

*Research Article*

## EXPLORING THE MEDICINAL POTENTIAL OF ALIEN PLANTS: A CASE STUDY OF THE MAO-NAGA COMMUNITY IN MANIPUR, INDIA

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**ABSTRACT:** There has been a constant struggle to fight against alien species across the world. This struggle has been a costly affair and unproductive in most cases. However, the Mao-Naga community of Manipur, India, approaches these plants holistically and positively to boost community health. The community has incorporated these plants into their folk pharmacopeia by discovering, based on trial-and-error approaches or by intuition, the medicinal properties of these plants. This approach can bring a positive impact to combat the invasiveness of alien plants, control their population and thereby sustain the population of the native plants.

**Key words:** Ethnomedicinal, Health Care, Plant management, Folk Medicine.

### INTRODUCTION

Traditional use of plants as some tool to combat health problems is found in many rural communities throughout the globe and their knowledge is found true when studied scientifically (Pattanayak 2021, Patel *et al.* 2022, Paul and Sujatha 2022). But due to the rapid increase in population, ecological perturbations triggered by biotic incursion have been a constant threat to global ecological balance, resulting in changes in anthropogenic biomes (Rai and Singh 2020). Many of the alterations in global diversity have been triggered by the human population by altering the earth's climate, biodiversity, and functions as a whole (Ellis *et al.* 2020). These changes resulted in the introduction of plants, either intentionally or accidentally to different parts of the world (Reddy 2008, Reddy *et al.* 2008). Many of the alien plants are found invasive, which negatively affects forest regeneration, biodiversity loss, and species extinctions, and pose a danger to the world's food security (IUCN 2022, Sundararaju 2018, Langmaier and Lapin 2020). According to IUCN (2018),

it is estimated that the European Union spends around €12.5 bn and Australia AUS \$13.6 bn annually on invasive alien species (Kumar and Prasad 2014). Alien plants are deemed to be a constant threat to native biodiversity and are considered the second worst threat to biodiversity (Higgins *et al.* 1999, Pimentel *et al.* 2001). According to Fantle-Lepczyk *et al.* (2022), alien species invasion costs 21 billion USD from 2010 to 2020 in the United States, and the sectors which affected the most were agriculture (\$510 bn) and terrestrial habitats (\$644 bn).

According to Khuroo *et al.* (2012) inventory of the alien flora of India, which included systematic reviews, meticulous analyses, and field observations from the previous 20 years, 1,599 alien vascular species belonged to 842 genera in 161 families and made up 8.5% of the total vascular flora of India. These species were distributed in 842 genera.

This article examines the role of traditional knowledge in utilizing alien plants by the Mao-Naga community in providing health care by tapping their

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medicinal uses. The objectives of the article are threefold: (i) to document the Mao-Naga medicinal knowledge, (ii) to understand the role of alien plants and their uses in maintaining community health, and (iii) to update the uses of medicinal plants in People Biodiversity Registers.

### North-eastern region of India

Northeastern (NE) India comprises eight states, namely Assam, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, and Tripura. Geographically, NE India is a part of Southeast Asia, unlike the rest of India which is in South Asia. The region is popular for its rich biocultural diversity. According to Census (2011a), the total population of NE India is 4,54,86,784. Of this, the ethnic population is 1,24,15,054, which constitutes about 56 percent. Among the NE states of India, Assam has the least percentage of ethnic communities at 12.4 percent, whereas Mizoram has the highest concentration of ethnic communities with over 94.4 percent of the total population (Kumar 2005, Census 2011a).

The Indo-Burma biodiversity hotspot includes Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, and a small section of Tripura's northern region, while the Himalayan hotspot includes Assam and the upper region bordering Arunachal Pradesh and Tripura (CEPF 2020, WWF-US 2005).

The wealth of biological diversity in these two hotspots supports a wide range of ethnic communities. For example, of the 450 ethnic communities in India, a whopping 225 have roots in NE India. The region also harbors 400 languages and dialects (Chatterjee *et al.* 2006, Singh *et al.* 2015, Vadlamannati 2011). Ethnomedicinal studies on a tribal community basis are meager in number in that region, though some study reports are coming in recent days (Pradhan *et al.* 2021).

### MATERIALS AND METHODS

The first author carried out fieldwork from 2013 to 2018, during which 30 knowledge keepers from the villages Punanamei, Pudunamei, Shajouba, Maopundung, and Chowainamei were interviewed (Table 1). We use the term 'knowledge keepers (KK)' to refer to the members of the Mao-Naga community who contributed their knowledge to this study. We find this as a better alternative to 'partners' or 'respondents' or 'participants' as it recognizes their intellectual contribution and is the primary custodians

of traditional knowledge (TK). KK are selected through snowball sampling; interviews were open-ended and carried out in a conversation style. The data collected is supported by participant observation of the first author who is also a member of the same community.

The Madras Christian College in Chennai, under whose aegis the research was conducted, does not have an ethics board. Hence, the code of the International Society of Ethnobiology (2006) was used as a reference, and utmost care was taken to ensure that the study conformed to the code. This code is also on par with the Nagoya Protocol on Access and Benefit Sharing. Written Prior Informed Consent was also taken from the KK before the interview.

### The Mao-Naga community

Mao-Naga, an ethnic community of the Naga group inhabits the Senapati district of Manipur in the Northeastern Region (NER) of India. The study area falls between 24.37° N and 93.29°-94.15° E with an annual rainfall range from 671 to 1454 mm. The total geographical area of the district is 3271 km<sup>2</sup> (District Administration Senapati Manipur 2018). Mao-Naga inhabits 58 villages in the district, of which 20 are federal units (Kapesa 2017). The total population is 116,374 (Census 2011b). The people of Mao-Naga are also known as "Ememei" or "Mao" as a whole. However, the name Mao-Naga is the popular term used to denote the community. The people are chiefly agrarian and cultivate rice as their staple food.

### Botanical inventorying

Field trips were undertaken to specific habitats identified by the KK. Voucher specimens of plants identified by the KK on the field were collected and identified using Floras (Hooker 1872-1897) of Assam (Kanjilal *et al.* 1934-1940) as well as for the states of Mizoram and Manipur (Singh *et al.* 2000, 2002) as well as the e-flora of China ([www.efloras.org](http://www.efloras.org)). Identifications were confirmed by Dr. K. Ravi Kumar of Trans-Disciplinary University (TDU), Bengaluru, and nomenclature was updated by referring to databases, such as [www.powo.science.keew.org](http://www.powo.science.keew.org), [www.tropicos.org](http://www.tropicos.org), [www.ars-grin.gov](http://www.ars-grin.gov), POWO (2023), Tropicos (2019), e-floras (2022) as well as in GRIN National Genetic Resources Program (2018) and relevant revisions and monographs. Voucher specimens have been deposited in the herbarium of the Botanical Survey of India, Eastern Regional Centre, Shillong (ASSAM) and the entry of accession number is still under process.

Data were analyzed by comparing with the Native American Medicinal Plants (NAMP) (Moerman 2017), Compendium of Indian Folk Medicine and Ethnobotany (CIFME) (Jain and Jain 2016), and Dr. Duke's Phytochemical and Ethnobotanical Databases (DDPED) (Duke 2018).

## RESULTS AND DISCUSSION

In the study, several ethnomedicinal plants were documented and used by the Mao-Naga community, of which, 27 species are found to be native to the tropical American region. The community uses these plants to treat a variety of illnesses and health-related problems.

### Perspective and observations

Some KK are of the view that medical knowledge should never be used to harm one or others. Even though the alien species recorded in this paper have no adverse effects that can cause major health problems or lead to substance dependence, the KK believes that medicinal plants should only be administered by mature individuals. The students (mainly the family's children) learned how to treat through observation and assistance from the trained herbalist.

According to the first author's observations and conversations with the KK, the males are more knowledgeable about bone setting, fractures, sprain, and muscle cramping (practitioners such as Dihrii Kholi, Hriini Pfokehrii, and Kholi Kolo) and the females are more knowledgeable about internal treatment such as decoctions, concoctions, and infusions. For example, Kaikho Ashihra from the Mao Pungdong village knows how to cure piles, women's health issues during pregnancy and childbirth, and how to make food supplements for children. The knowledge is also seen as common from the female KK such as Hriini Katia, Lokho Kaini, and Mobo Besa from Shajouba village.

From this perspective, it can be called gender-based treatment because, back in the day, hunting and battle were common, and men were vulnerable to physical injury, and treating them on the spot was critical for survival. Contrarily, the women's herbalist form of therapy is a drawn-out procedure that, depending on the severity of the illness or ailment, might take days to many months.

### Native American and Mao-Naga plants

Cross-cultural comparison has been carried out between the Native American communities and the Mao-Naga community in terms of their medicinal

uses. A compilation of more than 2500 ethnomedicinal plant species used by 217 Native American ethnic communities by Moerman (2017), based on the publications, has been used as a text of reference.

The comparative study (Table 2) shows that six plants were found to have nearly identical uses, suggesting a common shared knowledge pattern for these plants between the Native American communities and the Mao-Naga community. These plants include *Brugmansia suaveolens*, *Juglans nigra*, *Nicotiana tabacum*, *Psidium guajava*, *Ricinus communis* and *Tagetes erecta*. Whereas, species such as *Oxalis corniculata*, *Prunus persica* and *Verbena officinalis* are used by the Mao-Naga and Native American communities for different purposes. This shows that though the resource is the same, the knowledge of the use of the resource has evolved independently.

A majority of the Native American plants used in the folk medicinal system of the Mao-Naga are, however, not listed in the text of reference which portrays that none of the 217 ethnic communities living in the American region have developed a knowledge system on the medicinal use of these plants, though they're widely occurring in their territories. It is noteworthy to see that the Mao-Naga community has incorporated these plants into their folk pharmacopeia by discovering, based on trial-and-error approaches or by intuition, the medicinal properties of these plants.

According to phytochemical screening by Lutterodt (1989), Kamath *et al.* (2008), and Choudhury *et al.* (2012) on *Psidium guajava* is found to be effective against various gastrointestinal disorders. This validation through scientific evidence ensures that the ethnomedicinal knowledge from both the Mao-Naga community and NAMP is technically safe and reliable.

### CIFME and Mao-Naga

A comparison with CIFME compiled by Jain and Jain (2016), based on the published ethnobotanical literature across India revealed the uses of 17 Native American species that do not find a place in the compilation cited by Moerman (2017). Furthermore, the CIFME also includes another four Native American plant species with different medicinal uses practiced by Indian communities. This scenario makes it evident that though the plant resources may be alien, their knowledge of them has evolved independently. Furthermore, the use of many of these plants across diverse ethnic communities in India provides evidence for a pan-India pattern of knowledge. For example,

the use of alien plant species as traditional medicine has been reported in Africa (Semenya *et al.* 2012, Maema *et al.* 2016). Pappan and Thomas (2017) also documented the traditional use of alien plants from Kozhikode district, Kerala. There are a series of cases in which the world tries to combat the alien species. One such example that incorporates the use of alien species for community livelihood and combats the

growth of the plant is "The Lantana Project" by "The Shola Trust (2022)" in Nilgiris, Tamil Nadu. The trust together with Ashoka Trust for Research in Ecology and Environment (ATREE) in collaboration with the Tamil Nadu Forest Department uses the plant (*Lantana camara*) for making furniture to support the *Adivasis of Munnetra Sangam* to generate income and sustainable livelihood.

**Table 1. List of collaborating knowledge keepers.**

Sl. No.	Name of the knowledge keepers	Age	Sex	Village
1	Adahrü Nepuni	86	M	Punanamei
2	Athikho Kreni	57	M	Punanamei
3	Besü Athia	63	F	Shajouba
4	Azhoni Heshu	72	M	Mao Pungdong
5	Besü Athia	67	F	Shajouba
6	Deli Kholi	45	M	Punanamei
7	Dihrü Kholi	92	M	Shajouba
8	Eshu Athishu	40	M	Mao Pungdong
9	Heni Chakho	82	M	Shajouba
10	Hrüni Adaphro	49	F	Punanamei
11	Hrüni Katia	52	F	Shajouba
12	Hrüni Nelia	45	F	Senapati
13	Hrüni Pfokehrü	45	M	Punanamei
14	Hrüni Salew	40	M	Punanamei
15	Kaikho Ashihra	64	F	Mao Pungdong
16	Kapani Eshu	43	M	Chowainamei
17	Kholi Kolo	60	M	Senapati
18	Kholi Kapani	75	M	Chowainamei
19	Koso Komuhra	76	F	Punanamei
20	Lohrü Lidzusa	60	F	Punanamei
21	Lokho Kaini	53	F	Shajouba
22	Lokho Ashuli	46	M	Shajouba
23	Loli Kapani	70	M	Pudunamei
24	Loli Salew	73	M	Pudunamei
25	Mahrili Besü	50	M	Kalinamei
26	Makabo Kaikho	62	M	Punanamei
27	Mathibo Khazha	80	F	Shajouba
28	Mobo Besa	74	F	Shajouba
29	Modoli Pfokehrü	72	M	Shajouba
30	Pfokreni Akha	71	M	Chowainamei

**Table 2. Comparison of alien plants and their medicinal uses.**

Sl. No.	Botanical name	Uses	Ethnomedicinal uses in NAMP	Ethnomedicinal Uses in CIFME
1	<i>Acmella oleracea</i> (L.) R. K. Jansen	Cuts and wounds	NA	NA
2	<i>Acmella paniculata</i> (Wall. ex DC.) R. K. Jansen	Cuts and wounds	NA	NA
3	<i>Ageratina adenophora</i> (Spreng.) R.M.King & H.Rob.	Cuts and wounds	NA	NA
4	<i>Ageratum conyzoides</i> L.	Cuts and wounds	NA	Used differently
5	<i>Bidens pilosa</i> L.	Stomach pain	NA	Used differently
6	<i>Brugmansia suaveolens</i> (Humb. & Bonpl. ex Willd.) Sweet	Back pain, sprain and joints; snakebite; tonsillitis	Stimulant	NA
7	<i>Capsicum chinense</i> Jacq.	Cold and fever	NA	NA
8	<i>Chenopodium album</i> L.	Dysentery	NA	NA
9	<i>Chromolaena odorata</i> (L.) R.M.King & H.Rob.	Bee sting; cut and wounds	NA	Used differently
10	<i>Drymaria cordata</i> (L.) Willd. ex Schult.	Snakebite	NA	NA
11	<i>Dysphania ambrosioides</i> (L.) Mosyakin & Clemants	Eczema and athlete's foot; piles; boils	NA	Cholera
12	<i>Lantana camara</i> L.	Fever	NA	Used differently
13	<i>Mikania micrantha</i> Kunth	Insect bites	NA	Headache
14	<i>Mimosa pudica</i> L.	Toothache	NA	Used differently
15	<i>Nicotiana tabacum</i> L.	Toothache	Toothache	Used differently
16	<i>Oxalis corniculata</i> L.	Dysentery	Used differently	Used differently
17	<i>Passiflora edulis</i> Sims	Stomach problem	NA	Tumor
18	<i>Prunus persica</i> (L.) Batsch	Pimples	Used differently	Cold and cough
19	<i>Psidium guajava</i> L.	Dysentery	Dysentery	Bug bite
20	<i>Ricinus communis</i> L.	Muscle sprain and joints	Sores	Used differently
21	<i>Senna bicapsularis</i> (L.) Roxb.	Ringworms	NA	Toothache
22	<i>Solanum aculeatissimum</i> Jacq.	Toothache; anti-dandruff	NA	Used differently
23	<i>Solanum americanum</i> Mill.	Birds flu	NA	Used differently
24	<i>Solanum torvum</i> Sw.	Blood pressure	NA	Venereal
25	<i>Tagetes erecta</i> L.	Eczema	Eczema	Used differently
26	<i>Verbena officinalis</i> L.	Headache and fever	Used differently	Stomachache
27	<i>Xanthosoma sagittifolium</i> (L.) Schott	Bee sting	NA	Anodyne

\*NA - Not Applicable.

## CONCLUSION

The pan-Indian use of alien plants in the folk medicinal systems is a classic example that the alien species need not be perceived from a negative connotation but rather considered as valuable medicinal resources for many ethnic communities across India.

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