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Medicinal plants used in the treatment of diarrhoea and dysentery: A review of indigenous knowledge from Northeast India

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Abstract

Diarrhoea and dysentery remain major health concerns in rural and tribal regions of Northeast India. This review documents 102 medicinal plant species traditionally used by the Adi, Nyishi, Khasi, Jaintia, Galo, Poumai, and Mao tribes for managing these ailments. The species belong to 45 families, with Asteraceae, Rutaceae, Lamiaceae, Moraceae, and Apiaceae being the most dominant. Leaves were the most frequently utilized plant part, followed by fruits, roots, bark, and rhizomes. Common modes of preparation included decoctions, raw consumption, pastes, and infusions. Several plants *Psidium guajava*, *Centella asiatica*, *Houttuynia cordata*, *Zingiber officinale*, *Aegle marmelos*, and *Rhus semialata* were repeatedly cited across multiple tribes, reflecting cultural consensus and therapeutic reliability. The findings underscore the critical role of ethnomedicine in primary healthcare while emphasizing the urgent need for scientific validation, sustainable utilization, and preservation of indigenous knowledge.

Keywords: Diarrhoea, dysentery, ethnomedicine, indigenous knowledge, northeast India, medicinal plants

Introduction

Diarrhoeal diseases remain one of the most serious global public health challenges. According to the World Health Organization ^[1], diarrhoea is the second leading cause of death among children under five years of age worldwide, with nearly 525, 000 annual deaths attributed to it. Globally, diarrhoeal diseases account for approximately 1.6 million deaths each year, ranking as the eighth leading cause of mortality across all age groups ^[2]. In India, the disease burden is particularly severe, with an estimated 300, 000 child deaths annually linked to diarrhoea, making it a persistent challenge for the country's public health system ^[3]. Such alarming statistics highlight the need for affordable and accessible interventions, particularly in rural and tribal-dominated regions. In many parts of the world, particularly in rural and tribal communities, modern healthcare infrastructure remains limited, and access to pharmaceuticals is often unaffordable or unavailable. As a result, traditional medicine continues to play a central role in primary healthcare. The World Health Organization ^[4] estimates that approximately 80% of the population in developing countries relies on traditional medicine for their healthcare needs. Ethnomedicinal practices in these regions are not only a means of healthcare but also an integral component of cultural identity and heritage. For diarrhoeal disorders, which are highly prevalent in such areas, plant-based remedies remain the most widely used therapeutic approach.

Northeast India represents a unique convergence of cultural and biological diversity. The region, part of the Indo-Burma biodiversity hotspot, is home to nearly 50% of India's flowering plant species, many of which are used in ethnomedicine ^[5]. It is also home to more than 130 tribes and 200 sub-tribes, each with its own indigenous systems of healing and traditional knowledge ^[6]. The Adi, Nyishi, Khasi, Jaintia, Galo, Poumai, and Mao tribes are among the prominent groups known for their extensive ethnomedicinal practices. Such knowledge is primarily transmitted orally from one generation to the next, making it vulnerable to loss in the wake of modernization and cultural transformation ^[7]. Despite the wealth of ethnomedicinal information available from Northeast India, most existing studies are scattered and localized, focusing on the practices of a single community or limited geographic

area [8, 9]. A comparative synthesis across tribes is largely missing, despite the fact that several plant species such as *Psidium guajava*, *Centella asiatica*, and *Oxalis corniculata* are consistently reported across different ethnic groups for the treatment of diarrhoea and dysentery. The lack of consolidated documentation not only limits our understanding of cross-cultural overlaps but also hinders opportunities for pharmacological validation and conservation of medicinally valuable species.

Therefore, the present review aims to compile, compare, and synthesize ethnomedicinal knowledge of antidiarrheal plants used among the Adi, Nyishi, Khasi, Jaintia, Galo, Poumai, and Mao tribes of Northeast India. By highlighting both shared and unique practices, this work seeks to provide a comprehensive account of medicinal plant usage for diarrhoeal management, emphasize the importance of indigenous knowledge in primary healthcare, and outline the urgent need for scientific validation and conservation of these plant resources.

Materials and Methods

Study area and selection criteria

This review focuses on the ethnomedicinal knowledge related to the treatment of diarrhoea among seven prominent tribal groups of Northeast India: the Adi, Nyishi, Khasi, Jaintia, Galo, Poumai, and Mao tribes. Documenting cross-tribal patterns is crucial because previous ethnobotanical studies in

this area are largely localized and isolated. We synthesized information from diverse published ethnobotanical surveys, field reports, dissertations, and local literature that specifically document the use of plants for managing diarrhoeal ailments among these tribes.

To maintain relevance and coherence, our inclusion criteria were defined as follows:

- **Focus on diarrhoeal and dysentery treatment:** Only studies that explicitly reported the use of medicinal plants for diarrhoea & dysentery ailments were considered.
- **Target tribes:** Documentation needed to pertain specifically to the Adi, Nyishi, Khasi, Jaintia, Galo, Poumai, or Mao tribal groups.
- **Ethnobotanical rigor:** Studies must include details on plant species, local ethnonyms, preparation methods, or parts used.

From each eligible source, the following details were systematically extracted:

- Botanical name (scientific name of the plant)
- Plant family
- Local/traditional name
- Tribe(s) using the plant
- Plant parts used (leaves, roots, fruit, bark, etc.)
- Mode of preparation/use (e.g., decoction, paste, raw ingestion)

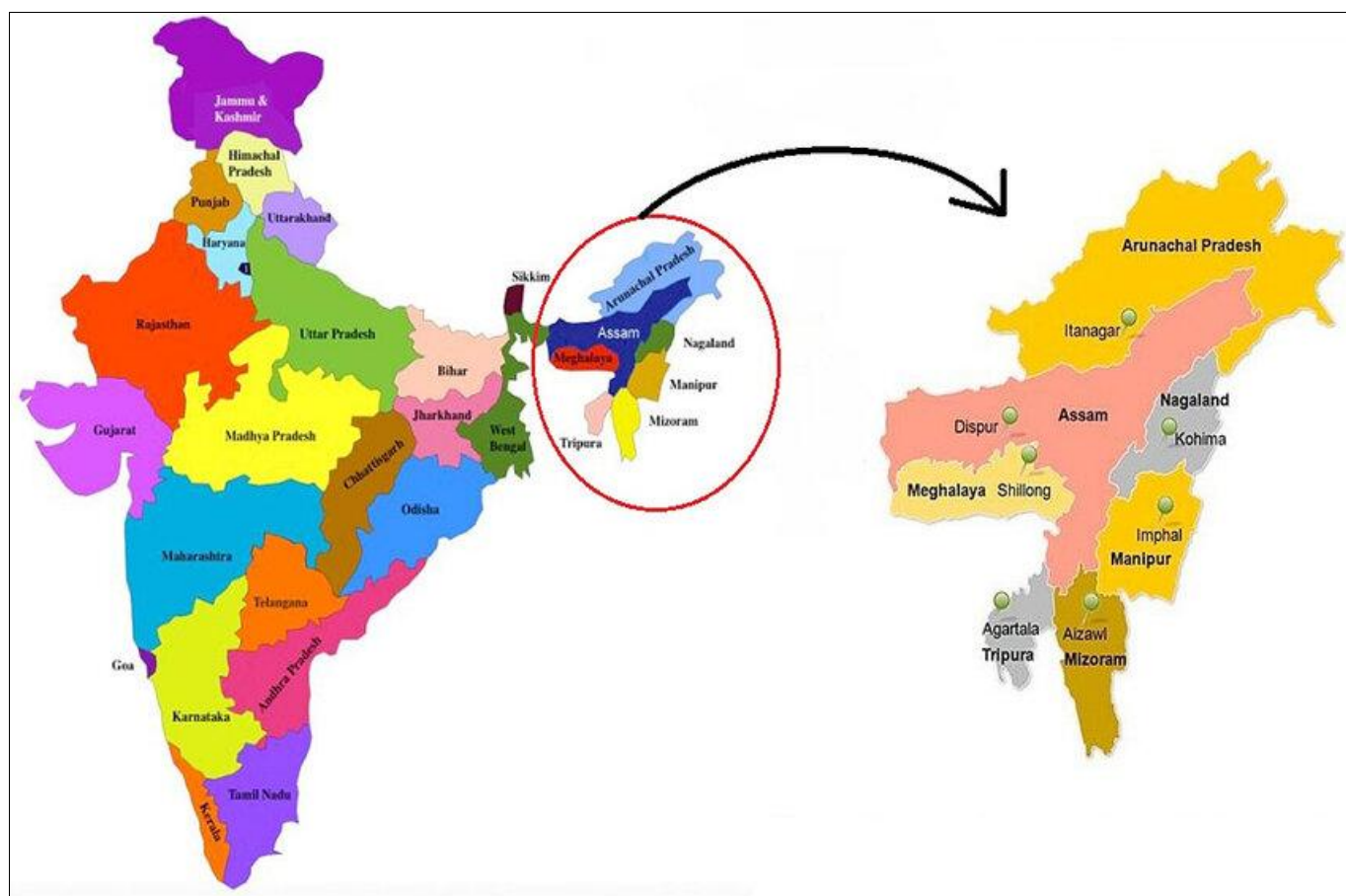


Fig 1: Map showing the Location of the North Eastern states of India

Results

A total of 102 medicinal plants were recorded for the treatment of diarrhoea and dysentery among the seven

prominent tribal groups of Northeast India: the Adi, Nyishi, Khasi, Jaintia, Galo, Poumai, and Mao tribes and the results are mentioned in the Table No.1 below.

Table 1: Enumerations of the ethnomedicinal used in the treatment of Diarrhoea & Dysentery among the 7 tribal groups of North East

Sl No	Botanical Name	Family Name	Vernacular Name A - Adi G - Gao J- Jaintia K- Khasi M - Mao N - Nyishi	Parts Used	Methods	References
1.	<i>Abroma augusta</i> L.	Sterculiaceae	A - Yaduk N - Raho	Bark & root	Bark & root/powder taken with water	[8, 35]
2.	<i>Aconitum ferrox</i> Wallich ex setinge	Ranunculaceae	N - Omle G - Omyu	Whole plant	The whole plant is used in dysentery and diarrhoea	[26]
3.	<i>Acorus calamus</i> L.	Acoraceae	N - Gongee	Rhizome	The rhizome is taken raw	[26, 35]
4.	<i>Aegle marmelos</i> (L.) Corrêa	Rutaceae	K & J - Soh bel	Fruit	Fruit pulp is boiled and filtered with fruits of <i>Punica granatum</i> L. and leaves of <i>Psidium guajava</i> L. The filtrate is mixed with sugar and water and taken to cure chronic dysentery and diarrhoea	[27]
5.	<i>Ageratina adenophora</i> (Spr.) King & Robinson	Asteraceae	J - Langsoo	Shoot	Tender shoots are ground and the juice is squeezed out and used for dysentery and diarrhea	[27]
6.	<i>Ageratum conyzoides</i> L.	Asteraceae	A - Yemmag N - Nyeam ei/ Pasho/ Pasu payou	Leave	Infusion of the leave is used in Dysentery and Diarrhoea	[8, 36]
7.	<i>Alstonia scholaris</i> (L.) R.Br.	Apocynaceae	N - Tai sen/ Taisan	Root, leave, bark, latex	The root, leave, bark, and latex are used in dysentery and diarrhoea	[37]
8.	<i>Alternanthera sessilis</i> (L.) R.Br. ex-DC.	Amaranthaceae	N - Oing	Stem, leave	The stem and leave are used in dysentery	[38, 39]
9.	<i>Alternanthera paronychioides</i> subsp.	Amaranthaceae	P - Pipi Hyou	Leave	Boil as well as raw vegetable	[32]
10.	<i>Angiopteris evecta</i> (G. Forst.) Hoffm.	Marattiaceae	G - Tach N - Nabay, Bom	Rhizome	The rhizome is used in dysentery and diarrhoea	[26, 35]
11.	<i>Aquilaria malaccensis</i> Lam.	Thymelaeaceae	N - Thing-rai	Stem	The stem is used in diarrhoea	[37]
12.	<i>Artocarpus heterophyllus</i> Lam.	Moraceae	G - Bela	Root and leave	Infusion of roots and leaves is used in dysentery	[25]
13.	<i>Asparagus filicinus</i> Buch. Ham. Ex D. Don	Liliaceae	K - Bat niang sohpet	Root	Root juice is mixed with honey and taken to cure diarrhoea	[27]
14.	<i>Asparagus racemosus</i> Wild.	Liliaceae	K - Bat niang sohpet, J - Phlang chokria	Root	Mixture of ground <i>Asparagus racemosus</i> and <i>Byttneria pilosa</i> together with boiled bark of <i>Myrica esculenta</i> is given to cure dysentery	[27]
15.	<i>Azadirachta indica</i> A. Juss.	Meliaceae	G - Neem K- Dieng neem	Leave	Boiled leaves extracts are used for the treatment of diarrhea and dysentery	[25, 28]
16.	<i>Bauhinia variegata</i> Linn	Fabaceae	K -Diengtharlong, J- Jalong N - Pachaum	Flower	Flowers are boiled and eaten for 6-7 days to treat piles and dysentery	[28]
17.	<i>Begonia josephii</i> A. DC	Begoniaceae	A - Sisi-baying	Stem & Leave	Decoction of the stem and leave is used in Diarrhoea	[8]
18.	<i>Begonia palmata</i> D.Don	Begoniaceae	A - Sisi-biyeng G - Bikku yulu N - Bayia/ Bikku yulu	Root	The root is used in dysentery and diarrhoea	[23, 26]
19.	<i>Begonia roxburghii</i> (Miq.) A. DC	Begoniaceae	A - Babeyaying	Shoot & rhizome	Shoot and rhizome in the boiled or raw form is used in stomach problem, dysentery, diarrhoea	[7]
20.	<i>Benincasa hispida</i> (Thunb.) Cogn.	Cucurbitaceae	N - Turutap	Fruit	The fruit is used in chronic dysentery	[38]
21.	<i>Bergera koenigii</i> L.	Rutaceae	N - Simyo gomko	Leave	The leave is used in the dysentery	[38]
22.	<i>Blumea lacera</i> (Burm.f.) DC.	Asteraceae	N - Tagungke khi	Root	It is used in blood dysentery	[38]
23.	<i>Blumea fistulosa</i> (Roxb.) Kurz	Asteraceae	A - Rumdum	Leave	Leaves in the boiled/cooked form is used in Diarrhoea	[7]
24.	<i>Boehmeria macrophylla</i> Horn	Urticaceae	K - Dieng soh khasim	Stem & Leave	A paste of the stem and leave is taken twice daily to get cured from dysentery	[27]
25.	<i>Bombax ceiba</i> L.	Malvaceae	N - Phuncha wng	Root, bark, leave, gall	The root, bark, leave, and gall are used in diarrhoea	[37]
26.	<i>Brassaiopsis glomerulata</i> (Blume) Regel	Araliaceae	N - Tago	Leave	It is used in diarrhoea	[36]
27.	<i>Bryophyllum adalae</i> (Hamet) A.Berger	Crassulaceae	A - Nebin-elam	Leave	Boiled leave is used in Dysentery	[8]

28.	<i>Calotropis procera</i> (Aiton) Dryand	Apocynaceae	G - Akon Asing N - Akon-Asing	Leave	Leave is taken in a raw form for dysentery	[26]
29.	<i>Cannabis sativa</i> L.	Cannabaceae	A - Bhang G - Bhang K & J - Bhang/ Kynja	Leave	Leaves are ground with water and filtered. The filtrate is given to cure dysentery	[8, 25, 27]
30.	<i>Careya arborea</i> Roxb.	Barringtoniaceae	J - Styngkrain	Bark	Decoction of the crushed bark is taken to cure dysentery	[27]
31.	<i>Centella asiatica</i> Linn. Urb	Apiaceae	A - Kipum naryum J - Khlein K - Batmoina M - Korivu P - Raivu N - Buri Kiik/ Mani muni	Whole plant	Whole plant is ground and the juice is squeezed out of it and used to get relief from both diarrhoea and dysentery	[21, 27, 28, 33, 35]
32.	<i>Chenopodium album</i> L.	Chenopodiaceae	M - Oruo P - Habavu	Leave	The young shoots and the leaves are cooked as vegetable and eaten for treating diarrhoea and dysentery	[33]
33.	<i>Chrysanthemum morifolium</i> (L) Desmond	Asteraceae	M - Shiipriipa	Leave	Five to ten young leaves are raw chewed and taken for cough, diarrhoea and dysentery	[33]
34.	<i>Citrus medica</i> L.	Rutaceae	N - Narang/ Jipin	Fruit, leave & seed	Decoction of fruit, leaf & seed is taken in diarrhoea	[35, 37]
35.	<i>Clerodendrum colebrookeanum</i> Walp.	Lamiaceae	N - Potto	Leave	It is used in diarrhoea, dysentery and high BP	[37]
36.	<i>Coptis teeta</i> Wall.	Ranunculaceae	G - Rinke N - Rinke, Rinko	Whole plant (mostly leaf and rhizome)	The plant is taken in raw for diarrhoea, and dysentery	[26]
37.	<i>Corylus avellana</i> L.	Betulaceae	N - Taying	Whole plant	Whole plant is used in dysentery	[36]
38.	<i>Crassocephalum crepidioides</i> (Benth) Moore	Asteraceae	A - Ogen	Leave	Apply leaf paste on cut and wound to check bleeding and early healing & leaf crushed mixed with water for diarrhoea and dysentery	[22]
39.	<i>Dillenia indica</i> L.	Dilleniaceae	N - Jampa/ Champak/ Outenga	Fruit & Leave	The fruit and leave are used in diarrhoea	[37]
40.	<i>Dysoxylum procerum</i> Heim	Meliaceae	J- Sla-Khro	Leave	The decoction of the crushed leaves is drunk to cure dysentery	[28]
41.	<i>Elephantopus scaber</i> L.	Asteraceae	A - Aying ing	Leave	Leaves juice for diarrhoea and dysentery.	[22]
42.	<i>Elsholtzia blanda</i> (Benth.) Benth	Lamiaceae	M - Kholo, P - Louh	Leave & shoot	Its extract is used for stomach pain and dysentery	[13]
43.	<i>Entada rheedei</i> subsp	Fabaceae	N - Rich/ Kawi	Bark & seed	It is used in dysentery	[37]
44.	<i>Equisetum giganteum</i> L.	Equisetaceae	N - Silum luming	Rhizome	It is used in dysentery, fractured bones	[38]
45.	<i>Eriosema chinense</i> Baker	Asteraceae	K- Sohpen, J- Sa-pyrdong	Bark	Bark used for treatment of diarrhoea	[28]
46.	<i>Eryngium foetidum</i> L.	Apiaceae	A - Ori	Leave	Paste of the leave is used in Dysentery	[8]
47.	<i>Eupatorium adenophorum</i> Spreng	Asteraceae	P - Japan reivu M - Japanpro	Leave	Raw tender shoots are consumed for fast alleviation from chronic dysentery	[14, 31]
48.	<i>Fagopyrum dibotrys</i> (D.Don) Trev.	Polygonaceae	G - Hukku	Grain	Grains are used in diarrhoea	[26]
49.	<i>Fagopyrum esculentum</i> Moench.	Polygonaceae	N - Wukuwooru Aoh	Leave, stem & flower	Leaves, stem & flower is used in diarrhoea	[40]
50.	<i>Ficus auriculata</i> Lour	Moraceae	M - Ovachiidoshii P - Vadoushi	Fruit	The ripen fruits are eaten raw to get relieve from diarrhoea and dysentery	[34]
51.	<i>Ficus cordata</i> (Thunb.).	Moraceae	A - Takuk	Root	Paste of the root is used in Dysentery	[8]
52.	<i>Ficus semicordata</i> Buch.-Ham. ex Sm.	Moraceae	M - Chodoshi P - Doushi	Fruit	The ripen fruits are eaten raw to get relieve from diarrhoea and dysentery	[34]
53.	<i>Garcinia pedunculata</i> Roxb. ex-Buch. -Ham.	Clusiaceae	G - Mibia N - Mibia/ Meba	Fruit & Leave	The fruit and leave are used in diarrhoea and dysentery	[26]
54.	<i>Glochidion khasianum</i>	Euphorbiaceae	K- Jalwai	Leave	Leave eaten for treatment of dysentery	[28]
55.	<i>Glochidion oblatum</i> J. D. Hooker	Euphorbiaceae	M - Lokhro tod	Stem & Root	Fresh stem and roots extracts are taken for dysentery	[34]
56.	<i>Gynura nepalensis</i> DC	Asteraceae	P - Boh M - Tabow	Leave	As vegetable; paste given in dysentery or diarrhea	[13]
57.	<i>Hodgsonia macrocarpa</i> (Blume) Cogn.	Cucurbitaceae	N - Khaum	Leave, seed, oil	It is used in dysentery	[37]

58.	<i>Houttuynia cordata</i> Thunb.	Saururaceae	A - Loren G - Namsune J - Myrdoh K - Jamyrdoh N - Honya	Root & Leave	Tender root, leaf and stem are used in dysentery and diarrhoea	[21, 25, 27, 37]
59.	<i>Hydrocotyle javanica</i> Thunb.	Apiaceae	J- Tyngkhieh N - Barung	Leave	The whole plant is ground with water and the leaves of <i>Rubus hexogonus Roxb.</i> , and <i>Cymbopogon</i> species. This decoction is given to cure watery diarrhea	[27, 37]
60.	<i>Hydrocotyle sibthorpioides</i> Lam.	Apiaceae	A - Killing-kiro N - Grang Kejong	Whole Plant	Juice of the whole plant is used in Dysentery	[8, 40]
61.	<i>Indofevillea khasiana</i> Chatterjee	Cucurbitaceae	N - Yazang pipe	Root & stem	The root and stem of the plant are used in the dysentery	[36]
62.	<i>Jasminum nervosum</i> Lour.	Oleaceae	N - Hruikha	Leave	The leave is used in the diarrhoea	[37]
63.	<i>Lagerstroemia speciosa</i> (L.) Pers.	Lythraceae	N - Thlado	Root, bark & leave	Root, bark and leave are used in dysentery	[37]
64.	<i>Leucas aspera</i> (Willd.) Link	Lamiaceae	A - Ekisipyak	Leave	Juice of the leave is used in Dysentery	[8]
65.	<i>Lindera neesiana</i> (Wall. ex Nees) Kurz	Lauraceae	N - Kusak Siin	Seed	Seed is used against the diarrhoea	[41]
66.	<i>Litsea cubeba</i> (Lour.) Pers.	Lauraceae	A - Tayer N - Earking/ Jayar	Fruit & leave	Pounded leaves and fruits mixed with water for blood dysentery, stomach trouble and fever.	[22, 36]
67.	<i>Magnolia champaca</i> (L.) Bail. ex-Pierre	Magnoliaceae	N - Salyo seen	Fruit	The fruit is used in dysentery	[38]
68.	<i>Mentha arvensis</i> L.	Lamiaceae	N - Anyup/ pudina P - Phousoupouvuh	Leave	It is either taken as porridge or the young shoots are consumed raw for diarrhoea, dysentery	[31, 32, 38]
69.	<i>Mesua ferrea</i> L.	Calophyllaceae	N - Hershe	Bark, leave, flower, fruit, seed	It is used in dysentery	[37]
70.	<i>Mikania micrantha</i> Kunth	Asteraceae	G - Nimeh K - Bat refugee N - Tare	Leave	Leaves are grinded and the juice is extracted, and consumed with little water	[25, 27, 37]
71.	<i>Momordica charantia</i> L.	Cucurbitaceae	P - Kha zhanya/Khashiraivu, M - Khenavii	Leave	Porridge is made from leaves, which are cooked with rice	[31]
72.	<i>Musa sapientum</i> L.	Musaceae	A - Kopak K - Ka kait M - Ovii P - Lahnga	Fruit	Ripe bananas are consumed one at a time to subdue or stop diarrhoea or loose motion	[7, 8, 28, 31]
73.	<i>Myrica esculenta</i> L.	Myricaceae	P - Zaichi chii	Bark	Boil the bark with water and drink the decoction	[31]
74.	<i>Myrica indica</i>	Myricaceae	K - Sohphie	Fruit	Fruit juice in raw condition is preserved in an airtight container for use in diarrhoea and dysentery	[28]
75.	<i>Myrica esculenta</i> Buch-Ham ex D. Don	Myricaceae	K - Soh-Phie J - Sa-Phai	Fruit	Fruit juice in raw condition is preserved in an airtight container for use in dysentery.	[6, 27]
76.	<i>Opuntia monacantha</i> (Willd.) Haw.	Cactaceae	A - Cactus	Stem	Decoction of the stem is used in Dysentery	[8]
77.	<i>Osbeckia crinata</i> Benth. Ex Naudin	Melastomaceae	K- Sohlyngkthut	Leave	Leave paste is used to treat diarrhoea and dysentery	[28]
78.	<i>Oxalis corniculata</i> L.	Oxalidaceae	A - Puakiyup K - Soh-dkhiew P - Nyamai mata	Whole Plant	Whole plant is ground into paste with <i>Drymaria cordata</i> , <i>Centella asiatica</i> and <i>Mentha spicata</i> ; juice extracted is used as medicine in diarrhoea and dysentery.	[8, 21, 27, 32, 34]
79.	<i>Paederia foetida</i> L.	Rubiaceae	A - Yepetere	Stem	Stem is boiled and used in gastritis, diarrhoea, dysentery, stomach disorder, paste of leaves applied to skin diseases.	[7]
80.	<i>Paederia scandens</i> (Lour.) Merr.	Rubiaceae	K - Kynbat-iw-tung, J - Nangra puhung	Leave	Leaves are ground and the juice extracted is taken in diarrhoea and dysentery.	[27]
81.	<i>Passiflora edulis</i> Sims	Passifloraceae	J- Soh brap P - Stabon	Leave	Porridge is made from leaves, which are cooked with rice	[14, 27, 31]
82.	<i>Physalis perviana</i> Linn.	Solanaceae	M - Tsiibobopro	Leave	The leaves are taken raw or boiled and the decoction is taken for diarrhoea and dysentery.	[14]
83.	<i>Piper pedicellatum</i> C. CD.	Piperaceae	A - Raro/lori	Fruit	Paste of the fruit is used in Stomach ache and Dysentery	[8]
84.	<i>Plantago asiatica</i> L.	Plantaginaceae	A - Donyi gori	Leave	Decoction of leaves are taken to cure diarrhoea and bone fracture.	[24]

85.	<i>Polygonum perfoliatum</i> Linn	Polygonaceae	J- Shrat	Leave & Root	Crushed leaves and roots mixed with water and taken to cure diarrhoea and dysentery	[28]
86.	<i>Polygonum orientale</i> Linn	Polygonaceae	M - Obuvii	Leave	Fresh leaves are boiled with or without rice and serve the patient suffering from serious diarrhoea and dysentery for quick relief.	[14]
87.	<i>Pouzolzia bennettiana</i> Wight	Urticaceae	A - Oyik	Leave	Leaves in the cooked form as vegetable is used in Dysentery	[7]
88.	<i>Psidium guajava</i> L	Myrtaceae	A - Muduri G - Mudri J - Sa-pyriam K - Sohpriam M - Pondal P - Pondal	Leave	The fresh young leaves are eaten raw to alleviate the effects of loose motion or diarrhoea	[7, 13, 14, 25, 27, 28]
89.	<i>Punica granatum</i> Linn.	Onagraceae	P - Aradouchi	Leave	The leaves are boiled and drank as tea to help in dysentery	[31]
90.	<i>Pyrus pashia</i> Buch.-Ham. ex D.Don	Rosaceae	P - Tyao Shi M - Chitishi	Leave	Raw as well as in the form of decoction	[32]
91.	<i>Rhododendron arboretum</i> Sm	Ericaceae	J - Latuthuiñ	Bark & Flower	Dried flower either eaten raw or fried with ghee is used to treat dysentery	[6, 9, 27]
92.	<i>Rhus semialata</i> Murr	Anacardiaceae	K - Dieng Sohma J - Dein Sama P - Mouchhi M - Omoshii	Fruit	Ripe fruits are either boiled or eaten raw to relieve diarrhoea and dysentery	[13, 14, 27, 28]
93.	<i>Rubus ellipticus</i> Sm	Rosaceae	K - Soh-shiah J - Sa-siah	Fruit, root, & stem	The fruits and crushed roots are given to cure dysentery	[27]
94.	<i>Solanum nigrum</i> L.	Solanaceae	A - Okomamang	Whole plant	Paste/Decoction of the whole plant is used in Diarrhoea	[8]
95.	<i>Spondias radlkoferi</i> Donn.Sm	Anacardiaceae	A - Degre	Fruit	Juice of the fruit is used in Dysentery	[8]
96.	<i>Stephania japonica</i> Miers.	Manispermaceae	G - Yapom/ Geep/ Raikey	Stem	Stem is used in dysentery	[26]
97.	<i>Tinospora cordifolia</i> Miers	Manispermaceae	G - Swein kije	Stem	Stem is used in dysentery	[26]
98.	<i>Trichosanthes cordata</i> Roxb.	Cucurbitaceae	A - Dongkoryong	Root	Decoction of the root is used in Dysentery, diarrhoea	[7]
99.	<i>Wedantia scarba</i> Kurz. Syn.	Vitaceae	G - Kepo Ae	Root	Roots used for cholera and dysentery	[26]
100.	<i>Zingiber zerumbet</i> (L.) Roscoe ex Sm.	Zingiberaceae	A - Kekir	Rhizome	Decoction of the rhizome is used in Stomach-ache, diarrhoea, cough	[7]
101.	<i>Zingiber officinale</i> Roscoe	Zingiberaceae	A - Takeng	Rhizome	Raw rhizome consumed or decoction of rhizome consumed orally to cure cough, diabetes and dysentery	[24]
102.	<i>Ziziphus jujuba</i> Mill.	Rhamnaceae	K - Dieng-soh-broi	Leave	Leave juice mixed with little salt is taken orally to treat dysentery	[9]

Ethnomedicinal Knowledge Among Tribes of Northeast India

Adi Tribe (Arunachal Pradesh)

The Adi community of Arunachal Pradesh maintains a rich repository of medicinal plants for gastrointestinal disorders, particularly diarrhoea. Commonly used remedies include *Psidium guajava* (leaves chewed raw or used in decoction), *Centella asiatica* (juice of whole plant), *Paederia foetida* (leaf paste), and *Zingiber zerumbet* (rhizome decoction). These practices are often integrated into everyday healthcare, with remedies prepared in simple forms such as decoctions, juices, or raw consumption, making them accessible within the community [7, 8].

Nyishi Tribe (Arunachal Pradesh)

The Nyishi, one of the largest tribes of Arunachal Pradesh, possess a particularly diverse knowledge of antidiarrhoeal plants. Distinctive remedies include *Coptis teeta* (used raw for dysentery), *Holarrhena antidysenterica* (bark and fruits for chronic dysentery), *Tinospora cordifolia* (stem decoction), and *Clerodendrum colebrookianum* (leaf decoction). Leaves are the most frequently used plant part, though roots, bark, fruits, and latex are also employed. The Nyishi knowledge system reflects both depth and diversity, demonstrating close ties to their forest environment and reliance on plant-based

primary healthcare [10].

Khasi & Jaintia Tribes (Meghalaya)

In Meghalaya, the Khasi and Jaintia tribes maintain a strong tradition of ethnomedicine for diarrhoeal treatment. Notable species include *Rhus semialata* (fruits boiled into concentrate), *Myrica esculenta* (bark decoction), *Centella asiatica* (whole plant infusion), and *Drymaria cordata* (leaf juice). Combination therapies are also common; for example, a mixture of *Centella asiatica*, *Mentha spicata*, and *Drymaria cordata* is prescribed to relieve diarrhoea and dysentery. This reflects a distinctive polyherbal approach, suggesting an emphasis on synergistic effects and cultural belief systems [9, 11].

Galo Tribe (Arunachal Pradesh)

The Galo tribe also rely on a variety of medicinal plants for diarrhoeal ailments. Frequently used examples include *Psidium guajava* (leaves chewed or used as decoction), *Mikania micrantha* (leaf juice), *Tinospora cordifolia* (stem extract), and *Coptis teeta* (root used raw). The overlap of plant uses between Galo and Nyishi tribes (e.g., *Coptis teeta*) suggests both cultural exchange and ecological commonality in the Arunachal region [12].

Mao Tribe (Manipur)

The Mao Naga tribe demonstrates rich ethnomedicinal traditions for gastrointestinal complaints. Commonly cited species include *Polygonum orientale* (leaf decoction for severe diarrhoea), *Physalis peruviana* (leaves boiled or chewed raw), *Glochidion oblatum* (stem and root extracts), *Ficus auriculata* and *Ficus semicordata* (ripe fruits eaten raw), *Centella asiatica* (whole plant used as raw or boiled infusion), and *Paederia foetida* (leaf vegetable). Their practice emphasizes raw, boiled, and porridge preparations, showcasing both diversity and cultural integration^[13, 14].

Poumai Tribe (Manipur)

The Poumai tribe inhabiting Senapati district of Manipur maintains a significant repertoire of medicinal plants for diarrhoeal disorders. Important remedies include *Rhus semialata* (fruit decoction for diarrhoea and dysentery), *Psidium guajava* (young leaves chewed raw), *Musa sapientum* (ripe fruit consumed to subdue loose motion), *Mentha arvensis* (young shoots eaten raw or as porridge), *Oxalis corniculata* (twigs and leaves cooked and eaten), and *Paederia foetida* (leaf vegetable). Preparation methods such as porridge, raw consumption, and decoction reflect accessible, community-based practices^[15].

Comparative Analysis

A cross-tribal synthesis of ethnomedicinal practices in Northeast India reveals both convergence and divergence in the management of diarrhoea.

Common Plants Across Tribes

Several plants recur consistently across the Adi, Nyishi, Khasi, Jaintia, Galo, Poumai, and Mao tribes, reflecting both their therapeutic efficacy and cultural consensus. The most frequently reported include:

- ***Psidium guajava* L. (guava):** widely used for its leaves, either chewed raw or decocted, to manage diarrhoea.
- ***Centella asiatica* L. (Indian pennywort):** consumed as juice or infusion of the whole plant to treat diarrhoea.

- ***Oxalis corniculata* L. (creeping wood sorrel):** leaves or whole plant are prepared as paste or infusion for diarrhoeal complaints.
- ***Houttuynia cordata* Thunb. (fish mint):** leaves and roots are eaten raw or decocted, especially in Adi, Khasi, and Nyishi.
- ***Zingiber officinale* Roscoe (ginger):** rhizome is used in decoctions and sometimes chewed raw as an antidiarrhoeal and digestive stimulant.
- ***Aegle marmelos* (L.) Correa (bael):** unripe fruit pulp is roasted or boiled into decoction for acute diarrhoea and dysentery, especially among Khasi and Nyishi tribes.

The repeated appearance of these species across culturally and geographically distinct groups suggests their long-standing recognition as effective remedies. Furthermore, a cross-analysis of plant usage highlights the dominance of families such as Asteraceae, Rutaceae, Lamiaceae, Apiaceae, and Moraceae. Leaves emerge as the most commonly utilized plant part, while fruits, roots, and bark are also important. Decoction and raw consumption remain the predominant preparation methods, reflecting both practicality and cultural acceptance. These patterns not only demonstrate empirical validation of certain species but also indicate cultural exchange and shared traditional knowledge across tribes of Northeast India.

Statistical representations

Dominant Plant Families

Most antidiarrhoeal plants documented belong to a few dominant botanical families, notably Asteraceae, Rutaceae, Lamiaceae, Apiaceae, and Moraceae. Asteraceae contributes species such as *Mikania micrantha* and *Chromolaena odorata*; Rutaceae includes *Aegle marmelos* and *Zanthoxylum rhetsa*; Lamiaceae features *Mentha spicata* and *Clerodendrum colebrookianum*; Apiaceae offers *Centella asiatica* and *Hydrocotyle javanica*; and Moraceae contributes several *Ficus* species (shown in Fig.2).

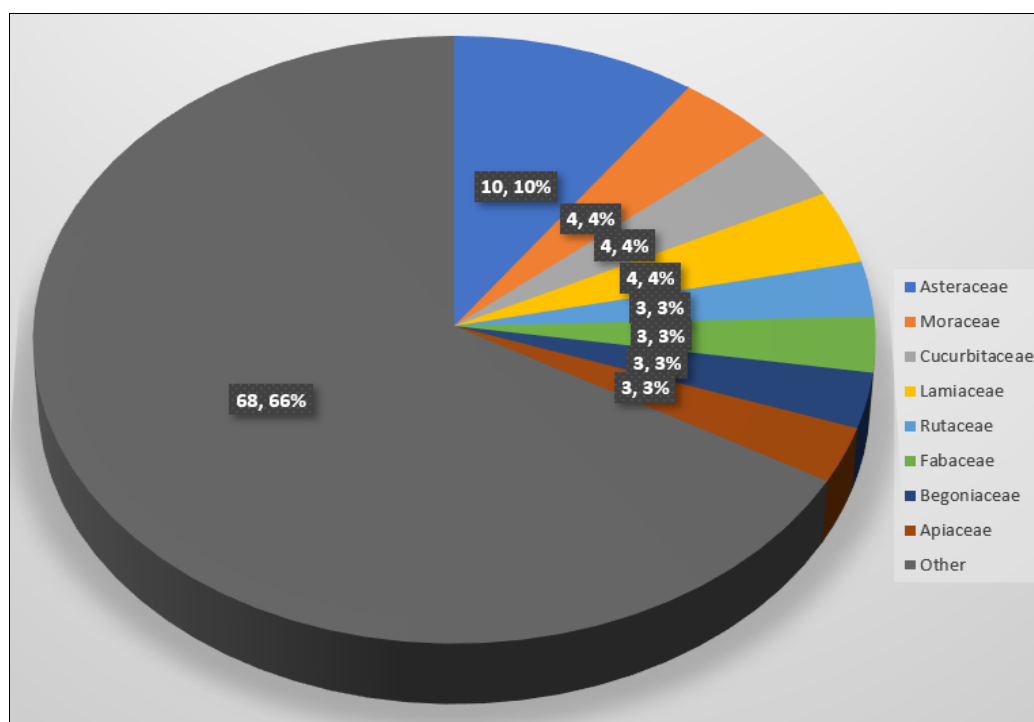


Fig 2: A pie chart Showing the dominant plant families

Preparation Methods

The most common methods of preparation include decoction, raw ingestion, pastes, and infusions, though variations exist depending on the plant species, cultural preferences, and availability of resources. Decoction is the predominant practice, reflecting its cultural acceptability and effectiveness in extracting water-soluble bioactive compounds. For example, rhizomes of *Zingiber officinale* and roots of *Coptis teeta* are boiled to prepare strong decoctions that are consumed to relieve diarrhoeal symptoms.

Raw consumption is another widely practiced method. Chewing the leaves of *Psidium guajava* provides immediate relief and requires minimal processing, making it a practical remedy in tribal settings where access to utensils or firewood may be limited. Fruits such as *Musa sapientum* and *Rhus semialata* are also consumed raw or lightly processed to subdue loose motions. Paste preparations, such as those from *Oxalis corniculata* leaves, are applied directly or consumed orally. Leaf pastes are often mixed with water or rice-based preparations to improve palatability and effectiveness. Infusions of tender leaves and whole plants, such as *Centella asiatica* or *Hydrocotyle javanica*, are another widely used approach. These preparations are valued not only for their therapeutic benefits but also for their refreshing taste, which

encourages regular consumption. Some tribes also employ combination therapies, where multiple species are prepared together to enhance efficacy. For instance, mixtures of *Centella asiatica*, *Mentha spicata*, and *Drymaria cordata* are prescribed by the Khasi and Jaintia tribes to treat diarrhoea and dysentery, reflecting a sophisticated understanding of synergistic interactions. In a few cases, medicinal plants are incorporated into porridge or soups, such as the young shoots of *Mentha arvensis* among the Poumai tribe, which provides both nutrition and medicinal value.

Interestingly, many of these methods mirror practices found in other traditional systems of medicine. In Ayurveda, for instance, decoction (kwatha) and infusion (phanta) are recognized as primary modes of preparing plant-based remedies, while raw consumption of fruits and leaves is also common in folk medicine across South and Southeast Asia. The diversity of preparation methods in Northeast India therefore indicates not only adaptability to different ecological and cultural contexts but also a deep empirical understanding of plant pharmacodynamics. This practical knowledge, refined over generations, ensures that remedies are effective, safe, and easily integrated into daily life, while also reflecting broader global traditions of ethnomedicine (shown in Fig.3).

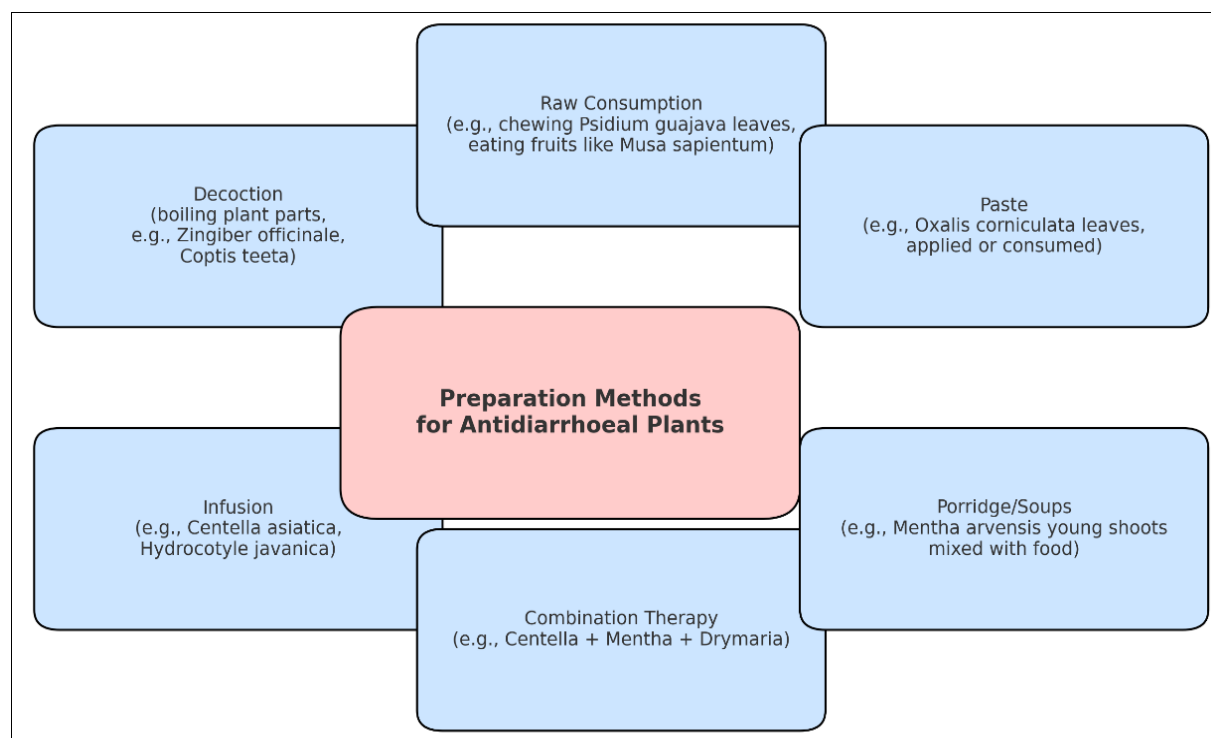


Fig 3: Displaying the preparation methods for antidiarrheal plants

Plant Parts Most Frequently Used

Across tribes, leaves are the most commonly utilized plant part, followed by fruits, roots, and bark. Leaves are the most accessible and renewable part of the plant, and they often contain high concentrations of secondary metabolites such as tannins, flavonoids, and essential oils with antidiarrhoeal properties. Fruits, such as those of *Aegle marmelos* and *Rhus*

semialata, are also important, while roots and bark (e.g., *Coptis teeta*, *Holarrhena antidysenterica*) are used less frequently but remain highly valued. The reliance on leaves suggests an underlying principle of sustainable harvesting, minimizing damage to the plant while ensuring regular availability (shown in Fig.4)

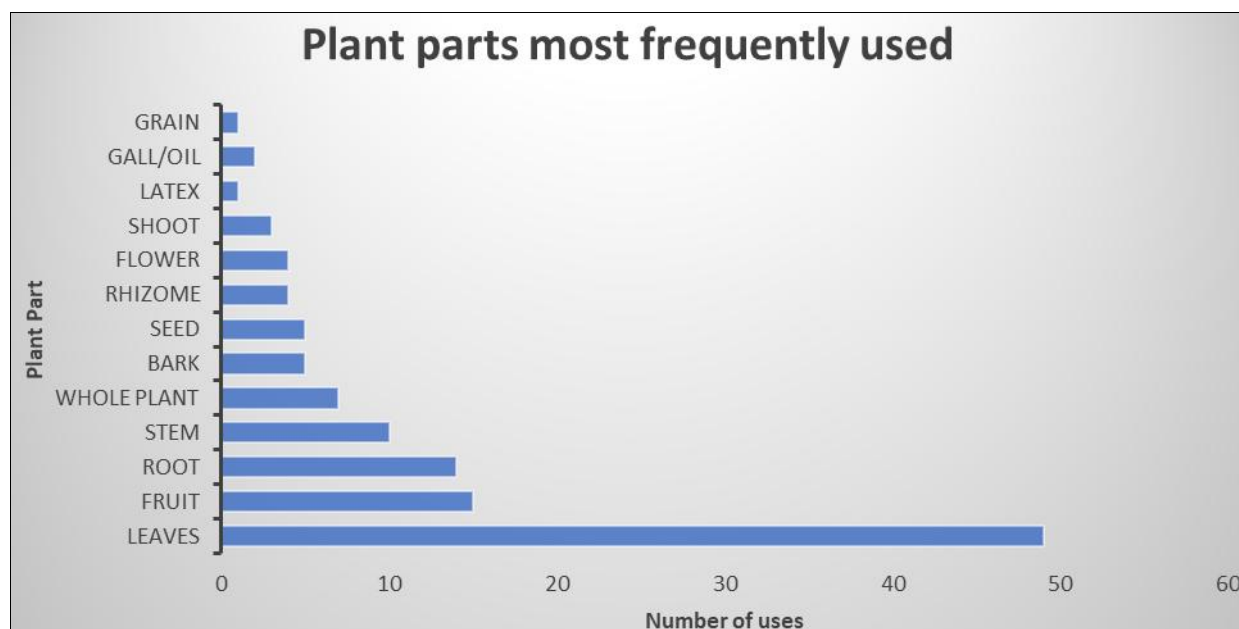


Fig 4: Showing Plant parts most frequently used

Discussion

The present review highlights the extensive use of medicinal plants in the management of diarrhoea among diverse tribal communities of Northeast India. The comparative analysis of these species indicates a high degree of cultural convergence, with plants such as *Psidium guajava*, *Centella asiatica*, *Zingiber officinale*, *Houttuynia cordata*, and *Aegle marmelos* appearing across multiple tribes. Such overlaps suggest not only the empirical efficacy of these species but also their role as culturally validated remedies reinforced over generations. When compared with ethnomedicinal practices in other regions, several similarities emerge. For instance, guava leaves (*Psidium guajava*) are widely documented as remedies for diarrhoea not only in India but also across Latin America and the Caribbean, where leaf decoctions and infusions are traditionally used to treat gastrointestinal disorders [16, 17]. Both *Aegle marmelos* (bael) and *Holarrhena antidysenterica* (kutaja) are long established in classical Ayurvedic/Unani formulations for diarrhoeal and dysenteric disorders and have been supported by pharmacological studies showing anti-diarrhoeal and anti-enteric activities [18-20]. These cross-cultural parallels strengthen the rationale for focused bioprospecting and drug-development efforts.

Despite these strengths, the current body of knowledge is limited by certain challenges. Much of the available data is scattered across dissertations, regional surveys, and unpublished reports, which hinders synthesis. Furthermore, while pharmacological studies have validated a few plants, many species remain underexplored scientifically. This gap highlights the need for integrative approaches combining ethnobotany, phytochemistry, pharmacology, and clinical trials. Finally, sociocultural transformations pose risks to traditional knowledge transmission. As younger generations shift away from indigenous practices due to modernization and healthcare access, the continuity of oral traditions is jeopardized. This underscores the urgency of documentation and community-based knowledge preservation initiatives.

Conservation Concerns

The rich ethnomedicinal heritage of Northeast India faces growing threats due to unsustainable harvesting practices, habitat loss, and cultural transitions. Many antidiarrhoeal species identified in this review are increasingly vulnerable.

For instance, *Coptis teeta* Wall., an endemic species restricted to Arunachal Pradesh, is classified as critically endangered owing to overharvesting of its roots and rhizomes for commercial trade [12]. Similarly, *Holarrhena antidysenterica* Wall. ex A. DC., traditionally used for treating dysentery, is under pressure from unsustainable bark collection, which threatens the survival of natural populations [19]. Beyond species-level threats, deforestation, shifting cultivation, and rapid modernization are eroding the ecological landscapes that sustain medicinal flora. Simultaneously, the transmission of traditional knowledge from elder healers to younger generations is weakening due to changing lifestyles, migration, and growing dependence on modern medicine. Without systematic efforts to preserve both biological and cultural diversity, much of this knowledge may be irretrievably lost. To address these concerns, community-led conservation programs and participatory ethnomedicinal documentation are essential. Empowering local communities through training, sustainable harvesting protocols, and benefit-sharing mechanisms can ensure both conservation of species and continuation of traditional healthcare practices. Furthermore, integrating traditional knowledge into biodiversity management policies would not only safeguard medicinal plant resources but also strengthen primary healthcare security in the region.

Conclusion

This review consolidates scattered ethnomedicinal knowledge on the treatment of diarrhoea among the major tribes of Northeast India, documenting more than 102 medicinal plant species from diverse botanical families. The comparative analysis reveals a strong cultural consensus, with plants such as *Psidium guajava*, *Aegle marmelos*, *Holarrhena antidysenterica*, *Centella asiatica*, and *Zingiber officinale* emerging as consistently valued remedies across different tribes. This convergence underscores both empirical validation and therapeutic reliability rooted in centuries of indigenous practice. Importantly, a number of these species have received pharmacological confirmation of their antidiarrhoeal activity, reinforcing the scientific basis of traditional wisdom. Yet, the majority remain underexplored, offering immense potential for phytochemical and pharmacological research aimed at novel drug discovery. At

the same time, urgent concerns remain regarding the sustainability of medicinal plant resources and the continuity of traditional knowledge systems. Overharvesting, habitat degradation, and rapid socio-cultural changes threaten both biodiversity and the oral traditions that safeguard this knowledge. Therefore, preserving this ethnomedicinal heritage requires a multi-pronged approach: systematic documentation, rigorous scientific validation, community-led conservation, and integration of indigenous practices into broader healthcare strategies. Such efforts will not only protect a vital cultural legacy but also provide accessible, affordable, and sustainable solutions to pressing public health challenges like diarrhoea.

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Authors contribution

LH and RA drafted the manuscript and carried out work. KJ, LT, NG, AB & PK participated in its design and coordination. All authors read and approved the final manuscript

Conflict of interest

The authors declare that they have no conflicts of interest.

References

- World Health Organization. Diarrhoeal disease. 2017. Available from: <https://www.who.int/news-room/fact-sheets/detail/diarrhoeal-disease>
- Troeger C, Blacker BF, Khalil IA, Rao PC, Cao S, Zimsen SR, *et al.* Estimates of the global, regional, and national morbidity, mortality, and aetiologies of diarrhoea in 195 countries: a systematic analysis for the Global Burden of Disease Study 2016. *Lancet Infect Dis.* 2018;18(11):1211-1228.
- Behera DK, Mishra S. The burden of diarrhea, etiologies, and risk factors in India from 1990 to 2019: evidence from the global burden of disease study. *BMC Public Health.* 2022;22(1):92.
- World Health Organization. Traditional medicine: Growing needs and potential. WHO Policy Perspectives on Medicines, No. 2. Geneva: WHO; 2002.
- Myers N, Mittermeier RA, Mittermeier CG, Da Fonseca GA, Kent J. Biodiversity hotspots for conservation priorities. *Nature.* 2000;403(6772):853-858.
- Laloo RC, Kharlukhi L, Jeeva S, Mishra BP. Status of medicinal plants in the disturbed and the undisturbed sacred forests of Meghalaya, northeast India: population structure and regeneration efficacy of some important species. *Curr Sci.* 2006;90(2):225-232.
- Arya OP, Myllemngap W, Pandey A. Ethnomedicinal plants used by Adi community of Upper Siang District of Arunachal Pradesh in North-East India. *Pleione.* 2020;14(2):265-276.
- Chetry LB, Basar K, Taye K, Taka T, Tsering J, Wangpan T, *et al.* Medicinal plants used against gastrointestinal disorders among the Adi Tribe of Eastern Himalaya. *NeBio.* 2018;9(1):93-101.
- Dolui AK, Sharma HK, Marein TB, Lalhriatpuii TC. Folk herbal remedies from Meghalaya. *Indian J Tradit Knowl.* 2004;3(4):358-364.
- Bisht P, Joshi NC, Pandey S. Ethnobotanical study on plant species used by the Nyishi tribe of Arunachal Pradesh, India. *J Tradit Folk Pract.* 2021;9:63-83.
- Lyngdoh JP, Syiem D, Mao AA. Pattern of traditional medicine usage in East Khasi Hills of Meghalaya. *Indian J Tradit Knowl.* 2014;13(1):164-170.
- Bhardwaj Y, Bhuyan B, Yugandhar P, Nagayya S, Srinivasulu C, Mumtam T, *et al.* Ethnomedicinal plants used for gastro-intestinal disorders (GIDs) by the tribal communities of Arunachal Pradesh (Eastern Himalayas), India: a comprehensive review. *Ethnobot Res Appl.* 2025;30:1-39.
- Lokho K, Narasimhan D. Ethnobotany of Mao-Naga Tribe of Manipur, India. *Pleione.* 2013;7(2):314-324.
- Lokho A. The folk medicinal plants of the Mao Naga in Manipur, North East India. *Int J Sci Res Publ.* 2012;2(6):1-8.
- Vemai S, Dilip S, Ranibala G, Loushambam RS. Documentation of medicinal plants traditionally used in health care by Poumai tribe of Manipur, India. *Int J Econ Plants.* 2022;9(2):130-138.
- Joseph B, Priya M. Review on nutritional, medicinal and pharmacological properties of guava (*Psidium guajava* Linn.). *Int J Pharm Bio Sci.* 2011;2(1):53-69.
- Gutiérrez RMP, Mitchell S, Solis RV. *Psidium guajava*: a review of its traditional uses, phytochemistry and pharmacology. *J Ethnopharmacol.* 2008;117(1):1-27.
- Brijesh S, Daswani P, Tetali P, Antia N, Birdi T. Studies on the antidiarrhoeal activity of *Aegle marmelos* unripe fruit: validating its traditional usage. *BMC Complement Altern Med.* 2009;9(1):47.
- Jamadagni PS, Pawar SD, Jamadagni SB, Chougule S, Gaidhani SN, Murthy SN. Review of *Holarrhena antidysenterica* (L.) Wall. ex A. DC.: pharmacognostic, pharmacological, and toxicological perspective. *Pharmacogn Rev.* 2017;11(22):141-148.
- Sharma N, Radha, Kumar M, Zhang B, Kumari N, Singh D, *et al.* *Aegle marmelos* (L.) Correa: an underutilized fruit with high nutraceutical values: a review. *Int J Mol Sci.* 2022;23(18):10889.
- Ramya DT, John SS. Ethnomedicinal practices among Adis in two villages of Upper Siang District, Arunachal Pradesh. *Dera Natung Gov Coll Res J.* 2021;ISSN 2456-8228.
- Yumnam J, Bhuyan S. Tribe of East Siang District, Arunachal Pradesh. 2009.
- Choudhary RK, Srivastava RC. Upper Siang District (Arunachal Pradesh).
- Wangpan T, Jamoh J, Tangjang S. Exploring traditional medicinal practices: insights from the botanical heritage of Adi Tribe of Arunachal Pradesh (India).
- Kamum G, Kanwal KS, Lod Y. Ethnomedicinal plants used by Galo community of West Siang District, Arunachal Pradesh. *Int J Res Appl Sci Eng Technol.* 2018;6(1):438-444.
- Murtem G, Chaudhry P. An ethnobotanical study of medicinal plants used by the tribes in Upper Subansiri District of Arunachal Pradesh, India. *Am J Ethnomed.* 2016;3(3):35-49.
- Ahmed AA, Borthakur SK. Ethnobotanical wisdom of the Khasis (Hynniew Treps) of Meghalaya. In: Bishen Singh, Mahendra Pal Singh, editors. *DehraDun-01: India*; 2005. p.114-147.
- FRLHT. Medicinal plants conservation and sustainable utilization- Meghalaya, India. Annexure-C. Meghalaya: 2003. p.55-75. Available from: <http://www.frlht.org.in/html/reports/meghalayaslpc.pdf>
- Neogi B, Prasad MN, Rao RR. Ethnobotany of some

- weeds of Khasi and Garo Hills, Meghalaya, Northeastern India. *Econ Bot.* 1989;43:471-479.
30. Jaiswal V. Cultures and ethnobotany of Jaintia tribal community of Meghalaya, Northeast India- A mini review. *Indian J Tradit Knowl.* 2010;9:38-44.
 31. Gill R, Veimy M. Ethnomedicinal practices of the Poumai Nagas of Manipur, North East India. *J Tradit Med Clin Natur.* 2025;14:499. doi:10.4172/2573-4555.1000499.
 32. Loushambam RS, Vemai S, Dilip S, Ranibala G. Documentation of medicinal plants traditionally used in health care by Poumai tribe of Manipur, India. *Int J Econ Plants.* 2022;9(2):130-138. doi:10.23910/2/2022.0442b.
 33. Gangurde VV, Kalarikkal VW, Rahangdale DY, *et al.* Traditional medicinal plants used by ethnic communities in Senapati and Kangpokpi districts of Manipur, India: a quantitative assessment. *Discov Plants.* 2025;2:82. doi:10.1007/s44372-025-00141-3.
 34. Sewa NK, Bora A, Das J, Dwivedi SK. Ethnobotanicals of Senapati District of Manipur in North East India. *World J Pharm Sci.* 2020;8(12):96-101.
 35. Bushi D, Bam K, Mahato R, Nimasow G, Nimasow OD, Tag H. Ethnomedicinal plants used by the indigenous tribal communities of Arunachal Pradesh, India: a review. *Ethnobot Res Appl.* 2021;22:1-40.
 36. Srivastava RC, Nyishi Community NC. Traditional knowledge of Nyishi (Daffla) tribe of Arunachal Pradesh. 2010.
 37. Balkrishna A, Joshi B, Srivastava A, Shankar R, Vashistha RK, Kumar A, *et al.* Medicinal plants of Seijosa Circle, Pakke-Kessang District, Arunachal Pradesh, India. *Indian J Nat Prod Resour.* 2021;12(1):101-115.
 38. Bora C, Boissya CL. Ethnobotany of Lower Subansiri District (Nishi Tribe) of Arunachal Pradesh, India [PhD thesis]. Gauhati University, Assam, India; 2001.
 39. Toku B, Deuri M, Borah D, Tangjang S, Das AP. Traditional phyto-medicines from the districts along the course of Subansiri river in Arunachal Pradesh, India: a review. In: *Bioresources and sustainable livelihood of rural India.* New Delhi: Mittal Publications; 2021. p.185-239.
 40. Nanu T, Nimasow G. Ethnomedicinal plants on home gardens of the Nyishi Tribe of Papum Pare District of Arunachal Pradesh, India. *Int J Ecol Environ Sci.* 2024;50(5):793-798.
 41. Das SK, Das TJ, Tshering D, Tsering J, Paul D, Gupta DD, *et al.* Ethnobotanical notes on significant food and medicinal flora used by the indigenous Monpa and Nyishi communities of Arunachal Pradesh. 2019.