

Plant wealth of Northeast India with reference to ethnobotany

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The paper highlights the rich plant resources and the vast wealth of ethnobotanical information available with the various tribes of the region. A brief review of ethnobotanical and traditional knowledge system reports published by various workers from the region is given. It also highlights some important medicinal plants and its status in the wild and also discussed on the need for harnessing the rich bio-resources and translating it to economic products.

Keywords: Plant resources, Ethnobotanical wealth, Northeast India

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North East India comprising the states of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura lies between 21°34' N to 29°50' N latitude and 87°32' E to 97°52' E longitudes and covers an area of ca 262060 sq km. It represents ca 8% of the country's total geographical area. The region is characterized by diverse physiography, ranging from plains, plateaus and mountains with associated valleys. The region receives moderately high rainfall and the average minimum and maximum are 1650 mm and 6320 mm, respectively.

The North-east India is part of both Himalaya as well as Indo-Burma biodiversity hotspots in the world. It forms a unique biogeographic province encompassing major biomes recognized in the world. It has the richest reservoir of plant diversity in India and is one of the 'biodiversity hotspots' of the world supporting about 50% of India's biodiversity¹. All types right from the grassland, meadows, marshes, swamps, scrub forests, mixed deciduous forests, humid evergreen forests, temperate and alpine vegetation are found here. The varied forests types found in the region are home to numerous plants and animals. Specially, the region exhibits the richest diversity in orchids, zingibers, yams, rhododendrons, bamboos, canes and wild relatives of cultivated plants. It is also considered as cradle of 'angiosperms'

as primitive plant families such as Magnoliaceae, Lauraceae, Hamamelidaceae, Degeneriaceae, Tetracentraceae and Lardizabalaceae are well represented here. About 50% of the total 17500 flowering plants hail from the region, and 40% of them are endemic. Wild relatives of 132 economically important species, some important and notable include citrus, banana, rice, sugarcane, and pulses, are originated in this region. National Bureau of Plant Genetic Resources (NBPGR) Regional Station, Shillong has so far collected over 10000 accessions of wild relatives of crop plants since its inception. The estimated diversity in some major crops includes – rice (9650+), maize (15 varieties and 3 sub varieties), banana (14 sp), citrus (17 sp+52 vars), sugarcane and their wild relatives (15 sp) and bamboos (60 sp)². Hence, the region is regarded as the place of origin of progenitors of many cultivated crops.

More than 200 tribes of different ethnic groups with distinct cultural entities inhabit the region (Figs 1-4). Agriculture is the main occupation of the people and the crops grown are rice, brinjal, ginger, chillis, maize, tumeric, grain legumes, sweet potato, cucurbits, taros, yams, etc. The people in the hills practice 'Jhum' or 'Shifting' cultivation in which they grow cereals, vegetables and fruits. A rich variety of germplasm exist under various crops that include upland rice (298), brinjal (37), ginger (60), chillis (68), maize (674), tumeric (60), grain legumes (200),

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sweet potato (5), cucurbits (76), taros (250) and yams (242)². The tribes celebrate numerous festivals and majority of them are associated with agriculture.

The distinct tribes in the region have rich indigenous traditional knowledge system on the uses of components of biodiversity for their daily sustenance like food, fodder, shelter and healthcare (Figs 5-13). The knowledge and utilization of local plants depends on the ethnic group they belong to and also their remoteness from the modern world. Forests in general are regarded with reverence and certain states have a number of sacred grooves, they considered abodes of their gods, where cutting of tree is prohibited³⁻⁷. The table presented below shows the richness of plant resources and ethnic population of the region.

State	Total Area (Sq. Km.)	Forest Cover (%)	Tribal population (%)
Assam	27826	35.48	12.8
Arunachal Pradesh	68019	81.22	63.7
Manipur	17219	77.12	34.4
Meghalaya	16839	75.08	85.5
Mizoram	18430	87.42	94.7
Nagaland	13609	82.09	87.7
Sikkim	3262	45.97	22.4
Tripura	8093	77.18	30.9

Ethnobotanical studies

Since the early 1970's different groups in various Universities and Research Institutions have been working on ethnobotany and traditional knowledge system of the region and published many reports. Most of the publications were concerned to ethnobotany or agricultural operations including shifting cultivation and festivals of the region. Ethnobotanical reports were mainly on ethno-medicinal plants with a few publications on food and beverages⁸⁻¹². The ethno-medicinal publications in most cases cited only the names of plants used without going into the details of the method of use, the quantum of use and other related aspects. During the 1980's Ministry of Environment and Forests (MoEF), Government of India also launched an all India co-ordinated project to document ethnobotanical uses of plants by indigenous people in India which was participated by many research institutions and universities of the country. Under the project Botanical Survey of India, Eastern Circle, Shillong, undertook studies in tribal areas of Assam, Nagaland,

Tripura and Arunachal Pradesh. From the study the department recorded 200 plant species from Arunachal Pradesh use for treatment of 44 different diseases and ailments, 286 plant species from Assam for treatment of 40 different diseases and ailments, 526 plant species from Nagaland for treatment of 83 different diseases and ailments and 194 plant species from Tripura for treatment of 50 diseases and ailments^{13,14}. 834 medicinal plants have been recorded from Meghalaya by Foundation for Revitalization of Local Health Tradition (FRLHT), Bangalore¹⁵. It has been observed that most of the reports are just listing of the various plants used by different tribes. Most of these wild vegetables, fruits and medicinal plants uses are of little known or not known at all to the outside world. Also, many of the known medicinal uses of plants have not been studied empirically in detailed for the active chemical compounds. On the wild edible vegetables and fruits, nutritional values of these plants need to be investigated. For the benefit of researchers some of the reports published by different workers from the region are cited in the reference¹⁶⁻⁸¹.

Based on the observation of the ethno-botanical research publications it may be said that India is second to none in documentation in this field, however, the country has so far not been able to translate the information into economic wealth. The time has come, therefore, to selectively screen some of the interesting ethno-medicinal plants for active chemical compounds which may lead to the discovery of new novel drugs. A few examples of medicinal plants which need critically study for its active chemical compounds are given below. Also, a few plants which are over-exploited by medicinal plant traders and a list of threatened medicinal plants from the region are given for reference.

A. Some potential ethnomedicinal plants uses which require critical study

Oroxylum indicum Vent. (Bignoniaceae)

Medicinal uses of the plant are well known. The local tribes (*Sema*, *Angami* and *Lotha*) of Nagaland cook and eat the young leaves to control hypertension. Also, the seed is eaten raw to control hypertension. This is new information and need to verify clinically.

Solanum kurzii Brace ex Prain (Solanaceae)

The fruit is used as anti-allergy by the *Mao Naga* tribe of Manipur. The fruit is crushed and the juice is applied to the allergy area of the body. This is very



Fig.1 An old Apatani lady



Fig.2 An Adi lady



Fig.3 An Adi man



Fig.4 Khasi boys in Traditional dress



Fig.5 *Cordyceps sinensis*



Fig.6 *Panax assamicus* rhizome



Fig.7 *Panax assamicus*



Fig.8 *Berginia ciliata*



Fig.9 *Croton caudatus*



Fig.10 *C. caudatus* leaf decoction



Fig.11 Lichens trade



Fig.12 Sale of edible hornets



Fig.13 Edible water bugs

effective for any types of allergies. The fruit is also edible and use by the tribals' of the region as vegetable.

Pouzolzia hirta Hassk. (Urticaceae)

It is a small herb. The root is grinded into a paste and applied to the boil in any part of the body to extract out the pus. The sticky paste act like plaster to suck the pus out. It is very effective and widely practiced by the *Khasi* tribe of Meghalaya. Also, the local herbal practitioners use *P. hirta* and *P. viminea* Wedd. root paste for fracture bone setting.

Lysimachia racemosa Lam. (Primulaceae)

The leaf of this herb is use by the *Khasi* tribe of Meghalaya for de-worming in children as well as adults. The fresh leaf is eaten raw. A handful of the leaves are sold for Rs.10/- in Shillong bazaar. It is said to be very effective for de-worming and very popular with the local people.

Litsea cubeba (Lours.) Pers. (Lauraceae)

The bark of the tree is used for treating foot and mouth disease of cattle *Khasi* and *Jaintia* tribes in Meghalaya. The bark is ground and given to the cattle two times a day for 3-4 days to cure it completely.

Anemone revularis Buch.-Ham. ex DC. (Ranunculaceae)

The leaf is crushed and aroma is inhaled to cure sinus problem. It gives a burning sensation. The local *Khasi* herbal practitioners in Shillong recommend for people suffering from sinusitis.

Rhus javanica L. (Anacardiaceae)

The fruit juice is taken for to control any types of loose motion. The dried fruits is boiled in a cup of water and taken like juice. One can add sugar to it to give a sour-sweet taste. It is commonly taken by *Naga* tribe of Manipur and Nagaland.

B. Some over-collected medicinal plants of the region.

A few important medicinal plants from the region have been described below as to how they are being driven into various categories as 'threatened'.

Cordyceps sinensis (Berk.) Sacc. (Clavicipitaceae)

It is also known as 'caterpillar fungus'. In nature, this mushroom grows only off the head of a buried caterpillar. It comes out from the high Himalayas' mountains. For centuries in the Orient, this mushroom has been highly priced for its medicinal properties and even today it is highly priced medicinal mushroom.

Its medicinal properties, such as antibiotic, increase of physical stamina, anti-cancer, anti-asthma, etc. are well known. In northeast India, it is found in Arunachal Pradesh and Sikkim in high Himalaya's mountains. Local people living at the Indo-China border find the caterpillar fungus by watching the wild yaks and the mushroom is found where the wild yak graze. A single mushroom costs between Rs.100-200/- depending on the availability. So far, no cultivation techniques have been developed and as a result all the supply comes from the wild. Over the years local people have been collecting and are becoming very rare. Hence, cultivation technique of this highly priced mushroom should be developed like in China and America. This will greatly boost the economy of the remote villagers living at high altitudes.

Dendrobium denudans D.Don, *D. eriaflorum* Griff., *D. transparens* Wall. and *D. devonianum* Paxt. (Orchidaceae)

The pseudobulbs of these orchids are collected when the leaves have fallen. These orchids are collected in large quantities by the local people especially in Manipur and Mizoram. It is for sold Rs.200/- to 600/- per kg depending on the demand from across the border in Myanmar. Except for flowers, the local villagers have no knowledge of the use of these orchids. It is believed that the orchid may be used in the manufacturing of some drugs. These orchid species have become already rare and endangered especially in Manipur and Mizoram due to over-collection.

Lemanea australis Alkins (Leimaneaceae)

It is fresh water green alga found on stones in the river of Sugnu area in Chandel district, Manipur. Locally, known as *Nungsham* (stone hair) and collected by the local villagers during the months of October to December for its delicacy. The alga eaten fresh or in dried form is very rich in iron source and considered good for health. The alga used to be abundance in the river many years ago but recently, it has become very rare and endangered due to over collection by the local people. The habitat of the plant is unique that is only found in this river and not in any other place in Northeast India.

Lycopodium pseudoclavatum Ching (Lycopodiaceae)

The plant has been extensively collected in large quantities especially from Meghalaya. Most of the

supply goes to some firms in south India. It is also used in some homeopathic and Ayurvedic medicines and used in the making of crackers. The plant used to be abundant in East and West Khasi hills but now it is very less due to over collection.

Panax assamicus Banerjee (Araliaceae)

The plant is commonly known as ginseng by the local people. It is found in the hills of Arunachal Pradesh, Manipur, Meghalaya and Nagaland. The rhizome is used as a tonic and vitalizer by the local herbal practitioners. The rhizome has been extensively collected from the forest by local people in the late 1990's to 2001. One kg of rhizome is sold for Rs.700/- to 1,000/- in Manipur and Nagaland in the early part and later on it is sold as low as Rs.100/- per Kg. It is also sold in the form of powder @ Rs. 1,000/- per Kg at Dimapur and Kohima in Nagaland. As a result, the plant has become very rare and endangered especially in Manipur and Nagaland.

Paris polyphylla Sm. (Liliaceae)

Medicinal use of the plant by the local people is not known but is used in Chinese medicine for its anticancer properties. The plant is abundant in the higher hills of Northeast India. However, recently the plant has been collected in large quantity by local plant collectors and sold to Myanmar national. Recently, a few local buyers from Manipur had bought about 1.0 lakh kg of rhizomes collected from Manipur, Nagaland, Arunachal Pradesh and Meghalaya. One kg of fresh rhizome cost from Rs.150/- to 200/- and for dried ones Rs.500/- to 700/-. The plant which once used to be abundant in the hills has become very rare due to over collection.

Rubia manjith Roxb. ex Fleming (Rubiaceae).

The plant root is collected in large quantities from various parts of Northeast India. The local buyers pay Rs.15-20/- per kg from the villagers and then sell to the middlemen @ Rs.35-50/- per kg. In 2007 alone, over 20 trucks loads of the root have been exported from one district in Arunachal Pradesh, which clearly indicate the amount of extraction from the region. The plant is not cultivated by the villagers but is collected from the wild. Hence, there is all possibilities that this plant may become endangered if the trend continues without encouraging the villagers to cultivate.

Taxus wallichiana Zucc. (Taxaceae)

Medicinal use of the plant by the local people is not known and there were very good population in many

natural habitats in Arunachal Pradesh, Manipur, Meghalaya and Nagaland. However, in the early nineties some private buyers from outside the region collected it extensively from these states through local plant collectors. During survey of Ukhrul district (Manipur) in 2001 many big tree of hundreds of years old were virtually found to be dead due to collection of the leaves. As the local villagers were not taught good harvest practices, they collected all the leaves from the tree. Due to similar practice, the plant has become very rare in all the states of northeast India.

C. Some threatened important medicinal plants of north east India

All taxa listed as Critically Endangered (CR) qualify for Vulnerable (VU) and Endangered (EN), and all listed as Endangered qualify for Vulnerable. Together these categories are described as threatened. Some important medicinal plants listed below from the region are in the various threatened categories (Source: BSI).

Aconitum ferox Wall. Ex Ser. (Ranunculaceae) – EN

Aconitum heterophyllum Wall. Ex Royle (Ranunculaceae) – EN

Aquilaria khasiana Hallier f. (Thymelaceae) – CR

Aquilaria malaccensis Lam. (Thymelaceae) – CR

Bergenia ciliata Sternb. (Saxifragaceae) – VU

Coptis teeta Wall. (Ranunculaceae) – EN

Cordyceps sinensis (Berk.) Sacc. (Clavicipitaceae) – EN

Dendrobium nobile Lindl. (Orchidaceae) – EN

Flickingeria fugax (Rchb.f.) Seidenf. (Orchidaceae) – EN

Garcinia pedunculata Roxb. (Clusiaceae) – EN

Gentiana quadrifaria Blume (Gentianaceae) – VU

Homalomena aromatic (Roxb). Schott (Araceae) – VU

Lemanea australis Alkins (Leimaneaceae) – CR

Lycopodium pseudoclavatum Ching (Lycopodiaceae) – VU

Malaxis muscifera (Lindl.) Kuntze (Orchidaceae) – CR

Nardostachys jatamansi (D.Don) DC. (Valerianaceae) – EN

Panax assamicus Banerjee (Araliaceae) – EN

Paris polyphylla Sm. (Liliaceae) – VU

Rauwolfia serpentina (L.) Benth. Ex Kurz (Apocynaceae) – CR

Rubia manjith Roxb. ex Fleming (Rubiaceae) – VU
Smilax glabra Roxb. (Smilacaceae) – CR
Swertia chirayita (Roxb.) H. Karst. (Gentianaceae)
 – VU
Taxus wallichiana Zucc. (Taxaceae) – EN
Valeriana hardwickii Wall. (Valerianaceae) – VU
Valeriana jatamansi Jones (Valerianaceae) – VU

Discussion

Many research papers on rich bio-resources of the region have been published by various workers but so far no tangible outcome of economic benefit for the people. Also, many interesting medicinal plants are being reported, for example, the recent report on *Croton caudatus* (Euphorbiaceae) as anticancer from Churachandpur district, Manipur which had caught many National News papers attention. Thousands of patients from different states of India had visited the man in his village and taken the leaf decoction. Therefore, it requires urgent systematic investigation using biotechnological tools to authenticate and develop new novel drugs from the rich bio-resources of the region. The studies must be taken up on priority basis otherwise it will be a great loss for India and mankind as the environmental scenario of the region is changing rapidly. The bio-resources along with the rich indigenous knowledge systems are depleting so fast due to various anthropogenic activities and rapid urbanization. Also, due to lack of knowledge on good harvest practices, many plant collectors over exploited many important medicinal plants without knowing the future consequences. The region also has a unique problem of enforcing conservation law. The entire region except for Assam, Tripura and Sikkim *ca* 90% of the land belong to the communities and the state Government has no control over them. As a result, in spite of the ban of tree cutting imposed by the Supreme Court, people still continues to harvest the forests for economic gains. Many of the tribal communities whose life styles were once very simple, but have now become sophisticated and urbanized. With changing trends, the sustainable utilization of resources is getting lost. The wild vegetable, edible fruits, cultivated land races of crop once nurtured by ethnic groups, are being replaced by the imported commercially available high yielding hybrid varieties resulting to the loss of precious native germplasm. They have become more dependent on the imported products available in the markets. The traditional knowledge system they possessed or inherited as a

legacy is vanishing fast or polluted with the impact of modernity.

This valuable ethnobotanical information along with the rich bio-resources of the region needs to be conserved and taken up for sustainable utilisation involving the various ethnic tribes. They should be trained in good harvest practices and post harvest technology. The rich bio-resources have to be translated into products and uses without which the rich resources have no value for the poor stricken people of the region who are the custodian of it. The concern authorities and parties need to build local people's confidence coupled with sensitizing the people of the virtues of conservation. They should be jointly involved in the preparation of Biodiversity Registers. At the same time, there has to be scientific and technological intervention to bring a change in their skills and in converting the rich bio-resources into economic wealth. The people should be encouraged to take up entrepreneurships sustainably utilizing the rich bio-resources and indigenous knowledge system with value addition to it through scientific and technological inputs from the various research institutions in the country. Therefore, the need of the hour for the region is to capitalize like other neighbouring South East Asian countries the rich bio-resources along with the rich indigenous wealth for the benefit of the people in the region and our country.

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