammation (Namsa *et al.* 2011). This plant is also used by Bodo, Jaintia, Kachari, Mishing, Rajbongshi, Rangias, Lushai, Chutia, Chothe, Tangkhul-Naga, Mao-Naga, Thadou, Khasi, Jaintia, Garo, Mizo, Sangtam, Ao, Phom-Naga, Limboo, Lepcha, Chakma, Mandwi, Halam, Manipuri, Dimasa, Hamar, and Chorei tribes for a mix of the above-mentioned ailments (Supplementary Table 2).

C. asiatica is one of the most important medicinal and nutraceutical herbs used by ethnic people in the study area. It accumulates large amounts of pentacyclic triterpenoid saponins, which form the major storehouse of secondary metabolites providing active compounds stimulating cell rejuvenation and improving physical and mental health (Joshi & Chaturvedi 2013). The herb is also recommended for the treatment of skin conditions such as leprosy, lupus, varicose ulcers, eczema, psoriasis, other ailments like diarrhoea, fever, amenorrhea, diseases of the female genitourinary tract, and for relieving anxiety and improving cognition (Mahapatra & Kumar 2012). Based on clinical trials, *C. asiatica* has many pharmacological uses, such as wound healing (Shukla *et al.* 1999), memory enhancement (Nalini *et al.* 1992), neuroprotective (Howes & Houghton 2003, Orhan 2012, Soumyanath *et al.* 2005), immunomodulatory (Plohman *et al.* 1994), an antidepressant (Chen *et al.* 2005), cardiovascular (Montecchio *et al.* 1991), hepatoprotective (Antony *et al.* 2006, Cheng & Koo 2000, Zhang *et al.* 2010), anti-cancer (Babykutty *et al.* 2009, Rai *et al.* 2011), and anti-diabetic (Dave & Katyare 2002).

***Ageratum conyzoides* L.**

The Tagin use fresh leaves in wound healing and blood clotting (Goswami *et al.* 2009). The Aka use the leaves on cuts (Gibji *et al.* 2011). The Nishi use this plant in wound healing and as an antihelmintic (Deb *et al.* 2009). The Galo also use leaves in wound healing and cuts (Bharali *et al.* 2016). The Adi and Apatani apply leaf paste on swollen parts to relieve pain. Plant juice is applied twice daily in a red-eye (conjunctivitis). Leaf paste and leaf juice are also applied to cuts and wounds to check bleeding and promote healing. Plants are pounded and made into pea-sized pills. One pill thrice a day is administered to cure blood dysentery or colitis (Kala 2005, Srivastava & Adi 2009, Srivastava *et al.* 2010, Tilling *et al.* 2015 Yakang *et al.* 2013). The

Adi give a warm leaf infusion for three days as antidysenteric and antidiarrhoeic (Kagyung *et al.* 2010). The Lisu apply crude leaf extract on fresh cuts to stop bleeding (Sarmah 2010). Padam and Idu use leaf paste for blood clotting, and root juice is taken against anthelmintics (Khongsai *et al.* 2011). The Monpa uses this plant as a wound healer and fish poison (Namsa *et al.* 2011). Singpho, Tangsa, Adi, and Memba use the paste of the whole plant for wound healing and blood clotting (Khongsai *et al.* 2011, Rethy *et al.* 2010). Plant products of *A. conyzoides* are also used by other tribes in the north-eastern states: Riang, Vaiphei, Ahom, Dimasa, Khasi, Jaintia, Naga, Phom-Naga, Lepcha, Tripuri, Mandwi, Halam, Chakma, Tangkhul-Naga, Thadou, and Mizo (Supplementary Table 2).

A. conyzoides has been used in the treatment and management of disorders such as diabetes, inflammations, spasm, headaches, and cancers, with little or no documentation (Agbafor *et al.* 2015). However, through experiments, it has been proven that the plant extract has anti-cancerous (Adebayo *et al.* 2010, Adetutu *et al.* 2012), nimicidal (Wabo *et al.* 2011), anti-diabetic (Nyunai *et al.* 2009, Agunbiade *et al.* 2012), gastroprotective (Shirwaikar *et al.* 2003), myorelaxant (Wabo *et al.* 2011), and haematopoietic (Ita *et al.* 1991) properties. Moreover, phytochemical investigations have revealed that many components are bioactive due to a broad range of secondary active metabolites such as terpenoids, flavonoids, alkaloids, steroids, and chromene (Chauhan & Rijhwani 2015).

***Houttuynia cordata* Thunb**

The Padam take whole plant extract for cholera, eat rhizome for cough, roots for stomach disorder, and leaves for dysentery (Khongsai *et al.* 2011). The Apatani use the whole plant to improve appetite, eat fresh plants twice daily in case of jaundice, and take roasted plants twice daily to cure dysentery (Srivastava *et al.* 2010). They also use raw leaves to get rid of sleeping disorders and indigestion (Yakang *et al.* 2013). They extract the juice and take it to relieve dysentery, indigestion, loose motion, and stomachache. It also provides sound sleep (Bhuyan 2015, Kala 2005, Tilling *et al.* 2015). The Bugun use roots and leaves for tonsillitis (Saha & Sundariyal 2013). The Mishing apply root paste on the affected area to cure skin disease (Bhuyan 2015). The Lisu apply leaf paste externally in bone fracture (Sarmah 2010). The Singhpho take leaf extract during dysentery and use crushed leaves and stems in case of measles, gonorrhoea, and skin troubles. They also use it as an anti-tumour, anti-cancer, pneumonia, bronchitis, and stomach ulcer medication (Khongsai *et al.* 2011, Perme *et al.* 2015). Some indigenous communities of Papum Pare, East and West Kameng, Tawang, Lower Subansiri and Kurung Kamey districts take leaves for measles, dysentery, gonorrhoea, eye and skin troubles, and stomach ulcers (Hussain & Hore 2008). The Adi use an extract of tender shoot for stomach aches, and warmed leaves are packed in a banana leaf for snuff or massage to relieve sinusitis (Kagyung *et al.* 2010). The Monpa prepare pills from the root and take them for piles (Chakraborty *et al.* 2017). The Galo use leaves for curing dysentery, constipation, headache, jaundice, and tonsillitis (Bharali *et al.* 2016). *H. cordata* is also popular among other tribes in North East India, including the Khasi, Garo, Sangtam, Ao, Sumi, Phom, Bodo, Kachari, Mishing, Santal, Goreswar, tribes of Meghalaya, Ahom, Barman, Mishing, Mao-Naga, Thadou, Tripuri, and Manipuri (Supplementary Table 2).

A survey of the literature (Fu *et al.* 2013) indicates that *H. cordata* possesses a variety of pharmacological activities, including anti-viral (Bharate 2003), anti-tumour (Jung *et al.* 1996), anti-inflammatory (Meng *et al.* 2008a), anti-microbial (Meng *et al.* 2008b), and anti-oxidative effects (Chen *et al.* 2003). The extract of *H. cordata* may have beneficial properties and is a new agent for diabetes treatment and improved renal and hepatic functions (Poolsil *et al.* 2017). This plant may be clinically helpful in preventing oral infectious diseases as a mouthwash (Sekita *et al.* 2016). It also has an anti-diarrhoeal activity which supports its use in traditional medicine (Das *et al.* 2014b).

What is used most commonly: different uses of the same species across indigenous groups

Arunachal Pradesh is the most studied region. The complexity and connectivity of use of five common ethnomedicinal plant species is provided in Figure 3, showing use by 18 indigenous communities of Arunachal Pradesh for 20 ailments. It is evident that one plant is used by several tribes for curing different ailments, for example, *A. conizoides* by Adi, Aka, Apatani, Galo, Idu, Lisu, Memba, Monpa, Padam, Singpho, Tagin, and Tangsa for treating six ailments. Outside Arunachal Pradesh, tribes like Riang, Vaiphei, Ahom, Dimasa, Khasi, Jaintia, Naga, Phom-Naga, Lepcha, Tripuri, Mandwi, Halam, Chakma, Tangkhul-Naga, Thadou, and Mizo also use this plant (Supplementary Table 2). Tribes use different plants also for the same ailments; for example, dysentery is cured by *A. conizoides, H. cordata,* and *C. asiatica*, diarrhoea is cured by *A. conyzoides, Clerodendron colebrokianum,* and *C. asiatica*, and deworming is done by *A. conyzoides, C. colebrokianum,* and *Spilanthes paniculata*.

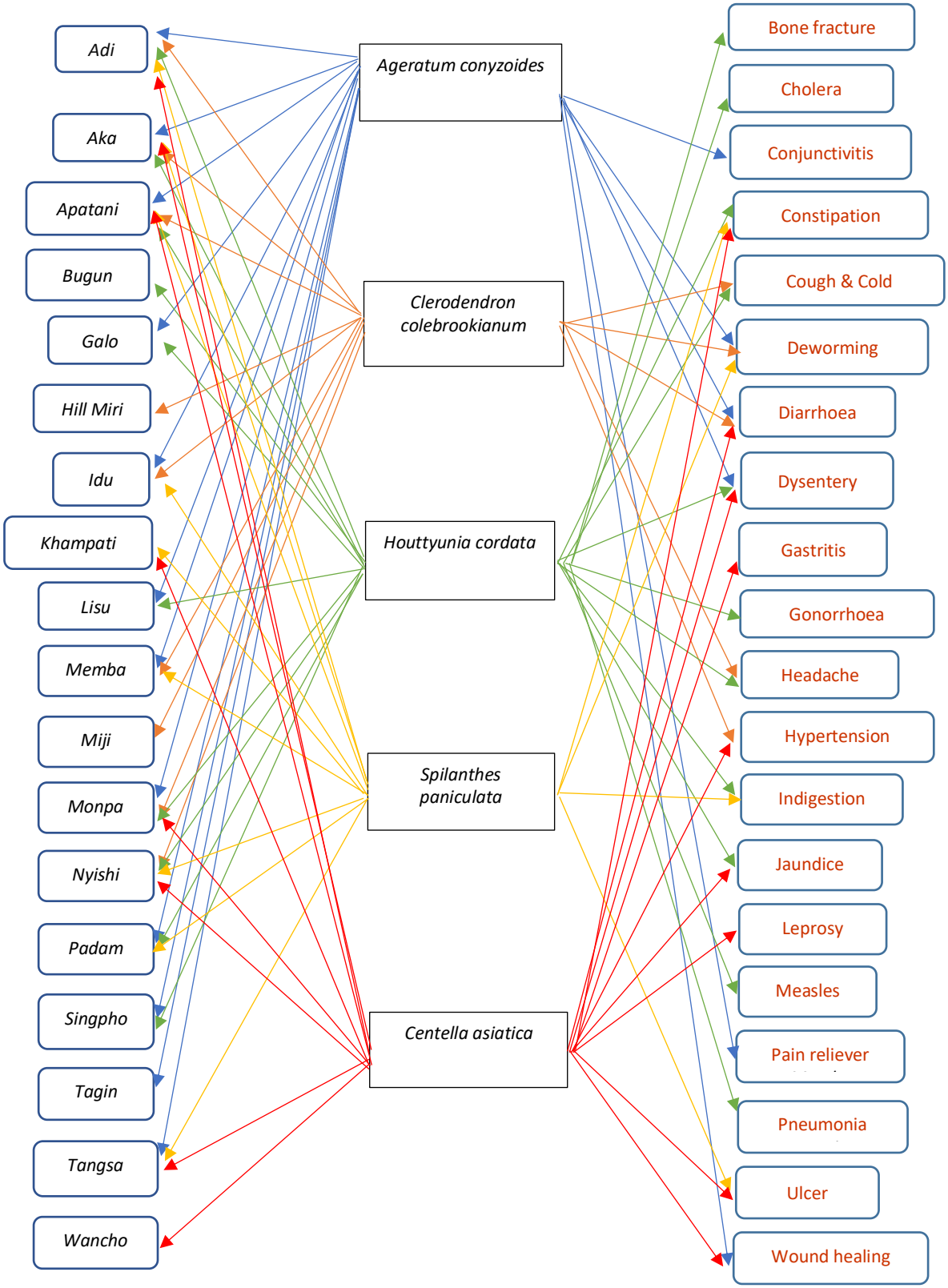

Figure 3: Exemplified cross-cultural use of ethnomedicinal plant species by indigenous communities in Arunachal Pradesh, North East India. Left column: indigenous groups; middle: commonly used plant species; right: what is treated.

What is treated most commonly: different ailments treated with the same species across indigenous groups

The literature (Supplementary Table 2) suggests that the most commonly treated ailments by the indigenous communities of Arunachal Pradesh are stomach problems (constipation, deworming, diarrhoea, dysentery, gastritis, indigestion) and a range of regular ailments (conjunctivitis, cough and cold, headache, general pain, wound healing, bone fracture, cholera, gonorrhoea, hypertension, jaundice, leprosy, measles, pneumonia, ulcer). These are often treated using the same plant

across indigenous groups. For example, stomach ache, stomach ulcer, leprosy, gastritis, abdominal pain, constipation, chronic dysentery, blood dysentery, high blood pressure, blood purification, tuberculosis, jaundice, cuts, wounds, inflammations, asthma, cholera, eye injury, eye infection, eyesore, colic ulcer, typhoid, nasal bleeding, troubled menstrual cycle, cough, diarrhoea, headache, body ache, wounds, kidney stone, heartburn, itches, joint injuries, skin boils, inflammation of the throat, skin disorder, rheumatism, epilepsy, nervous and immune system disorder, malaria, pneumonia, and fever are treated using different preparations (whole plant, shoot, leaves, roots) of *C. asiatica*. Tribes from Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, and Tripura use this plant, e.g., Adi, Aka, Ao, Apatani, Bodo, Chakma, Chutia, Chorei, Chothe, Dimasa, Garo, Halam, H'mar, Jaintia, Kachari, Khampati, Khasi, Lepcha, Limboo, Lushai, Mandwi, Manipuri, Mao-Naga, Mishing, Mizo, Monpa, Nyishi, Rajbongshi, Rangias, Phom-Naga, Sangtam, Tangkhul-Naga, Thadou, and Wancho (see Supplementary Table 2 for references).

Another set of ailments (cuts and wounds, blood clotting, dysentery, diarrhoea, antihelmintic (vermifuge), swollen parts, red eye (conjunctivitis), blood dysentery (colitis), jaundice, cancer, ulcer, intestinal colitis with flatulence, antiallergic, cough, antihaemorrhagic, nose bleeding) is treated with *A. conizoides* (fresh leaves, stem, twigs, whole plant) by Tagin, Adi, Galo, Memba, Lisu, Padam, Idu, Aka, Monpa, Apatani, Singpho, Tangsa, Riang, Vaiphei, Ahom, Dimasa, Khasi, Jaintia, Naga, Phom-Naga, Lepcha, Tripuri, Mandwi, Halam, Chakma, Tangkhul-Naga, Thadou and Mizo tribes from Arunachal Pradesh, Assam, Meghalaya, Nagaland, Sikkim, Tripura, Manipur and Mizoram (Supplementary Table 2).

Generalising findings: Three models to describe plant-people relationships

Using data from the better-studied, much-diversified, and resource-richer state of Arunachal Pradesh, we identify three models for looking at cross-cultural use of plants (Figs. 4-6).

(i) The Plant-Ailment-Tribe Model (Fig. 4): This shows how one plant species is used to cure different ailments across indigenous groups. Using the example of *A. conyzoides*, one of the two most highly used plants in North East India, this species is used to treat seven ailments: worms, diarrhoea, dysentery, pain relief, conjunctivitis, blood clotting, and wound healing. This curative knowledge is distributed across 20 indigenous groups (Adi, Adi-Minyong, Aka, Apatani, Bugun, Galo, Hill Miri, Idu, Idu-Mishmi, Khampati, Lisu, Memba, Miji, Monpa, Nyishi, Padam, Singpho, Tagin, Tangsa, and Wancho). Access to *A. conyzoides* is easy as it grows naturally around homesteads. There is no need for gardening or wild harvesting to acquire the raw material for herbal preparation.

(ii) The Ailment-Plant-Tribe Model (Fig. 5): This shows how one ailment is treated by different plants across indigenous groups. Here, using the example of diarrhoea and dysentery in Arunachal Pradesh, eight plant species (*Acorus calamus*, *Andrographis paniculata*, *Coptis teeta*, *Curcuma caesia*, *Dilenia indica*, *Melastoma malabathricum*, *Oroxylum indicum*, and *Paederia foetida*) are used across 20 indigenous groups: Adi, Adi-Minyong, Aka, Apatani, Bugun, Galo, Hill Miri, Idu, Idu-Mishmi, Khampati, Lisu, Memba, Miji, Monpa, Nyishi, Padam, Singpho, Tagin, Tangsa, and Wancho.

(iii) The Plant-Locality-Tribe Model (Fig. 6): This shows how one plant species is used across states in North East India and across indigenous groups in each state. The example of the highly used *C. asiatica* shows this species is used in all eight states across 33 indigenous groups (Adi, Aka, Ao, Apatani, Bodo, Chakma, Chorei, Chothe, Chutia, Dimsa, Garo, Halam, Hamar, Jaintia, Kachari, Khampati, Khasi, Lepcha, Limboo, Lusai, Mandawi, Manipuri, Mao, Mizo, Monpa, Mishing, Rajbongshi, Rangia, Nyishi, Sangtam, Thadou, Tangkhul, and Wancho).

Conclusion

The existing body of literature documents widespread use of plant species for medicinal purposes in North East India, across all studied states and indigenous groups. Of the 156 tribes, only 51 have been subjected to ethnobotanical studies of medicinal plant use. A sedentary tribe community of Arunachal Pradesh - Apatani - used the highest number of plants for health care. Among all the tribes, nine plants are very commonly used, and 17 plants are commonly used. Using plant materials after minor processing, such as pounding or boiling or drying, is very common.

We categorised used plant species by frequency of use (the number of indigenous groups using the species) and linked this to individual indigenous groups, aliments treated, and the sources of information. We developed three models for analyses, taking point of departure in: (i) a particular ailment and what species are used for treatment by whom (at the level of indigenous group), (ii) a particular plant species and what it is used for and by whom, and (iii) a particular plant species and where it is used and by whom. We found that a single species is typically used for many purposes and by many indigenous groups. None of the three described models are inherently better than the others. The choice of model depends on the objective of study. However, from a global relevance point of view, the “Plant-Ailment-Tribe Model” seems more effective for representation and documentation of ethnobotanical knowledge and practices.

Lastly, there is substantial evidence of therapeutic attributes in the literature supporting many traditional health care practices. No studies have investigated patterns of local experimentation or how medicinal plant knowledge diffuses across indigenous groups. However, some of the plants recorded in this review fall in the RET (Rare, Endangered and Threatened) category (Ray & Saini 2022). For example, *Acorus calamus*, *Andrographis paniculata*, *Angiopteris evecta*, and *Terminalia arjuna* are 'Endangered'. *Alstonia scholaris*, *Citrus medica*, *Coptis teeta* and *Hedyotis scandens* are 'Threatened'. The impact of local use on such plant populations should be a priority for investigation.

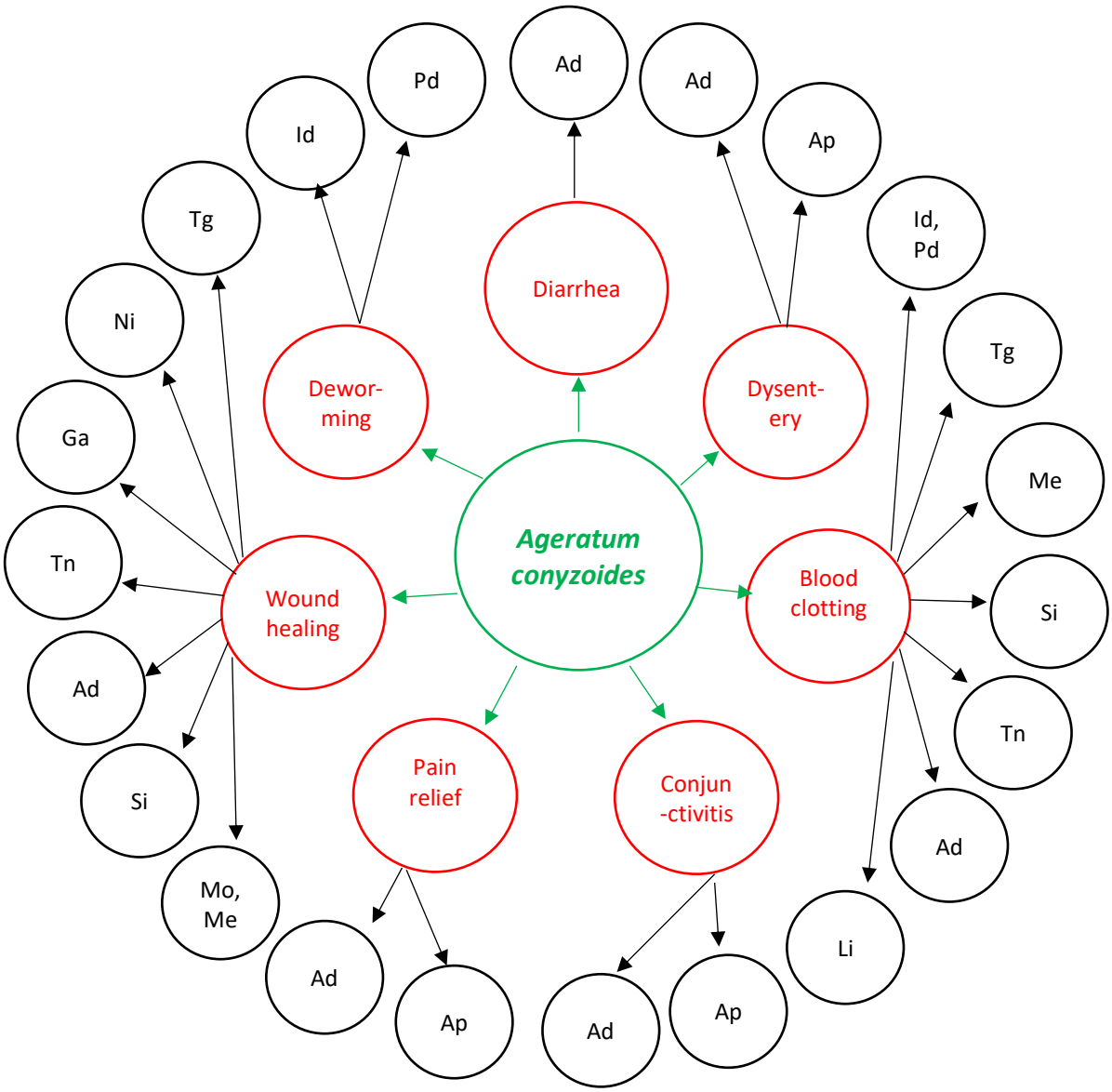

Figure 4. The Plant-Ailment-Tribe Model showing how a single plant species is used to cure multiple ailments across indigenous groups, here illustrated with the example of *Ageratum conyzoides* in Arunachal Pradesh, North East India. Indigenous groups: Adi (Ad), Adi-Minyong (Am), Aka (Ak), Apatani (Ap), Bugun (Bu), Galo (Ga), Hill Miri (Hm), Idu (Id), Idu-Mishmi (Im), Khampati (Kh), Lisu (Li), Memba (Me), Miji (Mi), Monpa (Mo), Nyishi (Ny), Padam (Pd), Singpho (Si), Tagin (Tg), Tangsa (Tn), and Wancho (Wa).

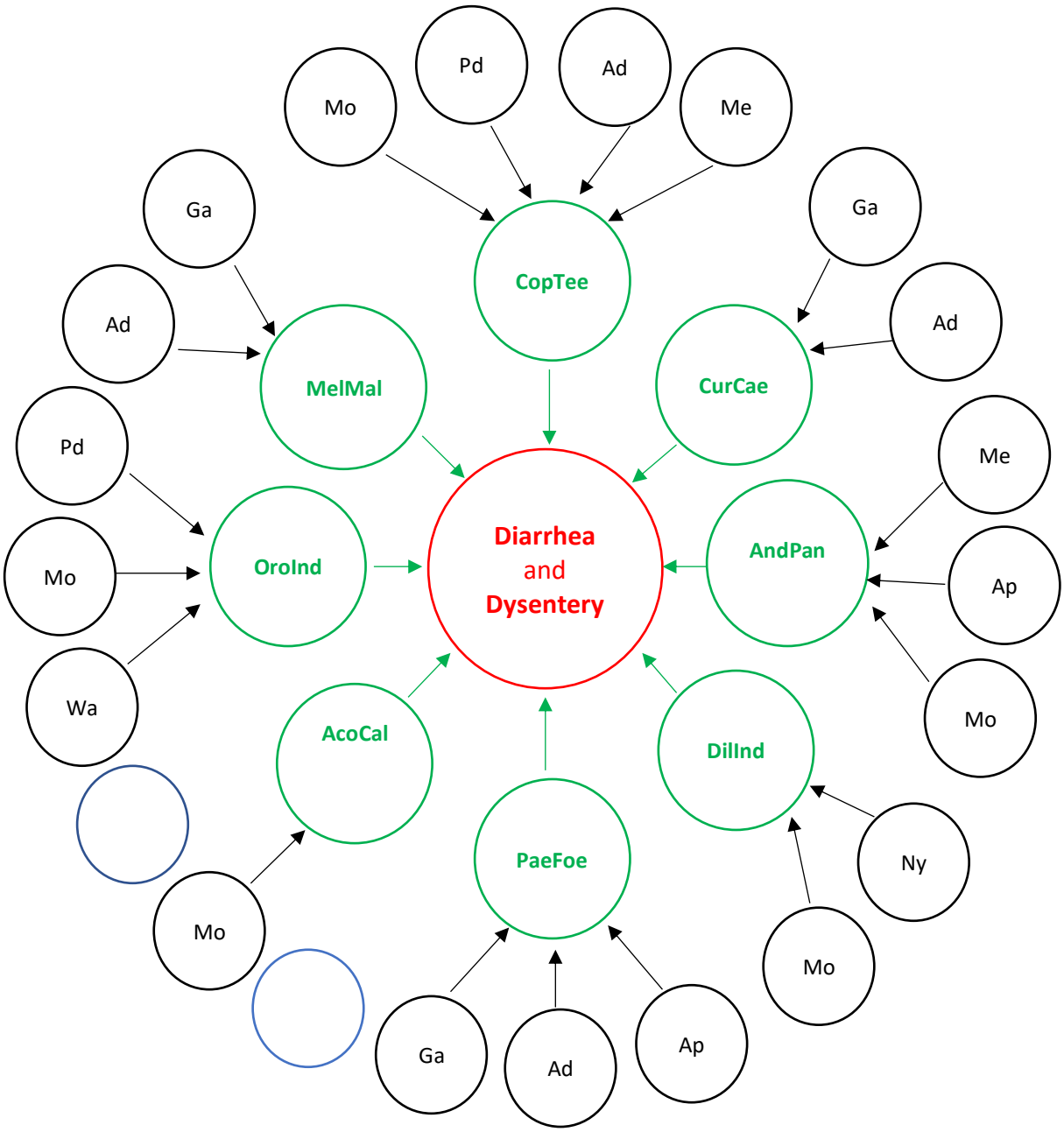

Figure 5. The Ailment-Plant-Tribe Model showing how one ailment is treated by different plants across indigenous groups. The figure uses the example of treatment of diarrhea and dysentery in Arunachal Pradesh, North East India. Plants: *Acorus calamus* (AcoCal), *Andrographis paniculata* (AndPan), *Coptis teeta* (CopTee), *Curcuma caesia* (CurCae), *Dilenia indica* (DilInd), *Melastoma malabathricum* (MelMal), *Oroxylum indicum* (OroInd), and *Paederia foetida* (PaeFoe). Indigenous groups: Adi (Ad), Adi-Minyong (Am), Aka (Ak), Apatani (Ap), Bugun (Bu), Galo (Ga), Hill Miri (Hm), Idu (Id), Idu-Mishmi (Im), Khampati (Kh), Lisu (Li), Memba (Me), Miji (Mi), Monpa (Mo), Nyishi (Ny), Padam (Pd), Singpho (Si), Tagin (Tg), Tangsa (Tn) and Wancho (Wa).

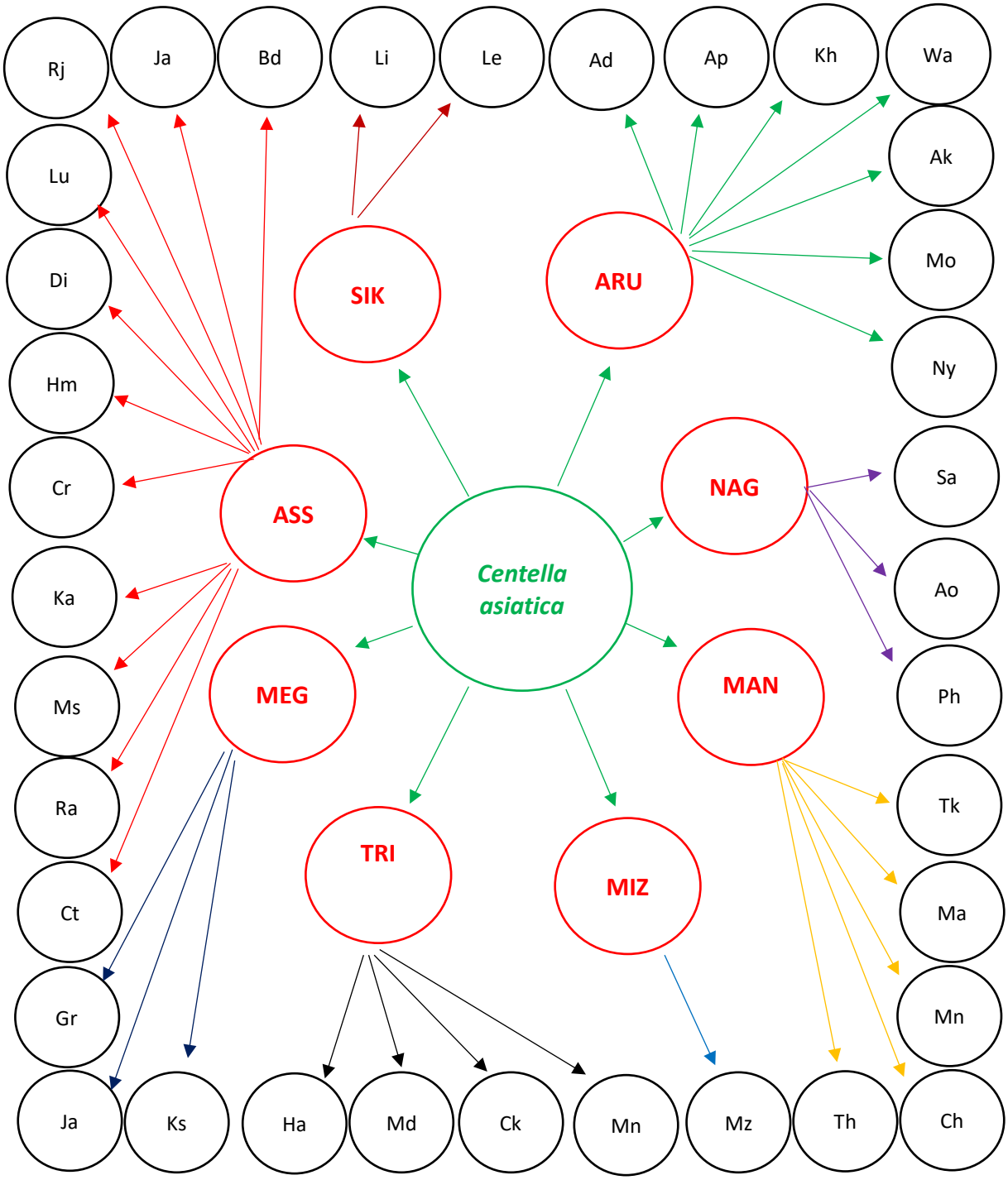

Figure 6. The Plant-Locality-Tribe Model showing how one plant species is used across states in North East India and by what indigenous groups in each state, here using the example of the highly used *Centella asiatica*. States: ARU: Arunachal Pradesh, SIK: Sikkim, NAG: Nagaland, ASS: Assam, MAN: Manipur, MEG: Meghalaya, MIZ: Mizoram, TRI: Tripura. Indigenous groups: Adi (Ad), Aka (Ak), Ao (Ao), Apatani (Ap), Bodo (Bd), Chakma (Ck), Chorei (Cr), Chothe (Ch), Chutia (Ct), Dimsa (Di), Garo (Gr), Halam (Ha), Hamar (Hm), Jaintia (Ja), Kachari (Ka), Khampati (Kh), Khasi (Ks), Lepcha (Le), Limboo (Li), Lusai (Lu), Mandawi (Md), Manipuri (Mn), Mao (Ma), Mizo (Mz), Monpa (Mo), Mishing (Ms), Rajbongshi (Rj), Rangia (Ra), Nyishi (Ny), Sangtam (Sa), Thadou (Th), Tangkhul (Tk) and Wancho (Wa).

Declarations

Ethics approval: Not applicable.
Data availability: The authors confirm that the data supporting the findings of this study are available within the article.
Competing interests: The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.
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Author contributions: KKJ conceived the idea, collected literature, analysed the data, and drafted the paper. CSH critically analysed the study, advised redrafting of the article, and further edited it. Both authors read and approved the final manuscript.

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Supplementary Table 1. Overview of ethnobotanical studies on medicinal plant species in North East India: state, tribes, number of plants (x/y, where x is number used in human medicine (EM) and y the total number of plants when including veterinary medicine (EV) and other uses (EB)).

State; Area; and main tribes*	**Studied Tribe/Sub-tribe/ Communities**	**No of plants studied**	**Study field**	**Authors (References)**
Arunachal Pradesh; 83,743 km^2; *Adi, Aka, Apatani, Bangani, Khamba, Khampti, Khowa, Memba, Miji, Hill Miri, Mishing/Miri, Mishmi, Monpa, Na, Nishi (Dafla), Nocte, Sherdukpen, Sulung, Singpho, Tagin, Tangsa, Wancho, Yobin (Lishu), Zakhring (Meyor).*	*Hill Miri*	5/28	EM	Tag & Das 2003
	Apatani	158	EM	Kala 2005
	Adi	19	EM	Ali & Ghosh 2006
	Khampati	37	EM	Sen *et al.* 2008
	Tagin	10	EM	Goswami *et al.* 2009
	Adi	30/108	EM & EB	Srivastava & Adi 2009
	Apatani, Monpa, Singpho, Tangsa	28	EM	Khongsai *et al.* 2011
	Aka, Monpa	7	EM	Panda & Srivastava 2010
	Memba	18/88	EM & EB	Rethy *et al.* 2010
	Lisu	14/63	EM & EB	Sarmah 2010
	Nyshi including *Hill Miri*	115/214	EM & EB	Srivastava & Nyshi 2010
	Apatani	45/108	EM & EB	Srivastava *et al.* 2010
	Ethnic group	64	EM	Doley *et al.* 2014
	Aka	18	EM	Gibji *et al.* 2011
	Apatani, Monpa, Sinpho, Tangsa, Padam, Nyshi, I-Idu	84	EM	Khongsai *et al.* 2011
	Monpa	36/50	EM & EB	Namsa *et al.* 2011
	Wancho	13	EM	Wangjen *et al.* 2011
	Adi	26	EM	Gibji *et al.* 2012
	Monpa and others	40	EM	Kalita & Khan 2013
	Apatani	33/111	EM & EB	Bamin *et al.* 2013
	Apatani	31/112	EM & EB	Jha 2015
	Apatani	34	EM	Tilling *et al.* 2015
	Galo	45	EM	Bharali *et al.* 2016
	Monpa	53	EM	Chakraborty *et al.* 2017
	Tagin, Hill Miri (now Nyshi) and Galo	140/158	EM & EV	Murtem & Chaudhry 2016

	Adi, Galo, Nishi, Tgain	45	EM	Tripathi *et al.* 2016
	Monpa	3/187	EM & EB	Tsering *et al.* 2017
	Nyishi	17	EM	Tripathi *et al.* 2017
	Adi	73	EM	Jeyaprakash *et al.* 2017
	Adi	28	EM	Danggen *et al.* 2018
	Bugun, Sartang and Monpa	23/77	EM & EB	Tshering *et al.* 2018
	Tagin	26/36	EM & EB	Wangpan *et al.* 2019
	Local community	29/187	EM & EB	Kashung *et al.* 2020
Assam; 78,438 km^2; *Chakma, Dimasa; Kachari, Garo, Hajong, Hmar, Khasi; Jaintia; Synteng; Pnar; War; Bhoi; Lyngngam, Any Kuki tribe, Lakher, Man* (Tai speaking), Any *Mizo (Lushai)* tribes*, Mikir,* Any *Naga tribes*, *Pawi, Syntheng, Barmans Cachar, Boro; Borokachari, Deori, Hojai, Kachari; Sonwal, Lalung (Tiwa), Mech, Miri (Mishing), Rabha.*	*Jaintia*	39	EM	Sajem & Gosai 2006
	Barman, Kuki, Vaiphei, Hmar, Riang, Reangmei, Tea garden community, Bengali	107	EM	Das *et al.* 2008
	Riang, Kachari, Hmar, Rongmai Naga, Manipuri Teagarden community	150	EM	Barbhuiya *et al.* 2009
	Hmar	60	EM & EB	Nath & Chaudhury 2010
	Dimasa Kacharis	25	EM & EB	Tamuli & Sharma 2010
	Bodo	20	EM	Saikia *et al.* 2010
	Mishing	43/86	EM & EB	Kutum *et al.* 2011
	Chorei	53	EM	Choudhury *et al.* 2012a
	Mising (Miri)	1/20	EM & EB	Gam & Gam 2012
	Dimasa	47	EM	Rout *et al.* 2012
	Bodo	37	EM	Paul *et al.* 2013
	Bodo-Kachari	44	EM	Basumatary *et al.* 2014
	Ethnic tribes of western Assam	39	EM	Deka & Nath 2014
	Rabha	30/75	EM, EV & EB	Das & Teron 2014
	Bodo	16	EM	Saharia & Yasmin 2014
	Hill Tiwas	30/176	EM & EB	Teron & Borthakur 2014
	Dimasa	6	EM	Bodo & Bodo 2015
	Mishing	70	EM & EB	Das & Hazarika 2015

	Kalita, Koch, Boro, Kosari, Rajbonshi, Nath, Brahmin etc.	76	EM	Kalita *et al.* 2015
	Mising	9/18	EM, EV & EB	Soren *et al.* 2015
	*Ahom**	68	EM	Bailung & Pujari (2016)
	Deori	60	EM	Hazarika & Dutta 2016
	Local community	40	EM & EB	Jyoti *et al.* 2016
	Ahom, Mishing, Sonowal-kachari, Deori	51	EM & EB	Bharali *et al.* 2017
	Local community	39	EM	Das & Mandal 2017
	Ethnic tribe	116	EM	Mehmud & Swarnakar 2017
	Garo	51	EM	Sarma & Devi 2017
	Ethnic groups	50	EM	Tamuli & Ghosal 2017
	Mising	142	EM	Chetia & Das 2018
	Mishing	40	EM	Sharma & Hazarika 2018
	Karbi	72/138	EM & EB	Mipun *et al.* 2019
	Bodo	43	EM	Swargiary *et al.* 2019
	Karbi, Tiwa,Pnar	201	EM	Teron 2019
	Tea tribes (multi-ethnic)	20	EM	Dutta *et al.* 2020
Manipur; 22,327 km^2; *Aimol, Anal, Angami, Chiru Chothe, Gangte, Hmar, Kabui, Kacha Naga, Koirao, Koireng, Kom, Lamgang, Mao, Maram, Maring, Mizo (Lushai), Monsang, Moyon, Paite, Ralte, Sema, Simte, Suhte, Tangkhul, Thadou, Vaiphei, Zou.*	*Tangkhul-Naga*	57	EM	Salam *et al.* 2009
	Meitei	51	EM	Devi 2011
	Mao Naga	61	EM	Lokho 2012
	Chothe	70/>70	EM & EB	Sanglakpam *et al.* 2012
	Mao Naga	31/63	EM & EB	Lokho & Narsimhan 2013
	Thadou	50	EM	Nanda *et al.* 2013
	Paite	40	EM	Devi *et al.* 2014
	Mao Naga	45	EM	Gurumayum & Soram 2014
	Chothe	47/55	EM & EB	Yuhlung & Bhattacharya 2014
	Ethnic communities	45	EM	Deb *et al.* 2015
	Paite	32	EM	Devi & Das 2015
	Thadou Kuki	27	EM	Singson *et al.* 2015
	Tribal communities	26	EM & EB	Kumar *et al.* 2016

	Rongmei	5	EM & EB	Panmei *et al.* 2016
	Tangkhul Naga	30	EM	Salam & Jamir 2016
	Local community	21	EM	Singh & Devi 2016
	Maring	39	EM	Yuhlung & Bhattacharya 2016
	Maring	144	EM	Nongmaithem & Das 2018
	Lio	30	EM	Singh & Sharma 2018
	Zeme	84	EM	Panmei *et al.* 2019b
	Zeliangrong (Zeme, Liangmai, Rongmei)	145	EM	Panmei *et al.* 2019a
	Maitei, Meitei-Muslim, Loi, Taithibi, Chiru, Hmar, Gangte, Kabui, Kom etc.	40	EM	Chakraborty *et al.* 2020
Meghalaya; 22,429 km^2; *Bhoi, Boro, Chakma, Dimasa; Kachari, Garo, Hajong, Hmar, Jaintia, Khasi, Koch, Kuki, Lakher, Lyngngam, Man* (Tai speaking), *Mizo (Lushai), Naga, Pawi, Pnar, Raba; Rava*, *Synteng, War.*	*Khasi*	181/293	EM & EB	Hynniewta 2010
	Local community	58	EM	Laloo & Hemlata 2011
	Ethnic group	37	EM & EB	Borborah *et al.* 2014
	Khasi	66	EM & EV	Sen *et al.* 2016
	Garo	75	EV	Sangma & Manohara 2018
	Jaintia	44	EM	Lytan & Bokolial 2019
Mizoram; 21,087 km^2; *Chakma, Dimasa (Kachari), Garo, Hajong, Hmar, Khasi* and *Jaintia,* Any *Kuki* tribes*, Lakher, Man (Tai*-speaking*),* Any *Mizo (Lushai)* tribes, *Mikir,* Any *Naga* tribes*, Pawi.*	Mizo	53	EM	Lalramnghinglova 2004
	Mizo natives	17	EM	Bhardwaj & Gakhar 2005
	Mizo tribe	>89	EM & EB	Lalfakzuala *et al.* 2007
	Tribal community	159	EM	Rai & Lalramnghinglova 2010a
	Mizo tribes	57	EM	Rai & Lalramnghinglova 2010b
	Indigenous *Mizo*	302	EM	Rai & Lalramnghiglova 2011
	Mizo tribe	60	EM	Hazarika *et al.* 2012
	Mizo people	279	EB	Kar *et al.* 2013
	Ethnic *Mizo*	82	EM	Lalmuanpuii *et al.* 2013
	Mizo tribe	25	EM	Shankar & Rawat 2012
	Tangkhul Naga	132/400	EM, EV & EB	Salam 2013
	Mizo tribe	36	EM	Shankar & Rawat 2013

	Local community	20	EM	Lalrinzuali *et al.* 2015
	Ethnic *Mizo*	53	EM	Laha *et al.* 2016
	Mizo community	207	EM, EV & EB	Lalramnghinglova 2016
	Mizo community	56	EM	Lalzarjovi & Lalramnghinglova 2016
	Mizo community	41	EM & EV	Buragohain 2017
Nagaland; 16,579 km^2; *Adi, Aka, Dimasa (Kachari), Galong, Caro, Khasi and Jaintia, Khowa, Kuki, Karbi (Mikir), Mizo, Any Naga tribe, Synteng, Momba.*	*Phom-Naga*	66	EM	Imchen & Jamir 2011
	Ao-Naga	38	EM	Jamir 2012
	Naga tribes	52	EM	Jamir *et al.* 2012
	Sangtam – Naga	53	EM	Sangtam *et al.* 2012
	Ao, Angami, Lotha, Sema	257	EM	Bhuyan *et al.* 2014
	Naga tribe	123	EM	Shankar *et al.* 2014
	Sumi	59	EM	Jamir *et al.* 2015
	Ao tribe	130/135	EM & EB	Kichu *et al.* 2015
	Zeliang	35	EM & EB	Singh *et al.* 2015
	Angami, Zeliang, Ao, Lotha, Sangtam, Konyak, Chakhesang, Rengma, Khiamniungam	241	EM	Zhasa *et al.* 2015
	Angami Naga	25	EM	Chowdhury & Biswas 2016
	Phom	71	EM	Jamir & Tsurho 2016
	Yimchunger-Naga	54/122	EM & EB	Rongsensashi *et al.* 2016
Sikkim; 7,094 km^2; *Bhutia, Lepcha, Limboo, Tamang.*	*Subbas, Bhutias, Lepchas*, Nepalis, Tibetan refugees	31/88	EM & EB	Chettri *et al.* 2005
	Local tribes	37	EM	Chhetri *et al.* 2005
	Local tribes	36	EM	Chanda *et al.* 2007
	Lepcha	118	EM	Pradhan & Badola 2008
	Lepcha, Bhutia, Nepali and others	19	EV	Bharati & Sharma 2009

	Lepcha, Bhutia, Nepali and others	20	EV	Bharati & Sharma 2010
	Bhutias, Sherpas, Tibetans, *Mangers, Tamang, Rai, Limboos* and *Lepcha*	100	EM	Lepcha & Das 2011
	Lepcha	44	EM	Pal & Palit 2011
	Local tribes	79	EM	Das *et al.* 2012
	Sherpa	16	EM	Jha *et al.* 2016
Tripura; 10,486 km^2; *Bhil, Bhutia, Chaimal, Chakma, Garo, Halam, Jamatia, Khasia, Kuki, Lepcha, Lushai, Mag, Munda, Noatia, Orang, Riang, Santal, Tripura Tripuri, Tippera, Uchai/Ochoi.*	*Tripuri*	50	EM	Majumdar & Datta 2007
	Tripuri	33	EM	Das *et al.* 2009
	Halam, Tripuri, Chakma	34	EM	Das & Choudhury 2009
	Ethnic communities	24	EM	Das & Choudhury 2012
	Local communities	73	EM	Choudhury *et al.* 2014
	Rural community	54	EM	Deb *et al.* 2014
	Bengali community	93	EM	Majumdar *et al.* 2014
	Chakma tribe	19	EM	Pandey & Mavinkurve 2014
	Tripuri (Debbarma)	23/64	EM & EB	Sharma *et al.* 2013
	Local communities	29	EM	Choudhury *et al.* 2015
	Chakma	59	EM	Guha & Chakma 2015
	Indigenous community	50	EM	Deb *et al.* 2016
	Mog, Reang, Uchai	39	EM	Patari & Uddin 2016
	Reang	37	EM & EV	Reang *et al.* 2016
	Debbarma	36	EM	Saha *et al.* 2016
	Bengali, Manipuri community	43	EM	Singha *et al.* 2016
	Mandawi	51	EM	Debbarma *et al.* 2017
	Reang	125	EM	Shil *et al.* 2014
	Tripuri, Reang	33	EM	Singh & Shrivastava 2017
	Halam	52	EM	Debnath & Das 2019

*Kar (2003), Mao & Roy (2016), NCERT 2017

Supplementary Table 2. Medicinal plants of North East India: Frequency of indigenous group use, plant name and parts used, distribution of use to indigenous groups and states, ailments treated, and references

Category of plants (Number of tribes)	**Name, (Family), Plant parts**	**Name of Tribes and (States)**	**Ailments treated**	**References***
Very high frequency use (35)	*Centella asiatica* (Linnaeus) Urban (Apiaceae) Whole plant, shoot, leaves, roots	Adi, Apatani, Khampati, Wancho, Aka, Monpa, Nyishi, Bodo, Jaintia, Kachari, Mishing, Rajbongshi, Rangias, Lushai, Chutia, Chothe, Tangkhul-Naga, Mao-Naga, Thadou, Khasi, Jaintia, Garo, Mizo, Sangtam, Ao, Phom-Naga, Limboo, Lepcha, Chakma, Mandwi, Halam, Manipuri, Dimasa, H'mar, Chorei (Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura)	Stomachache, stomach ulcer, leprosy, gastritis, abdominal pain, constipation, chronic dysentery, blood dysentery, high blood pressure, blood purification, tuberculosis, jaundice, cuts, wounds, inflammations, asthma, cholera, eye injury, eye infection, eyesore, colic ulcer, typhoid, nasal bleeding, troubled menstrual cycle, cough, diarrhoea, headache, bodyache, wovinds, kidney stone, heartburn, itches, joint injuries, skin boils, inflammation of throat, skin disorder, rheumatism, epilepsy, nervous and immune system disorder, malaria, penumonia, fever.	4, 5, 7, 8, 10, 11, 15, 17, 19, 23, 26, 28, 33, 34, 35, 37, 38, 39, 41, 42, 43, 44, 47, 48, 49, 50, 52, 53, 55, 56, 60, 61, 62, 63, 65, 66, 67, 69, 71, 75, 76, 77, 78
Very high frequency use (29)	*Ageratum conyzoides* Linnaeus (Asteraceae) Fresh leaves, stem, twigs, whole plant	Tagin, Adi, Galo, Memba, Lisu, Padam, Idu, Aka, Monpa, Apatani, Singpho, Tangsa, Riang, Vaiphei, Ahom, Dimasa, Khasi, Jaintia, Naga, Phom-Naga, Lepcha, Tripuri, Mandwi, Halam, Chakma, Tangkhul-Naga, Thadou, Mizo (Arunachal Pradesh, Assam, Meghalaya, Nagaland, Sikkim, Tripura, Manipur, Mizoram)	Cuts and wound healing, blood clotting, dysentery, diarrhoea, antihelmintic (vermifuge), swollen parts to relieve pain, red eye (conjunctivitis), blood dysentery (colitis), jaundice, cancer, ulcer, intestinal colitis with flatulence, antiallergic, cough, antihaemorrhagic, anti-nose bleeding.	3, 4, 6, 11, 12, 14, 16, 19, 23, 24, 26, 28, 30, 34, 35, 37, 41, 45, 48, 49, 53, 54, 55, 56, 58, 61, 64, 66, 67, 68, 69, 73, 75
Very high frequency use (29)	*Houttuynia cordata* Thunb (Saururaceae) Shoot, leaves, stem, root, whole plant	Padam, Apatani, Mishing, Lisu, Galo, Monpa, Singpho, Nishi, Adi, Bugun, Khasi, Garo, Sangtam, Ao, Sumi, Phom, Bodo, Kachari, Mishing, Santal, Goreswar, Tribes of Meghalaya, Ahom, Barman, Mishing, Mao-Naga, Thadou, Tripuri, Manipuri (Arunachal Pradesh, Assam, Meghalaya, Nagaland, Manipur, Tripura)	Measles, gonorrhoea, skin troubles, anti-tumour, anti-cancer, pneumonia, bronchitis, stomach ulcer, cholera, cough, stomach disorder, dysentery, jaundice, heart disorders. skin disease, bone fracture, indigestion, constipation, headache, tonsillitis, piles, measles, eye and skin troubles, sinusitis, sleep disorder, sores and boils, gas formation, diarrhea, bodyache, stomach ache, gas formation, expulsion of worms, excessive menstrual discharge, nose bleeding, goiter, allergy.	3, 4, 5, 6, 7, 9, 15, 16, 25, 26, 30, 32, 34, 35, 37, 38, 39, 40, 44, 45, 48, 49, 53, 59, 63, 64, 67, 69, 71, 75
Very high frequency use (27)	*Psidium guajava* L. (Myrtaceae) Leaves, stem, root, bark, fruit	Monpa, Khampati, Adi, Galo, Chorei, Hamar, Riang, Bodo, Rabha, Mishing, Ahom, Chothe, Mao-Naga, Manipuri, Thadou, Jaintia, Mizo, Naga, Sangtam, Ao, Naga, Phom-Naga, Limboo, Manipuri, Mandwi, Halam, Lepcha (Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Tripura, Sikkim)	Diarrhoea, cough, dysentery, toothache and foetid smell, headache, stomachache, vomiting, cholera, germicide, wounds, ulcers, constipation, piles, anaemia, sore throat.	3, 6, 10, 11, 14, 16, 20, 26, 28, 31, 34, 38, 41, 44, 47, 48, 49, 54, 56, 63, 65, 66, 68, 71, 78

Very High Demand (26)	*Oroxylum indicum* (L) Vent (Bignoniaceae) Root, seed, stem, leaf, fruit, bark, all parts	Wancho, Monpa, Apatani, Mishing, Padam, Halam, Tripuri, Limboo, Lepcha, Naga, Ao - Naga, Ao, Serna, Angami, Lotha, Manipuri, Chothe, Mao-Naga, Thadou, Mizo, Chutia, Mishing, Naga, Nepali, Lepcha, Bhutia (Arunachal Pradesh, Assam, Manipur, Mizoram, Nagaland, Sikkim, Tripura)	Stomach problems, anti-helminthic (germicide), carminative cancer, anti-malarial, jaundice, anti-arthritic, diarrhoea, fever, ulcer, anti-inflammatory, liver problems, stomachache, rheumatism, tuberculosis, headache, dysentery, diabetes, cough, stomach cleaning, scorpion sting, malaria, high bold pressure, burns, tonsillitis, typhoid, placental problem, neuralgia, gonorhoea, skin disease, muscle pain, epilepsy, jaundice, pneumonia, leukoderma	7, 8, 11, 12, 18, 22, 25, 27, 31, 35, 36, 37, 38, 41, 42, 44, 45, 46, 47, 53, 54, 55, 59, 62, 66, 67, 77, 78
Very high frequency use (25)	*Clerodendron colebrookianum* Walp. (Verbenaceae) Leaves	Apatani, Nyishi, Idu, Aka, Monpa, Adi, Hill Miri, Memba, Nyshi, Miji, Sangtam, Ao, Sumi, Naga, Phom, Ahom, Hmar, Barman, Mishing, Thadou, Chothe, Manipuri, Mao-Naga, Dimasa, Chakma (Arunachal Pradesh, Meghalaya, Manipur, Nagaland)	Blood pressure, anthelmintic, diarrhoea, cough and cold, liver disorders, stomach trouble, headache, rheumatism, malaria, laxative, antiseptic, anti-inflammatory, antipyretic, bronchitis, anti-dandruff, diabetes.	2, 3, 16, 18, 23, 25, 26, 30, 31, 32, 36, 37, 38, 39, 44, 48, 49, 50, 56, 58, 59, 63, 70, 73, 74, 75, 76, 77
Very high frequency use (24)	*Spilanthes paniculata* Wall ex DC (Asteraceae) Flowers, leaves, root, tender whole plant	Apatani, Khampati, Adi, Memba, Padam, Idu, Nyishi, Tangsa, Nyshi, Aka, Hmar, Dimasa, Riang, Hamar, Bodo, Jaintia, Mizo, Tripuri, Mandwi, Halam, Mishing, Assam, Mao Naga, Naga (Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Tripura)	Indigestion, stomach ache, throat pain, toothache. tongue ulcers, pain killer, constipation, intestinal worms, liver trouble, mouth ulcer, boil, dyspepsia, abdominal pain, expulsion of worms, dysentery, piles.	1, 2, 7, 11, 16, 19, 20, 26, 35, 37, 39, 44, 45, 50, 56, 60, 65, 66, 68, 69, 75, 76
Very high frequency use (23)	*Zingiber officinale* Rosc. (Zingiberaceae) Rhizome, stem, root	Adi, Padam, Apatani, Monpa, Khampati, Apatani, Dimasa, Ahom, Bodo, Rabha, Hmar, Kachari, Mao Naga, Thadou, Manipuri, Chothe, Mizo, Sangtam, Yimchunger-Naga, Phom, Phom-Naga, Limboo, Lepcha, Manipuri (Arunachal Pradesh, Assam, Manipur, Mizoram, Nagaland. Sikkim, Tripura)	Post-natal stomach pain, stomachache, bronchitis, fever, influenza, throat problems, cold and cough, asthma, indigestion, tooth ache, inflammation, hysteria, constipation, blood Purifier, detoxification, blood in stool, paralysis, sleepiness, back ache, mouth ulcer, inflammation in oral cavity, poor breath, cancer, urinary tract, respiratory problem, weakness, joint pain, arthritis, gout, muscle pain, ringworm, neuralgia and chest pain, piles, tuberculosis, antiseptic, rheumatic pain, womb tumor, dropsy, menstrual disorder.	3, 5, 7, 18, 20, 30, 34, 35, 37, 41, 44, 47, 48, 49, 50, 51, 53, 54, 55, 57, 62, 63, 65, 69, 70, 71, 75, 78
Very high frequency use (22)	*Paedaria foetida* Linn. (Rubiaceae) Leaf, root, bark, fruit,stem, twig, whole plant	Apatani, Adi-Miniyong, Adi, Galo, Aka, Tagin, Ahom, Mao-Naga, Thadou, Mizo, Yimchunger-Naga, Ao, Sumi, Ao - Naga, Tripuri, Bodo, Kachari, Chothe, Garo, Naga, Lepcha, Mishing (Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura)	Rheumatism and gout, gastritis, body pain, diarrhoea, stomach disorder, dysentery, skin diseases, urinary problems, toothache, antidotes, fire, hot Water burns, fungal/bacterial infection, ringworm, herpes, pile problems, chest pain, diabetes, chronic dysentery, rheumatism, paralysis, liver disorders, seminal weakness.	3, 4, 5, 6, 7, 23, 24, 26, 29, 32, 34, 35, 37, 38, 39, 42, 44, 45, 49, 53, 54, 55, 57, 59, 62, 68, 69, 75

Moderately high frequency use (19)	*Carica papaya* L. (Caricaceae) Whole plant, fruit, flower, leaf, root, latex	Galo, Apatani, Adi, Khampati, Kuki, Riang, Chorei, Hmar, Dimasa, Meitei, Manipuri, Chothe, Thadou, Mizo, Sangtam, Ao, Lepcha, Manipuri, Chakma (Arunachal Pradesh, Assam, Manipur, Mizoram, Nagaland, Sikkim, Tripura)	Anti-malarial, treatment of cuts, rashes, burns, stings, digestive problem, hearing trouble, gastrisis, easy delivery, burns, cuts, wounds and heel's crack, dysentery, dog bite, dry cough, impotency, toothache, deworming, jaundice, diabetes, pile, chronic ulcer, liver enlargement, diarrhoea, corns and warts, anti-cancer, aborting pregnancy, constipation.	6, 10, 11, 12, 16, 18, 21, 34, 37, 38, 41, 49, 50, 53, 54, 58, 63, 65, 71, 73, 78
Moderately High Demand (17)	*Acorus calamus* Linn. (Araceae) Leaves, stems, roots, rhizome	Apatani, Padam, Lisu, Wancho, Adi, Monpa, Mishing, Manipuri, Mao Naga, Chothe, Khasi, Jaintia, Naga, Ao, Lepcha, Limboo (Arunachal Pradesh, Assam, Manipur, Meghalaya, Nagaland, Sikkim)	Diarrhoea, dysentery. insecticidal activities, expel intestinal worms, dislocated and swollen bones, bone fracture, cut, wounds, antidote to snake bites, asthma, bronchitis, sinus, stomach ache. epilepsy, mental ailments, psychiatric problem, intermittent fever, colic pains, sore throat, child birth, headache, joint pain, skin rashes, cough, cold, pile, ligament injury, malaria, giddiness, leprosy, flu, stammering child.	4, 14, 18, 25, 26, 35, 36, 37, 38, 43, 44, 47, 53, 54, 56, 59, 62, 64, 68, 69, 75, 77
Moderately high frequency use (17)	*Musa paradisiaca* L. (Musaceae) Herb, stem flower, fruit, root, whole plant, latex	Padam, Idu, Khampati, Apatani, Galo, Dimasa, Bodo, Kachari, Tribes of Meghalaya, Tribes of Manipur, Meitei, Mao-Naga, Thadou, Sangtam, Phom-Naga, Manipuri, Halam (Arunachal Pradesh, Assam, Manipur, Meghalaya, Nagaland, Tripura)	Insanity, backache, fever and vomiting problems, diarrhea, deworming, indigestion, blood dysentery, clearance of stomach, diabetes, liver infection, snake bite, cholera, cardiac and hypertension problems, dysmenorrhoea and menorrhagia.	5, 6, 7, 11, 21, 26, 28, 35, 37, 40, 44, 58, 63, 65, 71, 79
Moderately high frequency use (16)	*Zanthoxylum armatum* DC (Rutaceae) Leaf, flower, stem, Bark, fruits, seeds,	Tangsa, Monpa, Adi, Apatani, Padam, Nyishi, Galo, Sinpho, Dimasa, Mao-Naga, Garo, Mizo, Yimchunger-Naga, Lepcha, Sherpa, Limboo (Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim)	Bronchitis and throat pain, stomachic, scabies, stomach bloating. cold, cough and fever, toothache, eradication of lice, cholera, dyspepsia, urinary problems, small pox, antiasthmatic, antihelminthic, leucoderma, eye & ear diseases, piles, snake bite, tooth ache, leech guard, vomiting.	2, 4, 25, 26, 32, 33, 34, 35, 37, 41, 47, 53, 54, 55, 57, 58, 59, 69
Moderately high frequency use (15)	*Alstonia scholaris* R.Br. (Apocynaceae) Leaves, stem, root, bark, flower, seeds, latex	Apatani, Wancho, Nyshi, Chorei, Riang, Ahom, Dimasa, Hmar, Mishing, Mizo, Naga, Ao, Phom-Naga, Mandwi, Borok (Arunachal Pradesh, Assam, Mizoram, Nagaland, Tripura)	Ulcer, swelling, abdominal pain, headache, stomach disorder, menstrual disorder, wound healing, boil eruption, snake bite, allergy, abscesses, malarial fever, skin diseases, gastritis, jaundice, constipation, piles, leprosy, insomnia, anxiety, paralysis, convulsion.	3, 10, 14, 16, 17, 19, 22, 28, 35, 38, 41, 50, 53, 66, 68, 75, 77
Moderately high frequency use (15)	*Andographis paniculata* (Burm. f) (Acanthaceae) Stem, leaf, seed, whole plant	Monpa, Apatani, Adi, Nyshi, Khampati, Vaiphei, Riang, Meitei, Manipuri, Mizo, Mandwi, Hmar, Bodo, Kachari, Mishing (Arunachal Pradesh, Assam, Manipur, Mizoram, Tripura)	Fever, worms, dysentery, liver disorder, malaria, jaundice, respiratory problems, stomach disorder, rheumatism, ulcerative colitis, jaundice, dyspepsia, irregular stool, anthelmentic. diarrhoea, cholera, diabetes, cough, asthma, typhoid, spleen complaints, jackal and dog bites, constipation, destroy tapeworm.	5, 7, 16, 18, 19, 21, 25, 34, 35, 36, 37, 39, 42, 50, 53, 56, 65, 70

Moderately high frequency use (15)	*Cannabis sativa* Linnaeus (Cannabaceae) Inflorescence, leaves, stem, seed, flower, whole plant except root	Monpa, Apatani, Padam, Mishing, Meitei, Manipuri, Chothe, Mao-Naga, Thadou, Naga, Sangtam, Ao, Phom-Naga, Lepcha, Limboo (Arunachal Pradesh, Assam, Manipur, Nagaland, Sikkim)	Anthelminthic, bronchitis, piles, nervine stimulation, stomach disorder, dysentry, loss of appitite, anti-inflammatory, analgesic, nausea, vomiting, hallucinogenic, insomnia, headache, cough, diabetes, depression, bone fracture, sprain and muscle pain, antiseptic, cuts and wounds, diarrhoea.	14, 18, 21, 28, 36, 37, 38, 44, 47, 49, 53, 54, 56, 59, 63, 68, 78
Moderately high frequency use (13)	*Curcuma longa* L. (Zingiberaceae) Leaves, rhizome, root	Adi-Miniyong, Adi, Khampati, Dimasa, Meitei, Chothe, Manipuri, Tangkhul-Naga, Thadou, Mizo, Naga, Lepcha, Borok (Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura)	Wounds and cuts, body pain, joint pain, stomach bloating and indigestion, asthma, bone fracture, anti tumour, cardiovascular disease, anti-bacterial, diabetes, bronchial complaints, dysentery, urinary disorders, anti-allergic, stomach ulcer, diarrhoea and gastric problem, cough, throat pain, jaundice, menstrual problems, skin infection.	7, 17, 18, 21, 26, 34, 41, 42, 49, 51, 53, 54, 56, 58, 61, 62, 65, 68
Moderately high frequency use (13)	*Ocimum sanctum* Linn. (Lamiaceae) Whole plant, leaves, root, seed	Apatani, Nyshi, Monpa, Hamar, Riang, Mishing, Ahom, Chothe, Naga, Manipuri, Mandwi, Borok, Tripuri (Arunachal Pradesh, Assam, Manipur, Nagaland, Tripura)	Bronchitis, cough, heart disease, skin diseases, stomach disorder, inflammations, wounds, cuts, scorpion sting and snakebite, fever, gout, constipation, eye diseases, headache, tonsillitis, asthma, cough, diabetes, fever, worm, urinary infection, jaundice.	3, 11, 16, 17, 19, 37, 39, 49, 53, 68, 70, 71, 78
Moderately high frequency use (13)	*Rhus semialata* Murr. (Anacardiaceae) Leaf, fruits, seed	Idu Mishmi, Apatani, Adi, Dimasa, Mao Naga, Thadou, Khasi, Garo, Mizo, Sangtam, Yimchunger-Naga, Sumi, Lepcha (Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim)	Stomach disorder, dysentery, diarrhoea, intestinal worm infestation, chicken pox, vomiting, allergy, food poisoning.	2, 26, 32, 34, 41, 44, 49, 54, 57, 58, 63
Moderately high frequency use (12)	*Amaranthus spinosa* L. (Amaranthaceae) Whole plant, stem, leaf, inflorescence, root	Khampati, Monpa, Singpho, Adi, Riang, Tea Garden community, Chothe, Naga, Tripuri, Tangkhul-Naga, Phom-Naga (Arunachal Pradesh, Assam, Manipur, Nagaland, Tripura)	Gout, leprosy, skin infection, piles, cough, digestion, desentry, hallucinogenic, skin infection, snake bite, gonorrhea., leucorrhoea, haemorrhoid, constipation, menstrual discharge, liver problems, throat infection.	1, 16, 28, 37, 45, 53, 61, 62, 65, 68, 78
Moderately high frequency use (12)	*Dillenia indica* L. (Dilleniaceae) Fruit pulp, leaves, seed, bracts, bark, fruit-ash	Monpa, Apatani, Adi, Galo, Nyshi, Chorei, Hmar, Ahom, Chakma, Mishing, Mizo, Lepcha (Arunachal Pradesh, Assam, Mizoram, Sikkim)	Dysentery, curing dandruff, wound healing, bone fracture, anti-diarrhea, stomachache, hair fall, throat dryness, cough, fever and weakness, constipation, jaundice.	2, 3, 6, 10, 34, 35, 36, 37, 39, 41, 50, 53, 54, 55, 59, 66, 69
Moderately high frequency use (11)	*Curcuma caesia* Roxb. (Zingiberaceae) Rhizome	Apatani, Galo, Adi, Khampati, Monpa, Manipuri, Chothe, Mizo, Naga, Lepcha, Chakma (Arunachal Pradesh, Manipur, Mizoram, Nagaland, Sikkim, Tripura)	Cough, asthma, inflammation, skin diseases, stomach pain, stomach disorder, blood dysentery, antidiarrhoeic, wounds and injuries, pimples removal, skin cancer, diabetes, constipation, piles, cancer, stomach problem, gastric ulcer, pox, tumor, food poisoning, vomiting, flatulence, sore throat.	6, 18, 31, 34, 35, 42, 48, 51, 52, 54, 62, 65, 69, 78

Moderately high frequency use (11)	*Eryngium foetidum* L. (Apiaceae) Leaves, seed, stem, whole plant	Adi, Apatani, Galo, Dimasa, Chothe, Tangkhul-Naga, Thadou, Mizo, Ao, Sumi, Manipuri (Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Tripura)	Anti-epileptic, headache, scorpion sting, anti-diabetic, anti- bacterial, analgesic, fever, arthritis, madness, allergy, hepatic problem, blood pressure, stomach trouble, fits and epilepsy, tooth ache, jaundice, dropsy, diuretic, worms.	6, 26, 32, 34, 35, 38, 41, 49, 53, 58, 61, 62, 66, 69, 71, 73
Moderately high frequency use (11)	*Terminalia arjuna* (Roxb. Ex DC.) Wight & Arn. (Combretaceae) Bark, leaf, fruit, heart wood	Adi, Idu Mishimi, Nyshi, Hmar, Chorei, Barman, Tea garden community, Chothe, Ahom, Mishing, Borok (Arunachal Pradesh, Assam, Manipur, Tripura)	Jaundice, diabetes, cardiac ailments, stomach problem, poisonous bites, liver trouble, dysentery, piles, hair loss, breathing difficulties, analgesic and anti-inflammatory.	3, 10, 14, 16, 17, 22, 50, 62
Moderately high frequency use (10)	*Oxalis corniculata* L. (Oxalidaceae) Whole plant, Leaves, stem, flower	Apatani, Monpa, Adi, Nyshi, Mishing, Khasi, Jaintia, Phom-Naga, Yimchunger-Naga, Lepcha (Arunachal Pradesh, Assam, Meghalaya, Nagaland, Sikkim)	Wormicide, bowel disorder, aneamia, scurvy, datura poisioning, opacity of cornea, antidysenteric, headache. Diarrhea, cuts and wounds, stomachache, mouth odour, snakebites, cough, Jaundice, toothache, checks boil, throat pain.	1, 2, 4, 7, 14, 26, 28, 33, 34, 35, 36, 37, 43, 53, 54, 57, 59, 75
Moderately high frequency use (10)	*Solanum torvum* Sw. (Solanaceae) Seeds, fruit, root	Padam, Monpa, Apatani, Hmar, Vaipehi, Mao-Naga, Mizo, Khasi, Jaintia, Naga (Arunachal Pradesh, Assam, Manipur, Mizoram, Meghalaya, Nagaland)	Indigestion, itching, anthelmintic, cough, skin diseases, abscess, headache, fever, toothache, blood pressure, blood sugar, snake bite, liver, spleen enlargement, oral contraceptive.	16, 26, 35, 37, 41, 44, 48, 50, 55, 66, 68, 69
Low frequency use (9)	*Begonia roxburghii* A. DC. Prodr. (Begoniaceae) Leaf, stem, roots, petioles, leaves, rhizome/tuber	Apatani, Lisu, Nyshi, Galo, Barman, Dimasa, Khasi, Jaintia, Garo (Arunachal Pradesh, Assam, Meghalaya)	Indigestion, anti-gas, constipation, cold, fever, malaria, itching, pneumonia, bile dysentery.	2, 6, 16, 26, 35, 58, 64, 69, 76
Low frequency use (9)	*Costus speciosus* (J. Koenig) (Zingiberaceae) Roots, stem, rhizome, beet	Adi, Monpa, Singpho, Padam, Aka, Naga, Ao, Sumi, Lepcha (Arunachal Pradesh, Nagaland, Sikkim)	Piles, ear diseases, respiratory problem, anti-helminthic, liver cirrhosis, urinary problem, jaundice, anti-inflammatory, gout, anaemia, bronchitis, fever, rheumatism, urinary stone, ear pain, eye infection, tooth ache, vermifuge, veneral diseases, urinary tract infections.	23, 25, 32, 36, 37, 38, 53, 54, 56, 59, 68
Low frequency use (9)	*Solanum khasianum* C.B. Clarke (Solanaceae) Seeds, berries, roots, whole plant	Padam, Adi, Apatani, Mao-Naga, Khasi, Jaintia, Mizo, Phom, Lepcha (Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim)	Toothache, leech killer, malaria, antifertility, anti-inflammatory, gum bleeding, snakebite, expel tooth worms, contraceptive, germicide.	26, 30, 37, 41, 44, 53, 54, 55, 56
Low frequency use (8)	*Colocasia esculenta* L. (Araceae) Leaves, stem, rhizome/corm	Tangsa, Adi, Aka, Galo, Sumi, Phom, Phom-Naga, Sangtam (Arunachal Pradesh, Nagaland)	Fever, cough, insect sting, cuts, burns, vermifuge, internal hemorrhage.	2, 6, 28, 30, 32, 53, 63

Low frequency use (8)	*Melastoma malabathricum* Linn. (Melastomaceae) Fruits, leaves, twigs, bark, root	Nyshi, Galo, Adi, Dimasa, Hmar, Chorei, Barman, Riang (Arunachal Pradesh, Assam)	Dysentery, diarrhea, wound healing, skin diseases, toothache, worm infestation, diabetes.	2, 6, 10, 16, 34, 50, 56, 73, 76
Low frequency use (7)	*Dioscorea bulbifera* L. (Dioscoreaceae) Tuber	Aka, Monpa, Apatani, Yimchunger-Naga, Sumi, Phom-Naga, Lepcha (Arunachal Pradesh, Nagaland, Sikkim)	Indigestion, dysentery, burning sensation, jaundice, head-ache, piles, ulcer.	28, 29, 33, 35, 43, 57, 59, 69
Low frequency use (6)	*Artemisia indica* Willd. (Asteraceae) Leaves, young seedlings, stem	Galo, Apatani, Adi, Khasi, Jaintia, Phom-Naga (Arunachal Pradesh, Meghalaya, Nagaland)	For skin allergy, breast cancer, cough, painful menstruation, body pain, nose bleeding, bodyache, asthma, skin diseases, stomach ache, loose motion, minor cuts, anthelmintic, nose blockade, headache, itching and skin allergy, redness of eye, back pain, sinusitis.	4, 6, 26, 28, 35, 53, 69, 73, 75
Low frequency use (6)	*Bidens pilosa* L. (Asteraceae) Whole plant. leaves	Apatani, Lisu, Monpa, Mao-Naga, Khasi, Jaintia (Arunachal Pradesh, Manipur, Meghalaya)	Wound healing, ulcer, ear and eye problem, influenza, hepatitis, urinary tract infection, anti-malaria, anti-pathogenic, cold and fever, headache, blood presssure, gastric disorders, antidote for snakebite.	26, 37, 44, 48, 53, 64
Low frequency use (6)	*Diplazium esculentum* (Retz.) SW (Athyriaceae) Rhizome, fronds, leaf	Galo, Khampati, Adi, Apatani, Riang, Yimchunger-Naga (Arunachal Pradesh, Assam, Nagaland)	Fever, food poisoning, constipation	6, 16, 34, 35, 57, 65
Low frequency use (6)	*Gynocardia odorata* Roxb. (Flacaurtiaceae) Seeds, fruits, leaves, bark	Tagin, Galo, Adi, Hill Miri, Aka, Nyishi (Arunachal Pradesh)	Leprosy, toothache, lupus, scrofula and many skin diseases, tooth decay, inflammation, skin diseases, intestinal worm, diarrhoea.	6, 22, 24, 53, 59, 74
Low frequency use (6)	*Gynura cusimbua* (D. Don) S. Moore (Asteraceae) Leaf	Apatani, Lisu, Adi, Nyshi, Tangkhul-Naga, Chothe (Arunachal Pradesh, Manipur)	Fresh cut and injury, stomach ache, worms, allergy, headache, wounds.	2, 61, 62, 64, 69, 75, 78
Low frequency use (6)	*Plantago major* L. (Plantaginaceae) Leaves, stem, whole plant	Idu Mishmi, Adi, Apatani, Monpa, Jaintia, Yimchunger-Naga (Arunachal Pradesh, Assam, Nagaland)	Constipation, wound healing, burns and inflammation, headache, earache, toothache, diarrhoea, piles, antipyretic agent. Jaundice.	2, 7, 25, 35, 48, 56, 57, 60
Low frequency use (5)	*Garcinia pedunculata* Roxb. (Lauraceae) Fruit, bark, seeds	Monpa, Khampati, Adi, Nyshi, Ao (Arunachal Pradesh, Nagaland)	Diarrhoea, dysentery, dyspepsia and in flatulence, gastritis.	22, 34, 36, 38, 65

Low frequency use (5)	*Litsea cubeba* (Lour.) Pers (Lauraceae) Leaves and bark, Whole plant, fruit, leaves, seed	Apatani, Adi, Galo, Monpa, Lepcha (Arunachal Pradesh, Sikkim)	Cough, diarrhea, dysentery, worm infection, blood dysentery, anti-inflammatory, bone fracture, headache, thread worm infection, stomach disorder, eczema, heart disease, bone fracture.	4, 6, 22, 33, 35, 48, 53, 69, 73, 75
Low frequency use (5)	*Piper nigrum* L. (Piperaceae) Leaves, fruits, seed, root	Singpho, Tangsa, Tagin, Padam, Idu, Hmar, Dimasa, Ahom, Mishing, Borok, Chakma (Arunachal Pradesh, Assam, Tripura)	Fever, tonsillitis, eradicate the lice, cough, throat pain, pneumonia, dysentery, piles, stomachic, headache, asthma.	3, 17, 24, 37, 39, 50, 52, 76
Very low frequency use (4)	*Artemisia nilagirica* (C.B. Clarke) (Asteracae) Leaves, stem, flower, leaf, oil, whole plant	Apatani, Aka, Monpa, Hill Miri, Mao Naga, Phom-Naga (Arunachal Pradesh, Manipur, Nagaland)	Wound healing, nose bleeding. Headache, stomach pain, asthma, cough, sores, worm troubles, nervine infection, fever, cuts, scabies, inflammations, skin disease, insect repellent, dandruff, dog bites.	23, 25, 28, 35, 44, 48, 53, 56, 59, 72, 74
Very low frequency use (4)	*Callicarpa arborea* Roxb. (Verbenaceae) Branch, bark and leaves	Adi, Nyshi, Padam, Hmar (Arunachal Pradesh, Assam)	Skin diseases, scorpion sting, toothache, indigestion and gastric problems, diarrhea.	16, 22, 37, 53, 73
Very low frequency use (4)	*Citrus medica* L. (Rutaceae) Leaves, fruit, mesocarp, juice of petiol	Monpa, Singpho, Nyishi, Khampati (Arunachal Pradesh)	Treatment of scurvy, intestinal ailments, antidote, anti-cancer, weak eyesight, vomiting, skin diseases, haemorrhoids, gastric problems, tumors, indigestion, epilepsy, convulsion, cough, common cold, dandruff.	36, 37, 53, 59
Very low frequency use (4)	*Clerodendrum serratum* Spreng. (Verbenaceae) Fresh tender leaves, root, whole plants	Hill Miri, Apatani, Tagin, Monpa, Sumi, Mishing, Chothe, Mizo (Arunachal Pradesh, Assam, Manipur, Mizoram, Nagaland)	Headache, eye disorders. blood pressure, diabetes, obesity, hypertension, fever, asthma, bronchitis, ear problem, gout, stomach pain, cold, cough, dyspepsia, jaundice.	24, 35, 36, 53, 74
Very low frequency use (4)	*Coptis teeta* Wall (Ranunculaceae) Root, rhizome	Adi, Monpa, Apatani, Padam (Arunachal Pradesh)	Malarial fever, backache, stomach disorder, aphrodisiac, cough & cold, diarrhea & dysentery, liver disorder, fever, headache, gastric trouble, dysentery, ulcer, insomnia, vomitting, dandruff, eye diseases, dyspepsia.	1, 25, 34, 36, 37, 53, 56, 69, 73
Very low frequency use (4)	*Cuscuta reflexa* Roxb. (Convolvulaceae) Seed, whole plant	Bugun, Monpa, Apatani, Dimasa (Arunachal Pradesh, Assam)	Stomach trouble, poisoning, jaundice, premature graying of hairs.	35, 59, 75
Very low frequency use (4)	*Drymaria cordata* L. (Caryophyllaceae) Whole plant	Galo, Miji, Khampati, Adi (Arunachal Pradesh)	Inflammation, skin diseases, scabies, jaundice, stomache, stone, headache, gastritis.	6, 34, 59, 65
Very low frequency use (4)	*Paederia scandens* (Lour.) Merr. (Rubiaceae) Leaves, stem, fruits	Nyshi, Apatani, Khampati, Mizo (Arunachal Pradesh, Mizoram)	Weakness, indigestion, toothache.	2, 41, 65

Very low frequency use (4)	*Solanum indicum* Linn. (Solanaceae) Seeds, fruits, root, whole plant	Monpa, Nyshi, Tangsa, Aka, Hmar, Ahom, Ao, Sumi, Phom (Arunachal Pradesh, Assam, Nagaland)	Anthelmintic (pinworm), ringworm, gout, asthma, toothache, pnemonia, asthma, dry cough, dropsy.	2, 3, 30, 32, 37, 38, 48, 50, 53
Very low frequency use (4)	*Trichosanthes tricuspidata* Lour. (Cucurbitaceae) Fruit, seed, root	Monpa, Apatani, Aka, Galo (Arunachal Pradesh)	Gastritis, ulcers, liver trouble, boils and sore, fire and hot water burns, asthma, pneumonia, dysentery, stomach trouble.	4, 6, 23, 59, 69
Very low frequency use (4)	*Zanthoxylum rhesta* Roxb. (Rutaceae) Fruits, tender leaves, seed	Apatani, Adi, Aka, Ao (Arunachal Pradesh, Nagaland)	Diarrhoea.	1, 23, 33, 38
Very low frequency use (3)	*Angiopteris evecta* (G. Forst.) Hoffm. (Marratiaceae) Stem	Adi, Apatani, Galo (Arunachal Pradesh)	Antidysenteric, antidiarrhoeic, inflammation, Skin diseases.	6, 34, 35
Very low frequency use (3)	*Crassocephalum crepideoides* (Benth) Moore (Asteraceae) Leaves, tender, shoot, whole plant inflorescence,	Tangsa, Apatani, Adi (Arunachal Pradesh, Manipur, Nagaland)	Anti-malarial, analgesic, epileptic, wound bleeding, headache, indigestion, stomachache, cut, cough, tonsil.	2, 31, 33, 35, 44, 53, 66, 69, 72, 73, 75
Very low frequency use (3)	*Elaeagnus pyriformis* Hook.f. (Elaeagnaceae) Flower, fruit, seed	Apatani, Sherdukpen, Monpa (Arunachal Pradesh)	Constipation, tooth ache.	35, 59
Very low frequency use (3)	*Hedyotis scandens* Roxb. (Rubiaceae) Root, leaf	Lisu, Adi, Khampati (Arunachal Pradesh)	Fever, gastric trouble, gallstone, diabetes.	34, 64, 65
Very low frequency use (3)	*Piper brachystachyum* Vahl. (Piperaceae) Seed	Padam, Idu, Apatani (Arunachal Pradesh)	Rheumatism, cough, bronchitis.	35, 37
Very low frequency use (3)	*Piper mullesua* Buch.-Ham. ex D. Don *(Piperaceae)* Fruit	Galo, Singpho, Tangsa (Arunachal Pradesh)	Cough, mouth ulcer, rheumatism, bronchitis.	6, 37
Very low frequency use (3)	*Piper pedicellatum* C. DC. (Piperaceae) Young leaves	Apatani, Miji, Galo (Arunachal Pradesh)	Body pain, abscesses, allergy.	6, 33, 59

Very low frequency use (3)	*Tinospora cordifolia* (Thunb.) Miers (Menispermace) Leaves, stem	Adi, Tagin, Monpa, Barman (Arunachal Pradesh, Assam)	Fracture, scabies, other skin disease, anaemia and urinary troubles, swelling, gastric trouble, ulcers.	16, 24

*1. Ali & Ghose 2006, 2. Angami *et al.* 2006, 3. Bailung & Pujari 2016, 4. Bamin *et al.* 2013, 5. Basumatary *et al.* 2014, 6. Bharali *et al.* 2016, 7. Bhuyan 2015, 8. Borah *et al.* 2012, 9. Chakraborty *et al.* 2017, 10. Choudhury *et al.* 2012, 11. Das & Choudhury 2012, 12. Das & Choudhury 2013, 13. Das & Choudhury 2014, 14. Das & Hazarika 2015, 15. Das *et al.* 2006, 16. Das *et al.* 2008, 17. Deb *et al.* 2014, 18. Deb *et al.* 2015, 19. Debbarma *et al.* 2017, 20. Deka & Nath 2014, 21. Devi 2011, 22. Doley *et al.* 2014, 23. Gibji *et al.* 2011, 24. Goswami *et al.* 2009, 25. Hussain & Hore 2008, 26. Hynniewta 2010, 27. Idrisi *et al.* 2010, 28. Imchen & Jamir 2011, 29. Jamir 2012, 30. Jamir & Tsurho 2016, 31. Jamir *et al.* 2012, 32. Jamir *et al.* 2015, 33. Jha 2016, 34. Kagyung *et al.* 2010, 35. Kala 2005, 36. Kalita & Khan 2013, 37. Khongsai *et al.* 2011, 38. Kichu *et al.* 2015, 39. Kutum *et al.* 2011, 40. Laloo & Hemlatha 2011, 41. Lalmuanpuii *et al.* 2013, 42. Lalzarzovi & Lalramnghinglova 2016, 43. Lepcha & Das 2011, 44. Lokho 2012, 45. Majumdar & Datta 2007, 46. Mao *et al.* 2009, 47. Mukhia & Mukhopadhyay 2012, 48. Namsa *et al.* 2011, 49. Nanda *et al.* 2013, 50. Nath & Chaudhry 2010, 51. Pal & Palit 2011, 52. Pandey & Mavinkurve 2014, 53. Perme *et al.* 2015, 54. Pradhan & Badola 2008, 55. Rai & Lalramnghinglova 2010a/b, 56. Rethy *et al.* 2010, 57. Rongsensashi *et al.* 2016, 58. Rout *et al.* 2012, 59. Saha & Sundariyal 2013, 60. Sajem & Gosai 2006, 61. Salam *et al.* 2009, 62. Sanglakpam *et al.* 2012, 63. Sangtam *et al.* 2012, 64. Sarmah 2010, 65. Sen *et al.* 2008, 66. Shankar & Rawat 2013, 67. Shankar *et al.* 2012, 68. Shankar *et al.* 2014, 69. Srivastava *et al.* 2010, 70. Singh & Devi 2016, 71. Singha *et al.* 2016, 72. Singson *et al.* 2015, 73. Srivastava & Adi 2009, 74. Tag & Das 2004, 75. Tilling *et al.* 2015, 76. Tamuli & Sharma 2010, 77. Wangjen *et al.* 2011, 78. Yuhlung & Bhattacharya 2014, 79. Yumnam *et al.* 2012.

Supplementary material 3

Synthesis of knowledge of six highly used medicinal plant species in North East India

***Psidium guajava* L.**

The *Monpa* use leaves to cure diarrhoea (Namsa *et al.* 2011), while the *Galo* treat dysentery (Bharali *et al.* 2016). The *Adi* also cures dysentery by taking tender shoots (Rethy *et al.* 2010) and tender leaves (Kagyung *et al.* 2010). The *Khampti* chew tender leaves to relieve diarrhoea (Sen *et al.* 2008). This plant is popular outside Arunachal Pradesh for its multi-curing ability. The *Chorei, Hamar, Riang, Bodo, Rabha, Mishing, Ahom, Chothe, Mao-Naga, Manipuri, Thadou, Jaintia, Mizo, Naga, Sangtam, Ao, Naga, Phom-Naga*, and *Limboo* tribes of Assam, Manipur, Meghalaya, Mizoram, Nagaland, Tripura, and Sikkim use this plant for curing cough, toothache and foetid smell, headache, stomach ache, vomiting, cholera, germicide, wounds, ulcers, constipation, piles, anaemia and sore throat (Bailung & Pujari 2016, Das & Hazarika 2015, Deka & Nath 2014, Kichu *et al.* 2015, Shankar *et al.* 2014, Singha *et al.* 2016, Yuhlung and Bhattacharya 2014 etc.).

Psidium guajava is a well-known traditional medicinal plant used in various indigenous systems of medicine. This possesses specific therapeutic properties like anti-diabetic, anti-inflammatory, anti-diarrhoeal, antiseptic, antioxidant, antispasmodic, anti-allergic etc. (Rao & Durga 2015). The phytochemical analysis revealed the presence of flavonoids, glycosides, alkaloids, steroids, and many other metabolites and the absence of tannins and saponins (Choudhury *et al.* 2012).

***Oroxylum indicum* (L) Vent**

The *Wancho* use roots for stomach problems (Wangjen *et al.* 2011). They also use it for cancer, jaundice, diarrhoea, fever, ulcer, and as an anti-arthritic, anti-malarial, and anti-inflammatory formulation (Perme *et al.* 2015). The *Monpa* use tree products as a hair tonic, anti-helminthic and carminative (Kalita & Khan 2013). They also use fresh pieces of bark for liver problems, stomach aches and rheumatism. The root extract treats tuberculosis and diarrhoea (Khongsai *et al.* 2011). They also use bark and root for diabetes, dysentery, cough (Doley *et al.* 2014), and ulcers (Saha & Sundariyal 2013). The *Apatani* use it as a purgative and for headaches (Bhuyan 2015, Kala 2005). The *Mishing* consume bark as a powder to recover from malaria (Bhuyan 2015). Some indigenous communities of Papum Pare, East and West Kameng, Tawang, Lower Subansiri and Kurung Kamey districts use root bark as a tonic and astringent, and in diarrhoea and dysentery. Tender shoots are stomachic, and seeds are purgative (Hussain & Hore 2008). The *Padam* consume the bark along with water for stomachache and rheumatic problems. The root treats tuberculosis and diarrhoea (Khongsai *et al.* 2011). *Halam, Tripuri, Limboo, Lepcha, Naga, Ao-Naga, Ao, Serna, Angami, Lotha, Manipuri, Chothe, Mao-Naga, Thadou, Mizo, Chutia, Mishing, Naga, Nepali, Lepcha* and *Bhutia* tribes of different northeastern states use this plant for treatment of several ailments like some mentioned above (Deb *et al.* 2015, Doley *et al.* 2014, Kichu *et al.* 2015, Lalzarzovi & Lalramnghinglova 2016, Yuhlung & Bhattacharya 2014 etc.). *Oroxylum indicum,* a well-known herb in Ayurvedic medicine, is suitable for rheumatic pain, enlarged spleen, cough, bronchitis, piles, jaundice, dyspepsia, smallpox, colitis, leucoderma, pharngodymia, cardiac disorders, gastropathy, haemorrhoids, cholera and arthritis. The main phenolic compounds like baicalein, oroxylin A and chrysin present in this species have shown therapeutic potential in some areas such as anti-cancer, anti-inflammatory anti-viral etc. (Raghu *et al.* 2013). The root bark and stem bark possess anti-allergic properties and are used in treating allergic disease, urticaria, jaundice, asthma, sore throat, laryngitis, hoarseness, gastralgia, diarrhoea, dysentery, infantile, erythema and measles (Lawania *et al.* 2010).

***Clerodendron colebrookianum* Walp.**

Some indigenous communities of Papum Pare, East and West Kameng, Tawang, Lower Subansiri and Kurung Kamey districts take leaves as vegetables or as a decoction for reducing blood pressure (Hussain & Hore 2008). The *Aka* use leaves for curing diarrhoea (Gibji *et al.* 2011). The *Apatani* take an infusion of boiled or steamed leaves for high blood pressure (Khongsai *et al.* 2011, Tilling *et al.* 2015). The *Nishi* and *Idu* keep the leaves on top of cooked rice to soften it and then take it to reduce blood pressure (Khongsai *et al.* 2011). The *Monpa* also use the plant product for blood pressure, cough and cold, and liver disorders (Kalita & Khan 2013). They also use plant products for high blood pressure, stomach disorder and headache (Namsa *et al.* 2011). The *Adi* take tender leaves as a vegetable and leaf-decoction (3-4 teaspoonfuls) twice daily to reduce blood pressure (Srivastava & Adi 2009). The *Hill Miri* eats cooked leaves to cure stomach trouble. They brush leafy twigs over the forehead to cure headaches. They also use it to reduce weight and blood pressure (Tag & Das 2004). The *Miji* use this plant against hypertension (Saha & Sundariyal 2013). The *Memba* use leaf decoction in high blood pressure (Rethy *et al.* 2010). The *Lisu* also use it for medicinal purposes (Sarmah 2010). This is another popular plant being used copiously by several northeastern tribes like *Sangtam, Ao, Sumi, Naga, Phom, Ahom, Hmar, Barman, Mishing, Thadou, Chothe, Manipuri, Mao-Naga, Dimasa* and *Chakma* from Meghalaya, Manipur and Nagaland (Bailung & Pujari 2016, Deb *et al.* 2015, Jamir *et al.*

2012, Jamir *et al.* 2015, Jamir & Tsurho 2016, Kalita & Khan 2013, Kichu *et al.* 2015, Nanda *et al.* 2013, Rout *et al.* 2012, Saha & Sundariyal 2013, Sangtam *et al.* 2012, Singh & Devi 2016, Tilling *et al.* 2015, Yuhlung & Bhattacharya 2014 etc.).

Clerodendrum colebrookianum is an example of a medicinal plant with several therapeutic qualities validated by modern science and used since ancient times (John & Singha 2014). They have reviewed that *C. colebrookianum* has several biological attributes like antihypertensive (Kalita *et al.* 2012, Lokesh & Amitsankar 2012), antioxidant (Majaw & Nongbet 2013, Shrivastava & Patel 2007), hypolipidemic (Devi *et al.* 2011), anti-peroxidative, anti-microbial, anti-cancer, anthelmintic, antiasthmatic, anti-inflammatory (Deb *et al.* 2013), anti-stress (Majaw *et al.* 2008) hepatoprotective (Das *et al.* 2015) and analgesic. The leaf of this plant could also be used to treat hypercholesterolemia (Devi *et al.* 2011).

***Spilanthes paniculata* Wall ex DC**

The *Apatani* take raw leaves to treat indigestion, stomachache and throat pain. Flowers are chewed to cure toothache (Tilling *et al.* 2015). They use leaves during constipation (Bhuyan 2015, Kala 2005). They also use this plant for curing intestinal worms. Leaves are used as a condiment or eaten raw/boiled to remove constipation. Flower paste is applied or chewed in the case of toothache (Srivastava *et al.* 2010). The *Khampati* apply latex to treat tongue ulcers (Sen *et al.* 2008). The *Adi* and the *Memba* use inflorescence to cure toothache (Ali & Ghose 2006, Rethy *et al.* 2010). The *Padam,* the *Idu* and the *Nishi* tribes chew flowers as a pain killer during severe toothache and body aches (Khongsai *et al.* 2011). The *Tangsa*, the *Nishi* and the *Aka* tribes use tender plants for medicinal purposes for general health care (Angami *et al.* 2006). *Hamar, Dimasa, Riang, Bodo, Jaintia, Mizo, Tripuri, Mandwi, Halam, Mishing, Mao Naga* and *Naga* communities are known to use this plant for health care like their Arunachal counterparts (Das & Choudhury 2012, Debbarma *et al.* 2017, Deka & Nath 2014, Nath & Chaudhry 2010, Shankar *et al.* 2014, Shankar & Rawat 2013, Tamuli & Sharma 2010 etc.).

Spilanthes paniculata, an important medicinal plant with a rich source of therapeutic and medicinal constituents, is commonly known as the toothache plant (Nathar & Yatoo 2015). *Spilanthes paniculata* possesses remarkable pharmacological effects and justifies its folk use as an anti-microbial, antipyretic, anti-inflammatory, and antiemetic agent (Hossain *et al.* 2014). Its leaves have potential anti-diabetic, moderate thrombolytic (Afreen *et al.* 2015, Akter *et al.* 2014), antioxidant, hepatoprotective (Ali *et al.* 2012), antibacterial (Thomas 2011) and potent antiproliferative effect (Mishra *et al.* 2015). The flower extract shows a pronounced diuretic effect (Ali *et al.* 2015). This plant has profound cytotoxic and anti-microbial effects (Morshed *et al.* 2011). *Spilanthes paniculata* contains constituents having antinociceptive properties and supports its popular folk uses in the management of pain (Das *et al.* 2014a).

***Zingiber officinale* Rosc.**

The *Adi* take warm rhizome decoction to relieve post-natal stomach pain and general stomachache (Kagyung *et al.* 2010). It is also used to cure cough (Tangjang *et al.* 2014). The *Padam* consume raw rhizomes with honey to treat cough, bronchitis, fever, influenza and other throat problems (Khongsai *et al.* 2011). The *Apatani* take rhizome juice mixed with honey for colds and coughs (Bhuyan 2015, Kala 2005). It is also taken with hot water against asthma and indigestion. A raw rhizome is chewed to cure toothache (Tilling *et al.* 2015). They also use dried stems mixed with salt in the treatment of hysteria. A fresh rhizome is eaten, and juice is taken for cough therapy (Shrivastava *et al.* 2010). The *Monpa* take rhizome for cough and stomachache (Namsa *et al.* 2011). The *Khampti* make rhizomes paste along with **jabung nag** (*Nigella sativa* Linn.) and **konkoa** (spider) to apply on the inflammation from irritation caused by caterpillars (Sen *et al.* 2008). The *Nishi* use rhizome for stomach pain and as a carminative and stimulant. Rhizome juice mixed with honey is used for cough (Deb *et al.* 2009, Perme *et al.* 2015). *Zingiber officinale* treatment of the above-mentioned ailments is also popular among *Dimasa, Ahom, Bodo, Rabha, Hamar, Kachari, Mao Naga, Thadou, Manipuri, Chothe, Mizo, Sangtam, Yimchunger-Naga, Phom, Phom-Naga, Limboo, Lepcha* and Manipuri in different northeastern states (Bailung & Pujari 2016, Basumatary *et al.* 2014, Deb *et al.* 2015, Deka & Nath 2014, Jamir & Tsurho 2016, Lalmuanpuii *et al.* 2013, Mukhia & Mukhopadhyay 2012, Nanda *et al.* 2013, Rongsensashi *et al.* 2016, Sangtam *et al.* 2012, Singh & Devi 2016, Singha *et al.* 2016, Yuhlung & Bhattacharya 2014 etc.).

Ginger rhizome is used in several traditional systems of medicine, including Traditional Chinese Medicine, Ayurveda and Western herbal medicine (Wolmuth 2008). The literature survey revealed that *Z. officinale* possesses anti-arthritic, anti-migraine, anti-thrombotic, anti-inflammatory, hypolipidaemic, hypocholesterolemic and anti-nausea properties (Setty *et al.* 2011). Numerous pre-clinical studies have supported its medicinal value in treating diabetes, obesity, diarrhoea, allergies, pain, fever, rheumatoid arthritis, inflammation and various forms of cancer (Dhanik *et al.* 2017).

***Paedaria foetida* Linn.**

The *Apatani* use leaf, root, bark, fruit, etc., for rheumatism, gout, and gastritis. They also use it as an emetic and astringent (Kala 2005, Perme *et al.* 2015). Fresh leaf paste is applied to the body during body pain, and the tubers are eaten with food as a salad for active digestion (Khongsai *et al.* 2011). They use juice from the pounded leaves mixed with boiled water twice daily for drinking against gastric trouble. Boiled leaves and twigs are used as a vegetable and are said to be effective for cleaning the stomach and against stomach swelling and diarrhoea (Bhuyan 2015, Srivastava *et al.* 2010, Tilling *et al.* 2015). The *Adi-Minyong* eat this plant as a vegetable to cure diarrhoea and dysentery. The paste of the leaves is applied to skin diseases (Bhuyan 2015). The *Adi* also eat boiled leaves and twigs with rice as a vegetable to help with indigestion, dysentery and diarrhoea (Kagyung *et al.* 2010). The *Galo* take leaves for urinary problems, toothaches, and use them as an antidote (Bharali *et al.* 2016). Juice of leaves and stem is used to cure dysentery, diarrhoea, gastric, indigestion and stomach ache. The *Aka* use leaves against fire and hot water burns (Gibji *et al.* 2011). The *Tagin* use the leaves in gastritis (Goswami *et al.* 2009). This plant is equally popular outside Arunachal Pradesh among *Ahom, Mao-Naga, Thadou, Mizo, Yimchunger-Naga, Ao, Sumi, Ao-Naga, Tripuri, Bodo, Kachari, Chothe, Garo, Naga, Lepcha* and *Mishing* from Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura for indigenous health care (Bailung & Pujari 2016, Basumatary *et al.* 2014, Jamir *et al.* 2015, Kichu *et al.* 2015, Kutum *et al.* 2011, Lalzarzovi & Lalramnghinglova 2016, Nanda *et al.* 2013, Rongsensashi *et al.* 2016, Sanglakpam *et al.* 2012, Shankar *et al.* 2014 etc.).

Paederia foetida is a potential medicinal plant with wide therapy coverage and diverse pharmacological and phytochemical importance (Wang *et al.* 2014). Various chemical constituents present in this plant are iridoid glycosides, sitosterol, stigmasterol, alkaloids, carbohydrates, protein, amino acid and volatile oil, having diverse pharmacological activities (Chauhan *et al.* 2010). They reviewed several works and suggested that this plant has antidiarrheal, anti-inflammatory, antispasmodic, and anthelmintic properties and certain activities like antitussive, antioxidant and hepatoprotective.

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