

A brief review of medicinal plants used by the Naga tribes of Nagaland, India

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Abstract

This review examines the use of 20 indigenous medicinal plants by the Naga tribes of northeast India. Each Naga tribe has its unique culture and traditions, and their medicinal practices vary. The review focuses on the phytochemical constituents, pharmacological and biological activities of these plants, as well as their traditional uses. The study found evidence supporting the efficacy of these plants and confirming traditional practices, but further investigation is necessary to fully understand their chemical components and biological effects for potential drug development.

Keywords: Medicinal plants; Naga tribes; Phytochemical constituents; Traditional uses

1. Introduction

Nagaland is a small state in northeast India located in the Indo-Burma hot spot biodiversity. It has a diverse range of flora, fauna, and a varying climate, from warm and subtropical in the plains to moderate and sub-montane in the mid-slopes to cool and temperate in the high hills [1]. The Naga tribe in Nagaland is comprised of various indigenous populations, including Angami, Ao, Chakhesang, Chang, Khamniungan, Konyak, Lotha, Phom, Pochury, Rengma, Sangtam, Sumi, Yimchungru and Zeliang. Agriculture is the primary occupation of the Nagas. For centuries, the Naga tribe has used medicinal plants to treat various illnesses. Their traditional knowledge of these plants is passed down through generations either orally or through traditional medicine practitioners [1]. However, due to a lack of written records much of this ethnomedicinal knowledge is at risk of being lost.

This review aims to highlight the importance of preserving traditional knowledge about medicinal plants used by the Naga tribes in Nagaland, India. Medicinal value species of plants include bulbs, shrubs, ferns, and trees such as *Allium chinese*, *Begonia palmata*, *Centella asiatica*, *Clematis napaulensis*, *Clerodendrum colebrookianum*, *Elaeocarpus floribundus*, *Elsholtzia blanda*, *Equisetum ramosissimum*, *Gynura nepalensis*, *Habaneria dentata*, *Lobelia nummularia*, *Molineria capitulate*, *Plantago erosa*, *Polygonum molle*, *Pouzolzia viminea*, *Rubia sikkimensis*, *Tainia viridifusca*, *Taxus Wallachia*, *Thalictrum foliolosum* and *Zanthoxylum armatum* have been used for centuries in traditional medicine to treat a variety of ailments. The loss of natural forests and disruption of traditional lifestyles can lead to the loss of this valuable knowledge. This is why it is important to document and preserve this knowledge for future generations.

2. Methodology

The methodology for selecting these medicinal plants is based on the previous studies on ethnobotanical studies in Nagaland, information gathered from practitioners, experiences of medicinal plant users, and common knowledge of medicinal plants among local people.

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3. Medicinal value plants in traditional medicine

Allium chinense G. Don is a species in the Amaryllidaceae family, with 500 species known. It is widely cultivated as a vegetable and spice and is used for medicinal purposes in northeast India [2]. *Allium chinense* is traditionally used to treat various ailments including diarrhea, fever, dysentery, chest pain, early stages of cancer, stomach ache, sore throat, and cough [3]. Its biologically active compounds such as steroidal saponins, amino acids, sulphur, nitrogen, flavonoids, essential oil, and organosulfur compounds are believed to promote beneficial health effects [4]. *Allium chinense* has been reported to have various pharmacological and biological activities, including antioxidant, anti-cancer, analgesic, anti-diabetic, anti-hypertensive, and anti-inflammatory effects [5].

Begonia palmata D. Don is a perennial plant with erect, branched stems growing from an elongated rhizome. In traditional medicine, various parts of the plant are used as antipyretic agents, astringents, and for the treatment of haematemesis [3,6]. Studies have reported the presence of various phytochemical compounds in *Begonia palmata*, including alkaloids, phenols, flavanoids, saponins, tannins, terpenoids, glycosides, carbohydrates, and amino acids [7]. However further research on their use in traditional medicine is needed.

Centella asiatica (CA) Linn, belongs to the family Apiaceae, it is a clonal, perennial herbaceous creeper found throughout India growing in moist places up to an altitude of 1800 m [8]. Traditional medicinal uses are the treatment of rheumatism, skin disorder, syphilis, gastritis, blood pressure, and neurological diseases [3]. Some of the most well-known bioactive compounds found in CA include asiaticosides, madecassoside, madasiatic acid, kaempferol, quercetin, and gallic acid. These compounds are believed to contribute to CA's medicinal properties such as anti-hypertension, atopic dermatitis, liver toxicity, liver fibrosis, gastric ulcers, breast cancer, gestational diabetes, leukemia, and Alzheimer's disease [9,10]. However, more research is needed to fully understand the mechanism of action and the extent of the health benefits of these compounds.

Clematis napaulensis D.C belongs to the Ranunculaceae family, with about 355 known species [11]. In Traditional Chinese Medicine (TCM) *Clematis chinensis*, *Clematis hexapetala*, and *Clematis mandshurica* are collectively referred to as *Clematidis Radix et Rhizome* (CRR). The genus *Clematis* is utilized for various ailments ranging from chronic skin diseases, mastitis, hypertension, hyperglycemia, rheumatoid arthritis, etc. [12]. *Clematis napaulensis* is a native plant of Nagaland and is used to treat a range of conditions, including bacterial and fungal infections, skin diseases, and rheumatism. However, there is a lack of research to support its potential use.

Clerodendrum colebrookianum Walp is a species belonging to the Verbenaceae family and is native to India and Southeast Asian countries. The Naga tribes in India collect and cultivate the plant for consumption. The plant has traditional uses as an antiseptic, tonic for bronchitis, treatment for malaria, and remedy for hypertension. The plant parts contain various phytochemicals, including phenols, alkaloids, flavonoids, polyphenols, steroids, caffeic acid, and apigenin [1,3,13]. It also has biological and pharmacological properties such as antioxidant, anti-inflammatory, and treatment for central nervous system disease, and depressive effects [14,15].

Elaeocarpus floribundus Blume is a species found in India, Burma, Thailand, Vietnam, Malaysia, and Indonesia. *Elaeocarpus* is commonly known as Indian olive. In traditional medicine, the juice extract from its fruit is used to treat blood pressure and nausea [16]. Phytoconstituents isolated from the leaves of the Indian olive plant include anthocyanins, cucurbitacin-type triterpenoids, phenolic derivatives, alkaloids, β -sitosterol, friedelin, epifriedelanol, stearic acid, oleic acid, elaidic acid, linolenic acid among others [17,18]. Compounds such as vanillin, trans-coniferyl aldehyde, vanillic acid, gallic acid and echitin have been isolated from the seeds [19]. The biological and pharmacological activities reported include, antioxidants, antimicrobials, antinociceptive and antiarthritic activities [20].

Elsholtzia blanda Benth belongs to the mint family (Lamiaceae) and is made up of mostly aromatic herbs or undershrub with 12 species recorded from India [21]. In the traditional medicine of the Naga tribe, it has been used to treat hypertension, diarrhea, skin diseases, cuts and wounds, kidney and bladder disorders, diabetes, cholera, blood purification, dysentery, and other ailments [3,22,23]. The secondary metabolites such as Flavonoids, glycosides, phenylpropanoids, terpenoids, phytosterols, and cyanogenic glycosides with specific compounds such as linalool, geranyl acetate, luteolin, luteolin-7-O-glucoside, luteolin-3'-O-glucoside, geranial, neural, e-isocitral and caryophyllene oxide are reported from this genus [23]. Pharmacological properties include antimicrobial, cytotoxic, and ACE inhibitory activities that have been reported from its close relative *Elsholtzia communis* [24].

Equisetum ramosissimum Desf is a family of Equisetaceae, they are perennial plants that reproduce by spores with about 30 known species which are distributed across the world [25]. The Naga tribe in India uses this plant to treat urinary tract infections and kidney problems [16]. *Equisetum* species contain various phytochemical compounds with diverse

biological activities, including antibacterial properties, protection against oxidation, and potential effects on melanoma and melanogenesis [26]. Some of the compounds isolated from these plants include monoterpenes, sesquiterpenes, β -caryophyllene, hexadecenoic acid, thymol, palmitic acid, linoleic acid, and various other compounds. [27,28].

Gynura nepalensis DC belongs to the Asteraceae family and is a perennial herb characterized by yellow flowers. It is native to Nepal, India, China, Myanmar, Bhutan, and Thailand [29]. The Naga tribe in India uses *Gynura nepalensis* to treat gastritis, and its leaves are crushed into a paste and applied on cuts and wounds to stop bleeding. *Gynura* species contain various phytochemicals compounds including alkaloids, tannins, saponins, steroids, glycoside, flavonoids, and reducing sugars, and have been found to have pharmacological activities such as anti-inflammatory, analgesic, antioxidant, and α -glucosidase activities [30,31]. Chlorogenic acid and its derivatives have been isolated from *Gynura nepalensis* of Chinese origin [32].

Habenaria dentata (Sw.) Schltr, is a species of orchid in the *Habenaria* genus. It is used in Traditional Chinese Medicine (TCM) for replenishing “kidney yin” and treating various health conditions [33]. The genus *Habenaria* is also mentioned in ancient Indian herbal texts, with Sanskrit names ‘Riddhi” and “Vriddhi” and considered to have medicinal properties and used as tonics for various health benefits such as purifying blood and deworming [37]. *Habenaria dentata* is a rare and endangered species found in northeast India and is in need of scientific intervention for propagation and conservation due to exploitation for its medicinal value.

Lobelia nummularia Lam is about 450 species belonging to the Campanulaceae family. In traditional medicine, the Naga tribes use *Lobelia nummularia* to treat cuts and wounds, gall bladder disorders, kidney stones, and urinary tract infections [33]. The major compounds isolated in the genus *Lobelia* are flavonoids, terpenoids, fatty acids, polyacetylene, coumarins, neoligans, polysaccharides, amides, and alkaloids such as (lobeline). Pharmacological activities include inhibitory activity against *Mycobacterium tuberculosis*, Central Nervous System disorders, anti-epileptic, anti-inflammatory, antibacterial, and antidepressant [34].

Molineria capitulate (Lour) is a small herb that belongs to the Hypoxidaceae family and is found in India and South-East Asian countries [35]. In traditional medicine, the rhizome decoction is used to treat jaundice and viral fever, irregular dilation of pupils, and ophthalmia, while a paste made from the rhizome is used as a treatment for a poultice, hemostatic, and antiseptic agent. Soaking rootstock overnight in water and applying its liquid has been a traditional method to treat conjunctivitis and earache [36]. Phytochemical screening of leaves revealed the presence of phytoconstituents, including alkaloids, carbohydrates, flavonoids, phenols, tannins, saponins, reducing sugars, glycosides, terpenoids, essential oils, etc. [37]. The biological and pharmacological activities reported for *Molineria capitula* include antioxidant, cytotoxic, thrombolytic, anti-inflammatory, and analgesic effects [38].

Plantago erosa Wall is an annual or perennial, stemmed, or stemless herb from the Plantaginaceae family, with 200 known species [39]. *Plantago erosa* is commonly used in traditional medicine by the Naga tribe in India to treat various diseases including diuretic, gastric, ulcers, respiratory trouble, diarrhea, febrifuge, expectorant, diabetes, pile, etc. [40]. The genus is rich in biologically active compounds such as flavanoids, alkaloids, terpenoids, phenolic acid derivatives, iridoid glycosides, fatty acids, and polysaccharides. The most abundant component, polysaccharides, has been reported to have multiple functions including antioxidant capacity, prebiotic effects, regulation of glucose and lipid metabolism, immunomodulatory effect, antiproliferative activity, antidiabetic, anticancer, wound healing, antibacterial and antiviral activities [41].

Polygonum molle D. Don in traditional medicine is consumed for blood purification by Nagas. Phytochemical constituents including flavonoids, anthraquinones, chalcones, lignans, coumarins, glycoside, sesquiterpenoids, thotneoside, quercetin, protocatechuic acid, gallic acid, chlorogenic acid, etc. were isolated from different parts of the plant [42,43]. Antioxidative activity has been reported [44]. Despite its medicinal use, more research is required to fully understand its therapeutic potential.

Pouzolzia viminea Wedd (also known as *P. sanguinea*) is an evergreen flowering shrub that is native to tropical regions in India, China, Thailand, Vietnam, and Bangladesh [58]. Some species of *Pouzolzia* have been used in traditional medicine for treating inflammation, diarrhea, and ulcers.[59]. Chemical analysis has revealed the presence of various compounds, including prenylated isoflavones, nor lignans, and triterpenes, in *Pouzolzia sanguinea* [60,61,62]. Studies have also reported a range of biological activities, such as anti-inflammatory, antioxidant, antibacterial, analgesic, antipyretic, and anti-snake venom properties, in the genus *Pouzolzia* [63,64].

Rubia sikkimensis Kurz; *Rubia* is a genus of perennial herbs with hardy climbing habits, found worldwide [45]. *Rubia sikkimensis* also known as Naga madder, is used in traditional medicine to treat urinary tract infections and snakebites

[35]. The phytochemical compounds isolated from *Rubia cordifolia* include anthraquinones, glycosides, saponins, steroids, phenols, and flavonoids, etc. which supports its long traditional use as a potent blood purifier, antioxidant, anti-inflammatory, immune modulator, antistress, antimicrobial, hypoglycaemic, hepatoprotective, anti-cancerous, cardio and nephroprotective agent [36]. There is a lack of research on *Rubia sikkimensis*, as such research is needed to fully understand the potential health benefits and uses of this plant species.



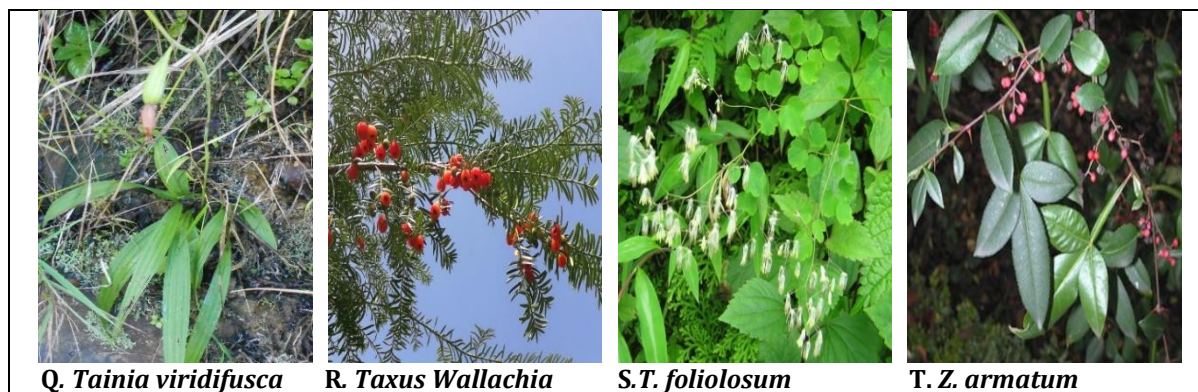


Figure 1 Photographs of some traditional medicinal plants

Tainia viridifusca (Hook.) Benth. & Hook is a species of orchid that is used in traditional medicine by the Chakhesang Nagas for skin disease and crack heels. The rhizome is crushed into a paste for topical application [47]. There is limited information available about this species in the literature.

Taxus wallichian Zuccarini also known as Himalayan yew, is an evergreen gymnosperm found distributed in the temperate zone of the Northern Hemisphere [48]. This plant is found in the forest of Nagaland and is used for medicinal purposes, such as the treatment of bronchitis, epilepsy, and giddiness; antiseptic, aphrodisiac, sedative, and anticancer properties [47]. The major phytoconstituents include essential oils, diterpenes, lignans, flavonoids, phytosterols, and phytoecdysteroids [48]. The plant has shown pharmacological activities such as anticancer, anti-inflammatory, analgesic, antipyretic effects, and anticonvulsant effects [49].

Thalictrum foliolosum A.P. de canolle is a perennial flowering herb in the family of Ranunculaceae. It is found in the Himalayas at an altitude of 1000-3400 meters above sea level. [50]. This plant is used in traditional Naga medicine to treat fever, malaria, and typhoid [47]. The preliminary screening of phytochemicals has revealed the presence of several secondary metabolites including alkaloids, phenols, triterpenes, saponins, and phytosterols [51]. Berberine, an alkaloid, is known for its biological activities. The plant has shown pharmacological activities such as antimicrobial, antioxidant, anti-malarial, epileptic, antipyretic, anti-gastric ulcer, and anti-leishmanial effects [52].

Table 1 Traditional medicinal value plants use for various ailments

Sl. No.	Botanical name	Family	Parts used	Traditional uses
1	<i>Allium Chinese</i> G.Don	Amaryllidaceae	Whole plant	Fever, stomach-ache, sore throat, cough, diarrhea, dysentery, chest pain, and early stages of cancer
2	<i>Begonia palmata</i> D. Don	Begoniaceae	Leaves, roots	Antipyretic, astringent, haematemesis
3	<i>Centella asiatica</i> (L.) Urb.	Apiaceae	Whole plant	Blood pressure, neurological diseases, rheumatism, gastritis, syphilis skin disorder, etc.
4	<i>Clematis napaulensis</i> DC	Ranunculaceae	Leaves, stems, and roots	Skin diseases and rheumatism
5	<i>Clerodendrum colebrookianum</i> Walp	Verbenaceae	Leaves	Antiseptic, tonic bronchitis, malaria, hypertension.
6	<i>Elaeocarpus floribundus</i> Blume.	Elaeocarpaceae	Fruit	Blood pressure, nausea, tonic
7	<i>Elsholtzia blanda</i> Benth.	Lamiaceae	Leaf	Kidney and bladder disorders, diabetes, hypertension,
8	<i>Equisetum ramosissimum</i> Desf	Equisetaceae	Whole plant	Urinary tract infections and kidney diseases

9	<i>Gynura nepalensis</i> DC	Asteraceae	Leaves and tender stem	Cuts and wounds, gastritis
10	<i>Habenaria dentata</i> (Sw.) Schltr	Orchidaceae	Rhizome	Kidney failure, impotency, tonic
11	<i>Lobelia nummularia</i> Lam	Campanulaceae	Whole plant	Cuts and wounds, gall bladder disorder, kidney stone, urinary tract infection
12	<i>Molineria capitulate</i> (Lour)	Hypoxidaceae	Rhizome	Jaundice, haemostatic, diarrhoea. dysentery, eye and ear drop, constipation
13	<i>Plantago asiatica</i> subsp. <i>erosa</i> (Wall)	Plantaginaceae	Whole plant	Dysentery, burns and in cuts, astringent, cooling, febrifuge, diuretic and tonic, toothache and pile problem,
14	<i>Polygonum molle</i> D.Don	Polygonaceae	Leaves and stems	Blood purification.
15	<i>Pouzolzia viminea</i> Wedd	Urtiteceae	leaves and roots	Skin infection and wound healing
16	<i>Rubia sikkimensis</i> Kurz	Rubiaceae	Whole plant, stem, and root	Urinary tract infections, an antidote for snake bite
17	<i>Tainia viridifusca</i> (Hook.) Benth. & Hook.	Orchidaceae	Rhizome	Skin disease and cracked heels
18	<i>Taxus wallichian</i> Zuccarini	Taxaceae	Leaves, bark	Bronchitis, epilepsy, giddiness; antiseptic, aphrodisiac, sedative, anticancer, etc.
19	<i>Thalictrum foliolosum</i> A.P. de candolle	Ranunculaceae	Roots	Fever, malaria, typhoid
20	<i>Zanthoxylum armatum</i> DC	Rutaceae	Leaves and seeds	Fever, headache, indigestion, respiratory problem, joint pain, skin allergy

Zanthoxylum armatum DC is a small tree, glabrous tree in the family Rutaceae. It is found in subtropical to temperate regions of the Himalayas, including Nepal, Bhutan, Pakistan, India, and South East Asian countries [53]. It is native species in Nagaland and is used for culinary purposes as well as medicinal uses such as treating toothache, hepatopathy, paralysis, stomach ache, indigestion, diarrhea, leprosy, anthelmintic, and liver problems [1]. The plant has been found to contain several phytoconstituents including alkaloids, flavonoids, saponin, steroids, terpenes, phenols, carbohydrates, proteins, amino acids, and an essential oil like linalool, lignan, and limonene. The pharmacological activities of *Z. armatum* include hepatoprotective, anti-diabetic, anti-depressant, anti-inflammatory, antioxidative, antimicrobial, antitumor, and other effects [54,55].

This paper has highlighted the potential pharmacological and economic value of the traditional medicinal plants used by the Nagas like *Allium chineses*, *Polygonum molle*, *Zanthoxylum armatum*, *Plantago erosa*, *Gynura nepalensis*, *Centella asiatica* and *Clerodendrum colebrookianum*. The demand for these plants is high due to the increasing popularity of traditional medicinal plants, the declining efficacy of synthetic drugs, the higher cost of modern drugs, and the rise of multidrug resistance. The traditional medicinal plants of northeast India, including Nagaland, have a niche market due to consumer confidence, risk reduction, and post-harvest technologies. India's traditional medicinal systems, including Ayurveda, Siddha, Unani, and Homeopathy, can be a platform for traditional medicinal plants with pharmacological and economic value. However further research is needed on the sustainability and production system of these plants. The paper also highlights lesser-explored traditional medicinal plants such as *Begonia palmate*, *Clematis napaulensis*, *Elsholtzia blanda*, *Gynura nepalensis*, *Pouzolzia viminea*, *Lobelia nummularia*, *Molineria capitulate*, *Polygonum molle*, *Rubia sikkimensis*, and *Tainia viridifusca*, which have traditional uses but need further investigation and validation. *Habenaria dentata* is a critically endangered orchid that needs conservation and preservation.

4. Conclusion

This study highlights the versatility and potential of plants as a source of medicine in traditional practices in Nagaland. The majority of the medicinal plants were herbs, with leaves, roots, flowers, bark, fruits, and rhizomes being the most commonly used parts. Different plant species were found to have various medicinal properties, such as antipyretic, astringent, antiseptic, tonic, and others. The study highlights the importance of preserving traditional medicine practices and promoting research to validate their use. This has the potential to contribute to the development of the pharmaceutical industry and support the upliftment of the rural economy. Further research is needed to fully understand the biological activities of these plants and to preserve traditional medicine practices through community preservation efforts.

Compliance with ethical standards

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Disclosure of Conflict of interest

The author declares no conflict of interest.

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