

# MEDICINAL PLANTS OF NORTH EAST INDIA

*Status Diversity Conservation Cultivation and Trade*



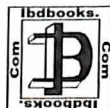
**Pratap Jyoti Handique**

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*Status Diversity Conservation  
Cultivation & Trade*



*By*  
**Pratap Jyoti Handique**



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## PREFACE

This book largely consists of the record and analysis of my own field and experimental work done on medicinal plants since the year 1985. This book also includes review and information from various available literatures on medicinal plants of North East India contributed by a number of scientist, forest personnel and traditional medicinal practitioners. All the literature cited and consulted are included in the bibliography. Description of 751 medicinal plant species found in NE India is given in the book besides comprehensive discussion on their status and diversity. It also contains ample information on the status of conservation, trade and cultivation of medicinal plants in NE India. Moreover, a chapter comprising information on physiography, climate, vegetation and floristic diversity of NE India is included in the book.

I have received tremendous help, cooperation, guidance and encouragement from the cross section of the people of this region in pursuing my work. I sincerely thank the PCCFs and other Officials of the Forest Departments of Assam, Arunachal Pradesh, Meghalaya and Mizoram for providing me various information and help during the field work. I also acknowledge the help and co-operation of BSI, Eastern Circle, Shillong; BSI Regional Centre, Itanagar; Regional Research Centre – Ayurveda, situated in Guwahati and Itanagar; Assam Science Technology and Environment Council, Guwahati; various traders and individuals of Assam, Arunachal Pradesh and Meghalaya. I sincerely acknowledge the help and cooperation of SFRI, Itanagar; State Medicinal Plant Board (SMPB) - Assam; AIDC, Guwahati; Bioresource Center (ASTECC, Guwahati); Silviculture Research Centre, Basistha, Guwahati; Jakai Bioresource Centre, Dibrugarh; and Defence Research Laboratory, Tezpur.

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**Pratap Jyoti Handique**

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## Profile of NE India

North East India comprising the states of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland and Tripura is a distinct biogeographic region in India as well as in the world. It is located between 20°N to 29°30'N latitude and 89°46'E to 97°30'E longitude. The total geographical area of this region is 2,55,161 km<sup>2</sup>. The statewide area is given in the table-1.1.

**Table –1.1: Statewide area of North East India.**

State	Total area (Km <sup>2</sup> )	Estimated forest area (Km <sup>2</sup> )
Arunachal Pradesh	83,725	68,906 (82.3%)
Assam	78,523	26,069 (33.2%)
Manipur	22,327	17,861 (80.0%)
Meghalaya	22,429	15,754 (69.8%)
Mizoram	21,087	18,177 (86.2%)
Nagaland	16,579	14,407 (86.9%)
Tripura	10,491	5,339 (50.9%)

Source: Basic Statistics of NER 1995

### 1.1 Physiography

North East India can be divided into three physiographic units –(a) the Plateau, (b) the Hills and Mountains and (c) the Plains. The Plateau region comprises of Meghalaya plateau and the Karbi plateau. Meghalaya plateau consists of three hills viz. the Garo, the Khasi and the Jaintia Hills. Karbi plateau consists of two hills viz. the Karbi and the Rengma Hills. The Hills and Mountains stretch from the Bhutan Himalaya covering the northern part of the region and then turning southern covers its eastern and southern parts. The eastern hills cover southeastern Arunachal, Nagaland, North Cachar Hills of Assam, and a part of Manipur, Mizoram and the eastern part of Tripura. The unit as a whole can be divided into two sub-units viz., (a) Arunachal Himalaya-covering northern mountain parts and (b) the Patkai-Purvachal Hills- covering eastern and southern parts. The Arunachal Himalaya is an integral part of Eastern Himalaya. The Plains consist of four distinct areas - the Brahmaputra plain (area 54315 Km<sup>2</sup>), the Barak plain (6962 Km<sup>2</sup>),



Manipur plain (1843 Km<sup>2</sup>) and Tripura plain (1843 Km<sup>2</sup>).

## 1.2 Climate

The climate of North-Eastern India is primarily tropical characterized by heavy monsoon rainfall. The important local phenomena that affect the climate of the region are – (a) the mountain and valley winds, (b) the dust storms, (c) the haze, mist and fog, and, (d) the cyclones. Considering the temperature, pressure and humidity in their temporal distribution, the weather conditions of the region in a year can be divided into four seasons viz. – Winter (Dec- Feb), Pre-monsoon (Mar-May), Monsoon (June-Sept.) and Retreating Monsoon (Oct-Nov.). The temperature falls down over the high hills and mountains often to 0°C. Arunachal Himalayas experiences a temperature below 0°C during winter nights. The hills of Manipur, Mizoram and Meghalaya experience a minimum temperature of 4°C or below. Minimum temperature ranges between 7°C –13°C in the plains. The region experiences high temperature ranges from 18°C to 36°C during the monsoon season. The average annual rainfall in Assam, Manipur and Tripura is 300 cm. But the rainfall pattern is highly variable. In Cherrapunji and Mawsynram (south Meghalaya) the average annual rainfall has been recorded upto 1200 cm while in Shillong located only 50 km from Cherrapunji gets only 240cm as average annual rainfall. Arunachal Pradesh receives a high rainfall with an annual average of 500 cm.

## 1.3 Soil

Soil is one of the most important ecological factors, which determines the distribution of the ecological groups of plant, such as Oxylophytes (on acidic soil), Halophyta (on saline soils), Psammophytes (on sand), Lithophytes (on rock surface) and Chasmophytes (in rock crevices) (Rao, 1994). Mainly four types of soil – alluvial, red, laterite and mountain soil is found in this region. Alluvial soil, which is further, divided into old and new alluvial soil is found in the river valleys and the plains. Red soils are found on all hill tops and the hill slopes. Laterite soil is found only in small patches at the medium altitude of the hills. Mountain soil is found at very high altitude (above 4500 M).

## 1.4 Biogeographic Status of NE India

In a recent classification (Rodgers and Panwar, 1988), India as a whole is divided into 12 biogeographic zones:

1. Trans Himalayas
2. West Himalaya
3. Eastern Himalaya
4. North East India

5. The Indian Desert
6. Semi-arid zone
7. Gangetic plain
8. Western ghats
9. Deccan peninsula
10. Indian coasts
11. Andaman and Nicobar Islands
12. Lakshadweep Island

According to this classification the North East India embraces two biogeographic zones, viz., (a) Eastern Himalaya comprising Arunachal Pradesh and (b) North East India-comprising the states of Assam, Manipur, Meghalaya, Mizoram, Nagaland, and Tripura. The Eastern Himalaya is accounted for a great diversity in plant wealth. The North East India biogeographic zone is the most significant among all the zones of India. This zone is identified as the richest zone in biodiversity- in terms of diversity at community level, at the species level and in endemic. The Khasi and Jaintia Hills of Meghalaya are perhaps the richest botanical habitats in entire Asia (Rao, 1994). However, in this book, both these zones will be considered as one unit in the name of "North East India" or "NE India".

## 1.5 Vegetation Diversity

The vegetation and flora of North East India has been studied by several workers chiefly by Griffith (1847), Hooker (1849), Clarke (1889), Bor (1938, 1942), Fisher (1938), Kanjilal et al (1934-40), Biswas (1934, 1941), Das (1942), Kingdon and Ward (1960), Deb (1960), Naik and Panigrahi (1961), Panigrahi and Joseph (1966), and Rao and Joseph (1965). Some other important works on flowering and non-flowering plants of NE India include Das and Rajkhowa (1968), Rao (1974), Baishya and Rao (1982), Haridasan and Rao (1985-86), Rao and Hajra (1986), Jamir and Rao (1988), Handique (1992), and Bora and Kumar (2003).

Based on these works the vegetation of North East India is classified under the following five types: (1) Tropical, (2) Sub-Tropical, (3) Temperate, (4) Sub-Alpine and (5) Alpine vegetation. Each of these types is composing of various subtypes, primarily based on altitude and climatic conditions.

### 1.5.1. Tropical Vegetation

Tropical vegetation typically covers the area upto the elevation of 1000m. This vegetation embraces four different types of forests viz.. (a) Tropical evergreen and semi-evergreen forests, (b) Deciduous forests, (c) Grasslands, and (d) Swamps forests.

### (a) Tropical evergreen and Semi evergreen forests

These forests represent one of the major ecological types in the region with rich floristic diversity. The outstanding features of tropical evergreen forests are their high species diversity, complex stratification and large standing crop biomass. The species composition in these forests is very much interesting and varies from region to region and even district to district, particularly in Arunachal Pradesh. It is difficult to draw any generalization regarding species composition in different vegetation and forest types (Rao, 1994). The list of species given here is only of representative but may not be typical of all the regions.

The top canopy consisting of some of the lofty tree species such as *Dipterocarpus retusus* Bl., *D. turbinatus* Gaertn., *Duabanga grandiflora* (Roxb. Ex DC) Walp., *Artocarpus chama* Buch.-Ham., *Terminalia myriocarpa* Heurck & Muell., *Tetrameles nudiflora* R.Br. ex Benn., *Ailanthus integrifolia* ssp. *calycina* (Nees) Nees, *Altinga excelsa* Noronha, *Phobe lanceolata* King & Prain, *Aglaia hiernii* Vishwa & Ramach., *Gmelina arborea* L., *Dysoxylum binectariferum* Hk.f., *Kayea assamica* (Pierre) Nootb. These trees are heavily plastered with lichens and festooned with climbers and epiphytes.

The middle storey is characterised by the preponderance of *Mesua ferrea* L., *Endospermum diadenum* (Miq.) Airy Shaw, *Gardenia paniculata* Roxb., *G. pedunculata* Roxb., *Garuga pinnata* Roxb., *Ficus rumphii* Bl., *Knema angustifolia* (Roxb.) Warb., *Cinnamomum pauciflorum* Nees., *C. tamala* Nees, *Lagerostroemia parviflora* Roxb., *Syzium grande* Walp., *Sapium baccatum* Roxb., *Sterculia hamiltonii* (Kuntze) Adelb.

The third storey consists of trees of 5 to 10 m high. The main components in this strata are *Premna bengalensis* Cl., *Carallia brachiata* (Lour) Merr., *Ficus recemosa* L., *Hibiscus macrophyllus* Roxb., *Picrasma javanica* Bl., and number of smaller tree species. The shrub layer is quite evident and often merges with smaller tree layer. The herbaceous flora is quite conspicuous and mainly belonging to *Rubiaceae*, *Poaceae*, *Begoniaceae*, *Fabaceae*, *Acanthaceae* and *Zingiberaceae*. Several species of tree ferns, Angiopteris, other ferns and fern allies, many lianas are common in these forests. Different species of Cane and Bamboo are profuse in the valleys and foothills. The epiphytic species mainly ferns and orchids also show a great profusion and variety in these forests.

### (b) Tropical deciduous forests

Deciduous forests occur in the areas with less than 150 annual rainfall. These are subclimax, man-made forests. Characteristic nature of the forests is seasonal leaf shedding and profuse flowering of trees. These forests are predominated by *Shorea*

*robusta* Gaertn.f. Other important species are *Tectona grandis* L.f., *Sterculia villosa* Roxb.ex.Sm. and *Gmelina arborea* L., *Schema wallichii* (DC) Korth, *Tetramelos nudiflora* R.Br., *Albizia* spp., *Vitex peduncularis* Wall.ex SCH., *Lansea coromandelica* (houtt.) Merr., *Bobax ceiba* L. The shrubby layer is often gregarious and forms impenetrable thickets during rainy season. The herbaceous undergrowth in these forests is quite variable. A number of introduced weedy species of the genera *Eupatorium*, *Galinsoga*, *Mikania* and *Lantana camera* L. are also seen in these forests during the dry period.

In some areas, these forests tend to become mixed deciduous forests with the intrusion of evergreen elements such as *Elaeocarpus floribundus* Bl., *Toona ciliata* Roem. Etc. Bamboos are also conspicuous elements in these areas.

### (c) Tropical Grasslands

The grassland vegetation makes appearance around 1000m of Arunachal where subtropical evergreen forests also exist. The common species are *Arudinella bengalensis* (Spreng.) Druce, *Setaria palmifolia* (Willd), Stapf, *Phragmites karka* Trin..ex Steud., *Arundo donax* L., etc. Savannah type of grasslands occurs in riparian flats inundated by floodwater of the river Brahmaputra. The common grasses are the species of *Saccharum*, *Anthisteria*, and *Erinthus Phragmites* etc. These grasses are very much tall. These grasslands are the result of removal of original forest cover. The grasslands in the higher altitude of Shillong plateau are the rolling grasslands composed of short grasses at the ground level. In many places the grasses are intermixed with sedges. The grasses are giving a green look to the barren hills and support many dicotyledonous species. The grassland area of the Kaziranga National Park represents a combination of grasslands, swamp forests and marsh, which form the ideal habitat for the one horned rhino.

### (d) Swamp or Marsh forests

Swamp or marsh vegetation is a characteristic feature of the tropical vegetation in the high humid Brahmaputra valley. This region contains extensive patches of natural vegetation in the form of swamps and marshes (Rao, 1974). In the valley innumerable number of stagnant ponds, which are locally known as 'beel', supports rich diversity of aquatic angiosperms. The dominant aquatic species belongs mainly to the families Nymphaeaceae, Lamnaceae, Araceae, Cyperaceae, Poaceae, Eriocaulaceae and Najadaceae.

## 1.5.2 Subtropical Vegetation

The subtropical forests occupy the elevations from 1000-2000 m in Arunachal

and 900-1800 m in the rest of the N.E India where average annual rainfall is between 150-500cm. The forest types are mainly – (a) Sub-tropical evergreen and semi evergreen forests and (b) Sub-tropical pine forests.

### (a) Sub-tropical evergreen and semi evergreen forests

These forests are climatic climax forests seen scattered in valleys, banks of rivers and streams and in pockets on hills. Trees are generally of a bushy appearance. The stratification is not clear but shrubby and herbaceous layers are well marked. Epiphytes are many in these forests. The undergrowth is impenetrable. Some of the common tree species are – *Castanopsis tribuloides* DC., *C. indica* A.Dc., *Ficus elastica* Roxb. Ex Hornem., *Magnolia insignis* (Wall.) Bl., *Exbucklandia populnea* (R.BR.) Griff., *Elaeocarpus floribundus* Bl., *Saurauia asciculate* Wall., and several others. A large number of the species of fungi, moss, ferns and fern allies are seen as undergrowth. Various species of the angiospermic family Zingiberaceae, Araceae, Commelinaceae, Gesneriaceae, Asteraceae, Solanaceae, and Urticaceae also occupy ground vegetation.

### (b) Sub-tropical pine forests

These forests are found at high elevations along the slopes of the hills. *Pinus kesiya* Royle ex Gourd is the principal element occurring in almost pure stands. Several broad leaved species are also found in these forests which include *Schima wallichii* Chgoisy, *Engelhardtia spicata* Leschen.ex Bl., *Rhododendron arboreum* Sm., *Terstroemia gymnanthera* (WT. & Arn.) Bedd. and *Garuga pinnata* Roxb. The forest floors support the growth of thick layer of herbaceous and shrubby species such as *Lyonia ovalifolia* (Wall.) Drude, *Dipsacus asper* DC., *Osbekia* spp., and many others.

## 1.5.3 Temperate Vegetation

The temperate forests occupy the areas between 1800-3000 m where rainfall is high (200-500 cm) and are seen in Arunachal, Shillong plateau, Nagaland, Mizo hills and Karbi Anglong hills (Mikir hills). These are climatic climax forests and usually found in isolated pockets along valley slopes and stripes. Mixed forests of *Acer*, *Betula*, *Juglans*, *Magnolia*, *Muchelia*, *Quercus*, *Rhododendron* and many other species occupy the hill slopes and the valleys in the lower elevations. *Rhododendron*, *Pinus* and *Tsuga* dominated the areas of higher elevations. The temperate conifer forests are found in Naga Hills and in Manipur. The dominant species is *Pinus wallichins* Jack. It is associated with *Rhododendron*, *Quercus*, *Lyonia*, *Alnus* and several other broad-leaved species.

In Meghalaya and adjoining areas the temperate forests show a bushy and

stunted habit. In Arunachal, cool broad-leafed forests appear upto elevations of 2500 m. The dominant species are *Acer campbellii* HK.F & th., *Corylopsis himalayana* Griff., *Persea* spp., and *Symplocos* spp. Temperate oak forests are seen at 1800-2600 m altitude where rainfall varies from 200-300 cm. The dominant species of these forests are – *Lithocarpus elegans* (Bl.) Hotus ex Soepadmo., *Rhododendron arboreum* Sm., R., *Litsea thomsonii* Meissn., *Rhododendron falconeri* HK.f., *Rhododendron thomsonii* HK.f and several others. Epiphytic flora is exceptionally rich. The fern flora is also dominant and shows gregarious growth

### 1.5.4 Sub-alpine Vegetation

The sub-alpine vegetation mainly occurs at 3500-4200 m altitude in Arunachal Pradesh, Nagaland and Manipur. The tree species in these forests are very rare. In Arunachal, the dominant species is *Abies densa* Griff., associated with *Betula utilis* D.Don and rarely by *i* Hk.f. & Th. In Naga Hills and Manipur, the dominant species are *Abies spectabilis* Spach, *Picea spinulosa* (Griff.) Henry., and *Tsuga* sp. The bushy and herbaceous flora is conspicuous in these forests. Shrubby species are mostly belonging to the genus *Berberis*, *Cotoneaster*, *Ribes*, *Rhododendron*, *Salix*, *Juniperus*, and a few others. The major herbaceous species are of genera *Meconopsis*, *Cardamine*, *Primula*, *Pedicularis*, *Astragalus*, *Corydalis*, *Polygonum*, *Saussurea*, *Aconitum* and *Anemone*.

### 1.5.5 Alpine Vegetation

Alpine vegetation occurs in Arunachal Himalaya between the altitude of 4200-4500 m. This vegetation is strikingly composed of low shrubs and herbs, which are all, stunted. The common species are *Rhododendron anthopogon* D.Don, *R. campanulatum* D. Don., *R. nivale* Hk.f. (only 5 cm high), *R. pumilum* Nutt., Hk.f., *P. glabra* Klatt., *Sedum* spp., *Polygonum* spp., *Pedicularis* spp., *Ephedra* spp., D.Don, *Thylacospermum caespitosum* (Comb.) Schischk. and several others.

## 1.6 Plant Diversity

North East India captures maximum precipitation and high humidity, which is conducive for plant life. It also comes in direct contact with many other floristic regions, so that there is free migration of flora. With its significant vegetation diversity and characteristic species composition, the region is the richest botanical diversity centre in the entire subcontinent. The region houses a large number of genera and species including endangered and endemic members.

The total number of the flowering plant species in India is expected around 17,000 spreaded over 315 families. About 50% of these species (around 8000) spread

over 200 families are found in North East India. The region houses several dominant families of flowering plants with large number of genera and species. The list of these families with the number of genera and species is given in the Table-2 showing their comparative abundance in N.E. India, India and world.

**Table-1.2: Number of Genera and Species in some dominant families of higher plants occurring in NE India, India and World**

Family	NE India		India		World	
	Genus	Species	Genus	Species	Genus	Species
<i>Orchidaceae</i>	104	700	200	1500	735	20000
<i>Poaceae</i>	160	500	240	1100	620	10000
<i>Fabaceae</i>	50	200	100	750	482	12000
<i>Cyperaceae</i>	14	175	21	350	90	4000
<i>Rubiaceae</i>	50	170	80	280	500	6000
<i>Euphorbiaceae</i>	55	160	65	340	300	5000
<i>Acanthaceae</i>	25	125	70	340	250	2500
<i>Lamiaceae</i>	30	95	65	380	180	3500
<i>Zingiberaceae</i>	18	73	20	115	46	850
<i>Asteraceae</i>	25	70	135	710	900	1300
<i>Urticaceae</i>	15	45	25	114	45	550
<i>Caesalpiniaceae</i>	11	42	23	801	52	2800
<i>Scrophulariaceae</i>	15	35	60	350	180	3500
<i>Mimosaceae</i>	10	35	15	75	56	2800

[Arranged in descending order in terms of species number available in N.E. India]

### 1.6.1 Endemic and Rare Species

The region provides maximum number of endemic species, which are of considerable botanical and economical importance. Some such endemic species are: *Acanthophippium sylhetensis* Lindl., *Ardisia quinquangularis* A.Dc., *Aphyllorchis vaginata* Hlk. f., *Ardisia rhynchophylla* Cl., *Coptis teeta* L., *Distylium indicum* Benth., *Gastrodia exilis* HK. f., *Heychium calecaratatum* Rao & Verma, *H. dekianum* Rao & Verma., *H. marginatum* Cl., *Ilex embellioidea* Hk. f., *Illicium griffithi*., *Magnolia griffithi* Hk. & Th., *M. gustavi* King., *Merrillioanax cordifolia* Sastry, *Pachylarnax pleiocarpa* Dandy, *Paphiopedilum ingigne* (Wall) pftiz., and *Nepenthes khasiana* Hk.f. A large number of plant species found in this region is either extremely rare or endangered. These include – *Rouwolfia serpentina*, *Venda coerulea*, *Gymnadaenia orchidis*, *Cycus pectinata*, *Gnetum gnemon*, *Podocarpus nerifoliius*, and many others.

## 1.6.2 Large groups

Several groups of plants exhibit remarkable species diversity in North East India. These groups are orchids, bamboo and fern and fern allies. About 700 species of orchids, 58 species of bamboo and 600 species of fern and fern allies are reported from this region.

## 1.6.3 Economic and medicinal plants

The North East India is very much rich in different group of economic and medicinal plants. The region houses about 40 species of high valued timber yielding plants. Bamboo and cane are another two major groups of economic plants. Quite a large number of species of wild plants are used as food and vegetables, about 40 species of which are marketed in local tribal and village bazars. About 1000 plant species of this region are reported as medicinal plants. Some of the high valued medicinal plants of this region are – *Aconitum ferox*, *A. chasmanthum*, *A. heterophyllum*, *Coptis teeta*, *Taxus baccata*, *Podophyllum hexandrum*, *Dioscorea deltoidea*, *Acorus calamus*, *Rauvolfia serpentina*, *Berberis asiatica*, *Artemisia nilagirica*, *Panax pseudoginseng*, *Picrorhiza kurooa*, and *Velerina jatamansi*.

## 1.6.4 Centre of Origin

North East India as a whole is one of the major centres of origin for a number of species. Some of such important plant groups are citrus, cucurbits and banana besides many tropical fruits and cereals. There are 64 varieties of *Citrus*, which grow wild in this region. The genus *Cucurbita* has maximum diversity in this region and about 12 species with several varieties are found. This region is also regarded as centre of origin of five species of Palms, viz., coconut (*Cocos nucifera* L), areca nut (*Areca catechu* L.), palmyra palm (*Borassus flabellifera* L), sugar palm (*Arenga saccharifera* Labill) and wild date palm (*Phonix sylvestris* Roxb).

## 1.6.5 Diversity in wild relatives of cultivated plants

This region is regarded as the “Hindustani Centre of origin of cultivated plants” by Vavilov (1926, 52). The region forms the richest reservoir of genetic variability of many groups of crop plants. Over 50 species of economic plants have their genetic diversity in this Hindustani Centre of Diversity (Zeven and Zhukovsky 1975). In a recent report, 189 species has been recorded as wild relatives of crop plants (Rao 1994).

## 1.6.6 Botanical Curiosities

Several plant species found in this region are considered as “Botanical curiosity”



on account of their special modifications and adaptations. Many of them are also endangered. List of such plants with peculiarities and status of abundance is given in the table 3.

**Table 1.3: Plants with botanical curiosities.**

Species name	Peculiarity	Abundance
1. <i>Aeginitia indica</i> Roxb	Root parasite on grass	Extremely rare
2. <i>Balanophora dioica</i> R.Br.	Root parasite	Endangered
3. <i>Boschniaekia himalaica</i> Hk.f. & th.	Root parasite on rhododendron	Endangered
4. <i>Mitrastemor yamamotoi</i> Makino	Root parasite on rhododendron	Polyendemic
5. <i>Rhopalocemis phalloides</i> Jung	Root parasite on rhododendron	Endangered
6. <i>Cheilotheca humilis</i> (D.Don) Keng.	Saprophyte	Rare
7. <i>Epipogium roseum</i> (D.Don) Lindl.	Saprophyte	Rare
8. <i>Galeola falconeri</i>	Tallest saprophytic orchid	Extremely rare
9. <i>Nepenthes khasiana</i> Hk.f.	Insectivorous	Endemic & rare
10. <i>Drosera peltata</i> Sm.	Insectivorous	Rare
11. <i>D. burmannii</i> Val	Insectivorous	Rare
12. <i>Thylacospermum</i> sp.	Cushion forming	-
13. <i>Saussurea gossypiphora</i> D.Don.	Snow ball like appearance	-
14. <i>S. graminifolia</i> Wall ex.DC.	Snow ball like appearance	-
15. <i>Rheum nobile</i> Hk.f. & Th.	Sheltering inflorescence by bracts	Rare
16. <i>Saussurea obvallata</i> (DC) Edgew.	Hot house, sheltering inflorescence by bracts	-

### 1.6.7 Primitive Flowering plants

There is a large number of primitive flowering plants species growing in the North East India. These species do not occur in other parts of India but grow further eastwards of North Eastern region. Some of the prominent species of the category are *Magnolia* spp., *Manglietia* spp., *Distylum indicum*, *Tetracentron sinensis*, *Pycnarrhena pleniflora* and several others.

## Diversity, Status and Conservation

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North East India as a whole is a home for a large number of diverse medicinal plants including several rare, endangered and endemic species. Till the recent past all the states of this region were fairly wooded with thick vegetation all round. But with the acceleration in urbanization and as a result of bringing greater hilly forest areas under shifting cultivation or jhuming the forests are confined mainly to reserve forests and patches of inaccessible terrain. Moreover, unregulated exploitation of forest plant wealth by a section of motivated people and many other socio-economic factors are responsible for depletion of forest cover in this region. It is to be mentioned that even after facing massive deforestation, this region is still rich in species diversity of medicinal plants. Even many forest areas are remaining uninvestigated for medicinal plant wealth till date.

There are quite a good number of works available mainly on ethno-botanical enumeration of medicinal plants of this region. However, no comprehensive treatise of medicinal plant is seen till date that incorporates the state wise list of plant species along with other relevant information such as local name, distribution, trade, uses and information about phytochemical enumeration and R&D activities. Moreover, most of the available ethno-botanical enumerations do not include any local name for a number of species which pose a difficulty in collecting them from natural habitats with the help of local users or medicine-men.

The ethno-medico-botanical information of this biodiversity hot-spot region is very vast and diverse. The largest number of tribal communities in India inhabits this region. There are about 280 different ethnic groups found in the seven states of NE India namely Arunachal Pradesh, Assam, Meghalaya, Manipur, Mizoram, Nagaland and Tripura, which have their own material culture and traditional medicinal practices. The culture and tradition of each ethnic group mostly differs from one another. Due to precipitous inaccessibility of the habitation areas and lack of exposure and interaction with the outside world, many of these tribes lead more or less secluded life particularly in the high altitudinal hilly states including the two hills districts of Assam namely Karbi Anglong and North Cachar District. This seclusion has resulted in preserving their culture, materials practices and traditional know-how. These tribes have their own beliefs, taboos, practices, handling and management that reflected in the ethno-botany and

more particularly in the ethno-medico-botany of NE India.

In recent times, this age-old traditional values and practices have gained tremendous importance throughout the globe. During about last twenty years there have been an ever-increasing demand especially from developed countries for more and more medicinal plants and plant based products. In addition, the cosmetic industries are increasingly using plants and plant-parts in their products. As a result of this a big domestic as well global market is growing based on medicinal plants. On the other hand, medicinal plants are one of the main alternative income-generating sources of indigenous and unprivileged communities. Therefore, strengthening this sector may benefit and improve the living standard of poor people.

## 2.1 Species richness

In India, of the 17,000 species of higher plants, 7500 are known for medicinal uses (Shiva 1996). This proportion of medicinal plants is the highest proportion of plants known for their medical purposes in any country of the world for the existing flora of that respective country. Ayurveda, the oldest medical system in Indian sub-continent, has alone reported approximately 2000 medicinal plant species, followed by Siddha and Unani (Table 2.1). The Charak Samhita, an age-old written document on herbal therapy, reports on the production of 340 herbal drugs and their indigenous uses (Prajapati *et al.*, 2003). Currently, approximately 25% of drugs are derived from plants, and many others are synthetic analogues built on prototype compounds isolated from plant species in modern pharmacopoeia (Rao *et al.*, 2004).

**Table 2.1: Number of plant species utilized by various Indian System of Medicine.**

Name of Medicinal System	Number of species used
Ayurveda	2000
Unani	700
Sidha	600
Amachi	600

A comprehensive list of medicinal plants of North Eastern India is not available till date though there are estimations that this region provides about 2000 species of plants with medicinal uses (Ved *et al.*, 2001). However, compilation of a number of published works revealed the existence of about 1500 species recorded with medicinal attributes with a state-wise distribution as given in the table 2.2. This estimate is mainly

based on the work of (Alphabetically) Ambasta (Ed., 1987), Balakrishnan (1981,83), Biswas (1934, 41), Bor (1938, 42), Bora and Kumar (2003), Chopra *et al* (1956), Chowdhury (2005), Clarke (1989), Das (1942), Das and Rajkhowa (1968), Dev (1960), Dutta and Dutta (2003), Gogoi *et al* (2005), Griffith (1847), Handique (94, 97, 2000, 01, 06), Handique *et al* (1987), Haridasan (2003), Haridasan and Rao (1985-86), Harper and Awksworth (1995), Hooker (1849), Hooker (1872-97, 1904), Kanjilal *et al* (1934-40), Kingdon (1960), Kirtikar and Basu (1935), Kumar (2002), Lalramnghinglova (2003), Majumder (1991), Mazumder *et al* (2003), Naik and Panigrahi (1961) Panigrahi and Joseph (1966), Pullaiah (2002), Rao (1974), Rao (1981, 94), Rao and Hajra (1986), Rao and Haridasan (1991), Sarker *et al* (1989), Sarma and Baruah (2006-07) and Singh *et al* (Ed., 2003).

**Table 2.2: Number of medicinal plant species in different states in NE India.**

States	Number of Medicinal Plant species
Arunachal Pradesh	568
Assam	951
Meghalaya	490
Manipur	440
Mizoram	386
Nagaland	380
Tripura	387

## 2.2 Endemism and Rarity of Medicinal Plants

Endemism is a unique phenomenon in the spatial distribution of plant or animal species. Such species are confined to a small geographical location. North Eastern Indian is rich in endemic medicinal plants. Some of the prominent and unique endemic species are *Aconitum ferox*, *Aquilaria malaccensis*, *Capparis acutifolia*, *Coptis teeta*, *Dipterocarpus macarocarpus*, *Gymnadaenia orchidis*, *Hydnocarpus kurzii*, *Nepenthes khasiana*, *Panax pseudo-ginseng*, *Tupidanthus calyptratus*, *Schima khasiana* and *Xylosma controversum*. Moreover, these species are either rare or endangered.

This region also houses several important medicinal plant species, which are rare, threatened and endangered. In many cases the rarity is contributed by the inherent problem of the plant such as immature seed falling, seed dormancy, lack of pollination and lack of fertilization. But, the physical and man-made factors are more acute causing sharp decline in the population of plant species causing rarity. Some of the extremely rare species found in this region includes- *Rouvolfia serpentine*, *Swertia chirayita*, *Nardiostachys grandiflora*, *Dioscorea deltoidea* and *Picrorhiza kurrooa*.

### 2.3 Status of conservation

People of the North Eastern region of India as a whole have intimate understanding and traditional practices for protection and conservation of valuable plant resources. As there is a general tendency exists among the diverse group of people for protection of valuable plant species, the region offers a unique opportunity for a range of conservation intervention. The existing pattern of protection and conservation of plant resources and more particularly medicinal plants can be categorized as (1) Community initiatives, (2) Government planning and actions, (3) NGO supported activities, and (4) Institutional extension and R &D programmes.

Community initiatives for conservation and protection of medicinal plants are a conspicuous element in NE India. One of the prominent and unique components of such enterprise is the 'Sacred forests', which are maintained for centuries together by the local communities. Such sacred forests are mainly found in the state of Meghalaya. However, comparable, though not similar, preserved forest areas are also seen sporadically in Assam, Manipur and Tripura. Village Forest Reserves of Arunachal Pradesh are another important group of components of community initiative of nature conservation. Besides, local people have been maintaining private forest areas, community forest areas and traditional 'bari' (that houses both cultivated and wild plants of various economic uses), which contributes towards the preservation and maintenance of a large number of valuable medicinal plant species.

The Government of India and the State Governments of all the seven states of North Eastern India has been implementing various plan, programme and activities for the conservation and development of medicinal plant sector in this region. As a measure for *in situ* conservation of fauna and flora and protection of the areas of biological importance, 11 national parks and 42 wildlife sanctuaries have been constituted in the region under the Wild Life Protection Act (1972). In addition to these, 5 biosphere reserves have also been notified in the region, each representing unique ecosystems identified on the basis of their biodiversity, naturalness and effectiveness as a conservation unit. The total area under national parks and wildlife sanctuaries in the region is 14,989.75 sq km, which constitutes about 5.71 percent of the total geographical area of the region. These areas provide houses for a large number of rare and valuable medicinal plant species. Besides, several medicinal plant gardens, botanical reserves and reserve forests established and declared by the state forest departments in all the states contribute substantially towards the conservation of medicinal and other economic plant resources. Moreover, the other land based departments such as agriculture, silviculture, horticulture and rural development departments have taken initiatives to conserve indigenous plant germplasm and continuous improvement programmes through various breeding techniques.

Activities of a large number of NGOs towards creating awareness among cross section of people and implementing conservation strategies of natural resources are another major factor in boosting up the conservation initiative of Medicinal plants in NE India. The role of NGOs linking among public, government and institutions is gaining popularity in all section of people. Such groups are instrumental in setting up of location specific conservation priorities for various medicinal plant germplasm.

Elaborate R & D programme and extension agenda of a number of National and State Level Scientific Research and Development organizations have been contributing significantly towards the conservation and development of medicinal plant resources. The Botanical Survey of India (Shillong), North East Institute of Science & Technology (Jorhat), Rain Forest Research Institute (Jorhat), ICAR Research Complex for NHR (Borapani, Meghalaya), Institute of Bioresources and Sustainable Development (Imphal), State Forest Research Institute (Itanagar), Regional Research Centre-Ayurveda (Guwahati), ICMR-Regional Medical Research Centre (Dibrugarh), Institute of Advanced Study in Science and Technology (Guwahati) and The Energy Research Institute-NE Centre (Guwahati) are actively engaged in various research and development work on medicinal plant that accelerating the protection and conservation initiative throughout North Eastern India. Various academic departments viz., Biotechnology, Botany, Life Sciences, Forestry and other related ones of Gauhati University (Guwahati), North Eastern Hills University (Shillong), Assam Agricultural University (Jorhat), Dibrugarh University (Dibrugarh), Rajiv Gandhi University (Itanagar), Manipur University (Imphal), Assam University (Silchar), Tezpur University (Tezpur), Nagaland University (Kohima), North East Regional Institute of Science & Technology (Itanagar) and Central Agricultural University (Imphal) have been contributing in the area of ethno-botanic exploration, development of agro-techniques, tissue culture propagation, bioprospecting, phyto-chemical investigation, mutation breeding, development of *in situ* and *ex situ* conservation strategies of valuable medicinal plant resources of NE India.

## 2.4 Problem of Conservation

In spite of the efforts made by various sections of people and organizations as discussed above towards conservation of medicinal plant resources, threats exist to species and ecosystem diversity in NE India. Besides the common causes threatening the species and ecosystem diversity of this region such as habitat fragmentation and illegal trade in wild flora, there exist certain crucial factors causing problems in conservation of plant resources specific to NE India. Some of these factors are - shifting cultivation, deforestation and habitat destruction, rapid spread of invasive species, destructive and over harvesting of wild plants beyond sustainable limit and clearing of

virgin forest areas for developmental activities such as construction of dams and roads.

Most clan-owned forests are over-exploited, as there is hardly any management system or any self-imposed restrictions on resource uses. The forests under the control of Village Councils, "Anchal Samitis" (Regional committees) and other traditional institutions are usually managed by customary laws. With the weakening of the influence of these traditional institutions over the land and people, the usage right of the people in these forests is now almost unrestricted. As a result, all these forests barring a few are now severely degraded.

Another weakness in nature conservation efforts is the diversity in forests administration. District councils administer a substantial portion of forests in Assam, Meghalaya, Mizoram and Tripura directly or indirectly. Likewise different traditional village level institutions control major forest areas in Arunachal Pradesh, Manipur and Nagaland. The government forest departments with technical know-how have very little forest area under their control. Such diverse forest stewardship or ownership patterns call for a strong institutional set up at the level of each institution responsible for forest management. Unfortunately, both the district councils as well as the traditional institutions do not have adequate trained manpower for sustainable management of the resources.

Lack of inter-departmental coordination is another causes that affecting the pace of nature conservation. All the land-based activities such as agriculture and horticulture relating to community development programme have to be complementary to the forestry activities. This needs a close inter-departmental coordination to address various developmental and livelihood issues of the people that in turn, will ensure the sustainable management of forest wealth. Besides, non-forestry sector policies, institutions and activities can have significant forestry implications. Therefore, coordination among different implementing departments is a must for the development of forests in the region.

The illegitimate collection of medicinal plants in huge quantities and subsequent inter border trading even with other countries is a great threat towards the conservation of valuable medicinal plant species. Besides, long exist inter-state border disputes among the north-eastern states is also posing a threat to the efficient management of forest wealth. Most of these border areas are forestlands and because of boundary disputes, such lands are often remained out of any form of management and control. Degradation of forests in such areas is very common.

## **2.5 Future Needs for Accelerating Conservation**

An over all reorganization and motivation is required among all the stack holders

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to ensure the effective management and effective conservation with sustainable utilization of the rich medicinal plant diversity of North Eastern India. In this context, institutional and human capacity building is considered as one of the most important factor for successful conservation of plant resources. Besides, extensive exploration programme for enumeration of individual species giving accurate and adequate information on habit, habitat, taxonomic identification keys, traditional medicinal uses and available trade information have to be undertaken. It is further required to design proper and coordinated programme for bioprospecting, molecular taxonomic study and development of individual species using biotechnological tools and techniques.



## Trade of Medicinal Plants

There is a growing demand today for plant-based medicines, other herbal health products including cosmetics and food supplements in the international market. The current international market of medicinal plants is over 60 billion US dollar per year, which is growing at the rate of 7 percent per annum. WHO's forecast is that the global market for herbal products is expected to be US\$ 5 Trillion by the year 2050. According to the data compiled by the International Trade Centre (Geneva), India is ranked second amongst the exporting countries, after China, with an annual export of 326000 tones raw materials with a value of Rs 45.95 million (about US\$ 1.4 million) during 1992-95. The present export of herbal raw materials and medicines from India is about US dollar 100-114 million approximately per year (Table-3.1). India is one of the major exporter of crude drugs mainly to six developed countries viz. USA, Germany, France, Switzerland, UK and Japan, who share between them 75-80 per cent of the total export market.

Medicinal plant trade is gaining momentum as an organized trade only in recent years in India. However, still it is inefficient, informal, secretive and opportunistic in nature. As a result of these characteristics medicinal plant materials supply situation is shaky, unsustainable and exploitative. It ultimately causes over exploitation of wild plants, depletion of resource base, exploitation of rural people and adulteration.

**Table- 3.1: Market status of Medicinal Plants**

International market	\$ 60. 0 Billion
China's share	\$ 05. 0 Billion
India's share	\$ 01. 1 Billion
India's internal turnover from traditional market	Rs. 2,300 Crores

Medicinal plants provide raw material for use in all the indigenous systems of medicine in India namely Ayurveda, Unani, Siddha and Tibetan Medicine (Table-3.2). According to the World Health Organization (WHO), 80% of the population in developing countries including India relies on traditional medicine, mostly in the form of plant drugs for their health care needs. Additionally, modern medicines contain plant derivatives to the extent of about 25%. On account of the fact that the derivatives of medicinal plants are non-narcotic having no side effects, the demand for these plants is

on the increase in both developing and developed countries.

**Table- 3.2: Uses of Medicinal Plants in Indian Systems of Medicines**

System of Medicine	Number of Plant species used
Ayurveda	2000 species
Unani	700 species
Siddha	600 species
Amachi/ Tibetan	600 species
Traditional	3000 species

There are estimated to be around 25000 effective plant-based formulations available in Indian medicine. Over 1.5 million practitioners of the Indian system of medicine in the oral and codified streams use medicinal plants in preventive, promotional and curative applications. It is estimated that there are over 7843 medicinal drug-manufacturing units operating in India, which consume about 2000 tons of herbs annually (Table-3.3).

**Table- 3.3: Users of medicinal plants in India**

Name of Users	Number of Users
Practitioner of ISM&H use for preventive/curative application.	15,00,000
Registered Practitioner of ISM&H use in Codified stream.	4,60,000
Registered Pharmacies (ISM&H)- Drug Manufactures.	7,843
Unlicensed small-scale unit.	Numerous

North East India is a defined destination for the traders of medicinal plants. A large number of plant species naturally grown in this region was identified as medico-chemically-potent materials in different forms of medicinal practices. Many of them are being commercially exploited in large scale. However, very less is known regarding the trade of medicinal plants in the context of the identification of buyers and sellers, volume and quantum of raw material collection, route of transportation, collection areas and nature of collections. An organized trade structure as available in timber and in some other minor forest produce is not seen in case of medicinal plants.

Published records regarding the collection and marketing of medicinal plants of NE India are very much insufficient to draw a picture of the situation. It is to be mentioned that the use of medicinal herbs for preparation of modern medicine got momentum only after the Second World War with the progress in natural product chemistry. During this period, the rich natural resources of NE India also had started to be exploited by traders of Asian and European countries. Thus, commercial collection of

certain high valued medicinal plant species from the Northeast India started roughly about 60-70 years ago. However, as many important plant species were fairly abundant in this region, much attention was not paid and there was no effective control over the collection of them.

Some 25-15 years back there were 'Mahal' system in Assam and Meghalaya for trade-collection of certain medicinal plant species. But due to excessive collection, the population of some valuable plants became scanty and thus 'Mahal' system was almost abolished.

However, some form of mahal system is still exists for selling of 'Laham bark' (*Oroxylum indicum*) in Assam. Such mahals are confined only to certain locations of the state of Assam. On the other hand, Forest Departments of Arunachal Pradesh, Assam and Meghalaya also sell certain medicinal plant species from both wild and cultivated sources through local bidding.

### 3.1 The 'Mahal' system

Mahal is a local demi-official term used in Assam and other states of North Eastern India denoting geographical area leased for extraction of forest produce. The operation through mahal was mainly confined to the government controlled forest areas. A 'Mahal' was allotted to the bidders(s) for a particular plant species in a specified forest area for a period of maximum two years. However, there is not much information available in published form on 'Mahal' system. Several valuable medicinal plant species were once brought under collection and trade through mahals in Assam, Arunachal Pradesh and Meghalaya. The list of these plant species once brought under mahal system is given in the table-3.4.

**Table -3.4: List of plant species sold through mahal**

Species name	State	Mahal area (District)	Period of extraction	Present status
<i>Bambusa bambos</i> (Banslochan)	Assam	Karbi Anglong	Upto 1981	Closed
<i>Cinnamomum</i> sp. (Bon dalcheni)	Assam	Karbi Anglong	Upto 1981	Closed
<i>Hydnocarpus kurzii</i> (Chalmugra)	-do-	Karbi Anglong, Golaghat, Kamrup	-do-	-do-
<i>Ealeocarpus</i> sps. (Rudraksha)	-do-	Kokrajhar & Dibrugarh	-do-	-do-

<i>Rauvolfia serpentina</i> (Sarpagandha)	Assam & Meghalaya	Karbi Anglang and Kamrup	-do-	-do-
<i>Taxus baccata</i>	Arunachal Pradesh	West Kameng	-do-	-do-
<i>Oroxylum indicum</i> (Bhatghila).	Assam	Sonitpur	1995 -till date	Open

Source: Records of Forest Departments, Govt. of Assam, Arunachal Pradesh and Meghalaya.

### 3.2 Trade of CITES listed medicinal plants

Out of several CITES (Convention on International Trade in Endangered species of Wild Flora and Fauna) listed plant species found in North East India, 7 species are reported to be used in medicinal purposes either in India or elsewhere. These species are mostly found in Arunachal Pradesh and Meghalaya. All the species are being collected and traded in various quanta. Current status of trade of these species is given in the table 3.5.

Table -3. 5: Trade of CITES listed medicinal plants of N.E. India.

Plant species	Trade Name	Distribution	Rarity status	Trade status
<i>Dendrobium nobile</i>	-	A, AR, M	Less frequent	Unauthorized collection
<i>Dioscorea deltoidea</i>	Dioscorea, Tura, Kriss	A, AR, M	Less frequent	Unauthorized collection
<i>Gymnadaenia orchidis</i>	-	AR	Extremelyrare	Unauthorized collection
<i>Nepenthes khasiana</i>	-	M	Endemic, rare	Doubtful
<i>Podophyllum hexandrum</i>	Podophyllum, Papri	AR, M	Rare	Unauthorised collection
<i>Rauvolfia serpentina</i>	Rauvolfia, Sarpagandha	A, AR, M	Endangered	Ban imposed on collection from wild.
<i>Taxus baccata</i>	Taxus, Yew	AR, M	Once common, now facing rarity	Over exploitation during 1991-94. Now there is ban on collection

A=Assam, AR=Arunachal Pradesh, M=Meghalaya

### 3.3 Much Exploited Species

There are several high valued medicinal plant species, which were collected from various localities of North Eastern Region of India in huge quantities for commercial purposes in recent past. The most prominent species among them are – Yew (*Taxus baccata*), Mishmi tita (*Coptis teeta*), Pipli (*Piper longum*), Lissi (*Illicium griffithii*) and Chiretta (*Swertia chiraytia*).

*Taxus baccata* is one of the most exploited medicinal plant species. The leaves and barks of *Taxus baccata* are a source of an anti-cancer drug called 'Taxol'. It is reported that a 20-year-old tree can yield up to 30 kg of leaves and 5 kg of bark, which in turn can produce 4 gm of taxol. At a very conservative estimate, 4 gm taxol is priced at Rs. 7 lacs. Collection of *Taxus* raw materials was mainly carried out from the West-Kameng district of Arunachal Pradesh. The concerned authorities have recently banned the exploitation of *Taxus* in Arunachal Pradesh considering the heavy demand for *Taxus* materials, which pose threat to the population of the plant species.

*Coptis teeta* (Mishmi-tita) that yield berberine alkaloid has a high commercial value. Some 20 years back, the annual official collection of Mishmi-tita rhizome from wild was about 4000 kg. The materials were exported to Japan and also to some European countries. Ban imposed on Mishmi-tita collection some 10 years back. However, Arunachal Pradesh Forest Department occasionally sells limited quantity of Mishmi-tita from cultivation yield at a rate of Rs. 150/- per kg. On the other hand, recent investigation revealed the sell of Mishmi tita in local market of Arunachal Pradesh at a rate of Rs. 500/- per kg, which are being exported to elsewhere by unidentified traders.

Pipli (*Piper longum*) is a commercial crop with great prospect for its medicinal fruits and roots. It is found mostly in Arunachal Pradesh. Pipli fruits are collected just prior to maturity when they are more pungent. On a rough average, a single plant yields 200 gm fresh fruits. Local people collect fruits from forest population and sold in local markets at a rate of Rs. 20-30/- per kg fresh and Rs. 60/- per kg dry fruits. They have a great demand in peppermint manufacturing industries and as food additive.

Lissi (*Illicium griffithii*) is in great demand and the dry fruits are sold at Rs. 90-100/- per kg in West Kameng and Lower Subansiri districts of Arunachal Pradesh. Fruits are used as spice and have stimulant and carminative properties. Fruits ripen during November-December and collection is done by plucking or by shaking the trees. These are dried in sun and seeds are extracted. The demand is so high that the immature fruits are collected during August-October and there remain hardly any fruits on the tree for ripening. A mature tree yields about 3-9 kg of fresh fruits. Mention should be made that there is no official control over collection. The species is not included in the list of

royalty earner by the Arunachal Pradesh Government.

Chiretta (*Swertia chirayita*) is indigenous to temperate Himalaya and found in Arunachal Pradesh and Meghalaya at an altitude of 1500-2500m. This species is widely used in various systems of medicinal practices and attracts a big domestic as well global market. First hand field based information of this author revealed that large quantities of chiretta plants are being collected from Arunachal Himalaya every year for trade. There is no control exists so far in collection and the plants are smuggled away easily for different destinations. As a result the population is fast disappearing. This species has been categorized as critically endangered by IUCN. National Medicinal Plant Board (NMPB), New Delhi now prioritizes the species for trade and commercial cultivation.

### 3.4 Other Plant Species in Trade

There are about 32 species of medicinal plants found in NE India are being sold in the domestic market on a regular basis. These plants are mostly collected from forests and occasionally from household plantations. Various trade information on these species are given in the table 3.6. The quantity of collection per annum was estimated on an average basis after assessing the annual requirement of certain medicine-manufacturing units and also on the basis of data gathered through interview with several local plant collectors. It is to be noted that local agents through local people and forest dwellers mostly collect these plants. Procedures for both collection of the materials and trade are not much organized.

**Table –3.6: List of medicinal plant Species of NE India currently exploited for trade.**

Species	Trade/ Local name	Rate Rs /Kg	Quantity (annual) Kg	Collection site	Parts collected
1	2	3	4	5	6
<i>Achyranthes aspera</i>	Latjira/ Bonsoth	10/-	2000	Forests, Road sides (Assam)	Whole plants
<i>Adhatoda vasica</i>	Vasaka / Bahek	8/-	2000	Forests/ Household areas (Assam, A.P.)	Whole plants
<i>Aegle marmelos</i>	Bael/Bel	30/- 50/-	5000	Forests/ plantation (Assam)	Bark and ripe fruits.
<i>Aloe vera</i>	Aloe / Grita-kumari	10/- *	3000	-do-	Whole plants
<i>Alstonia scholaris</i>	Saptaparni / Satiana	15/-	2000	Forests (Assam)	Stem Bark

<i>Asparagus racemosus</i>	Satavari/ Satmul	20/-	3000	Mostly from cultivation (Assam, A.P.)	Mature bulb
<i>Bacopa monnieri</i>	Brahmi	15/-	5000	Semi-wild & cultivation (Assam)	Whole mature plant
<i>Blumea lacera</i>	Kukuradru	15/-	2000	Forests (Assam)	Whole plants
<i>Boerhaavia diffusa</i>	Punarnava	25/-	4000	-do-	-do-
<i>Calotropis gigantea</i>	Arka/Akon	5/-	2000	-do-	-do-
<i>Clerodendrum indicum</i>	Bhargi/ Akalbih	20/-	2000	Wild population (Assam)	Mature stem bark & leaf
<i>Cryptolepis buchnani</i>	Karanta	20/-	1000	-do-	Mature fruits
<i>Datura metel</i>	Dhattura/ Dhatura	30/-	3000	-do-	Mature fruits
<i>Desmodium gangeticum</i>	Salaparni	25/-	2500	-do-	Whole mature plant
<i>Embelia ribes</i>	Vidanga/ beribans	25/-	5000	Forests (Meghalaya)	Mature fruits
<i>Embelica officinale</i>	Amla/ Amlakhi	10/-	10,000	Plantations & Forests (Assam, Meghalaya)	Mature fruits
<i>Ficus benghlensis</i>	Nyagordha/ Bot	10/-	3000 (Assam)	Wild population plants	Bark of mature
<i>F. religiosa</i>	Asvattha/ Ahot	10/-	3000	-do-	-do-
<i>Holarrhena antidysenterica</i>	Kutaja / Dudhkhuri	15/-	5000	Wild population (Assam)	Bark from Mature tree
<i>Ichnocarpus prutescens</i>	Sariva/ Anantamul	25/-	2000	Wild & plantation (Assam)	Whole mature plant
<i>Kalanchoe pinnata</i>	Asthibhaksha	30/-	4000	-do-	-do-
<i>Mangifera indica</i>	Amra/ Am	15/-	5000	-do-	Seeds
<i>Mimosa pudica</i>	Lajjalu/ Nilaji-bon	15/-	2000	Wild population (Assam)	Whole mature plant
<i>Oroxylum indicum</i> plants	Syonaka / Laham	15/-	5000	-do-	Bark of mature
<i>Paederia foetida</i>	Prasarini/ Bhedailota	15/-	2500	-do-	Tender leaves
<i>Sida cordifolia</i>	Bala/ Barial	30/-	3000	-do-	Mature seeds
<i>Solanum indicum</i>	Poison berry	15/-	2000	-do-	Whole plant
<i>S. khasiana</i>	Solanum	15/-	2000	-do-	Mature fruits
<i>Syzygium cumini</i>	Jambu/ Jamuk	20/-	5000	Forests (Assam)	Ripe fruits

<i>Terminalia arjuna</i>	Arjuna / Arjun	15/-	4000	-do-	Stem, Bark
<i>Tinospora cordifolia</i>	Guduci/ Siddilota	25/-	4000	Forests (Assam)	Whole plant
<i>Wedelia calenduleaceae</i>	Bhringaraj	10/-	3000	House-hold cultivation	Whole mature plant

**Source:** Based on data provided by various herbal medicine-manufacturing units of Assam and plant collectors for outside companies.

### 3.5 Unregulated large scale commercial collection

During the field investigation, several sources disclosed about the large-scale commercial collection of certain plant species of this region for use in medicinal industries. Due to the lack of sufficient official control and regulation, the collection and transportation of these materials are up till now very much easy. Various sources supported that most of such collections are transported as agricultural products as there not much checking and control is exercised on the supply and transportation of agro-based produces. However, news on ceasing of such items during routine police checking is also not uncommon. A list of such plant species with relevant information is provided in the table - 3.7 based on first hand information. However, further study is necessary for verification and authentication of these data.

**Table -3. 7: Medicinal plants under unregulated large-scale commercial collection**

Plant species	Locality	Approximate quantity of annual collection	Destination
1. <i>Acorus calamus</i>	Assam	Huge, Undetermined	Domestic
2. <i>Costus speciosus</i>	-do-	-do-	Domestic / exported.
3. <i>Curcuma</i> sps.	Assam, Meghalaya	Huge, Undetermined	Domestic / exported
4. <i>Embelia ribes</i>	Assam, Meghalaya	Huge, Undetermined	Domestic / exported
5. <i>Garcinia</i> Sps.	Assam, Meghalaya	Huge, Undetermined	Domestic / exported
6. <i>Homalomena aromatica</i>	Assam, Meghalaya	Huge, Undetermined	Domestic
7. <i>Lichens</i> (about 3 sps.)	Meghalaya	Above 20 ton.	Exported
8. <i>Lycopodium</i> sps.	-do-	Above 30 ton.	Domestic / exported



9. <i>Mesua ferrea</i>	Assam, Meghalaya	Huge, Undetermined	Domestic / exported
10. <i>Panax pseudoginseng</i>	Arunachal Pradesh	Huge, Undetermined	Domestic
11. <i>Rubia cordifolia</i>	Assam, Meghalaya	Huge, Undetermined	Domestic / exported
12. <i>Smilax</i> sps.	Assam, Meghalaya	Huge, Undetermined	Domestic
13. <i>Zingiber</i> sps.	Assam, Meghalaya	Huge, Undetermined	Domestic / exported

### 3.6 Some Critical Observations

In spite of the natural abundance of certain high valued medicinal plants, the government-introduced 'Mahal' system could not be continued due to excessive collection over permissible limit and due to loss of plant population as a result of deforestation.

Demand for plant materials for pharmaceutical preparations is gradually increasing and a number of business establishments have come up for trading medicinal plants. But imposition of trade rule and regulations for trade in medicinal plants is yet to take place. Moreover, critical identification of important plant species, quantification of their availability, and, guidance and monitoring in field-collection by the appropriate authority is still lacking.

No organised attempts have been seen to undertake by any authority for large-scale propagation and their effective marketing of high valued medicinal plants indigenous to NE India. Huge commercial collections of certain unspecified species such as *Lycopodium* are virtually unnoticed by the forest and other responsible authorities. Even the status of the species, which are recommended by the concerned authority for commercial collection, is also not clear due to over exploitation and damage caused by deforestation. On the other hand, though a ban imposed on collection of certain species, but despite the ban, high valued species viz. *Taxus*, *Pseudoginseng* and *Coptis teeta* are still being collected illegally by some outsiders and local traders. The volume of such trade could not be assessed. These forest produce are mainly transported outside the states as agricultural product for which not much strict procedure on trade-transfer and transit of goods is operative in this region.

Demand for certain medicinal plants, which were once high valued, is sharp decreasing. *Rauwolfia serpentina* and *R. Canescence* are such an example. Silviculture divisions of both Assam and Meghalaya forest departments have discontinued the cultivation of *Rouwolfia canescence* due to non-existence of market. However, sources disclosed that several medicine companies through local collectors are still collecting *R. serpentina* roots from the wild sources. There is also a belief persists among the local people and some traders that wild plants are more potential than cultivated ones.

### 3.7 Need of the day and possible measures

Formulation of appropriate policy for regulation of medicinal plant trade and to ensure revenue collection are very much important in all the states of North East India. At the same time it is considered very much important to ensure natural abundance, conservation and large-scale cultivation of diverse medicinal plant wealth. In this circumstances, following measures have been identified which may be undertaken for the purpose.

- (1) Eco-friendly collection of medicinal plants,
- (2) Control of theft and illegal collection of plants,
- (3) Realization of revenue from export of medicinal plants by formulating appropriate procedure and regulation,
- (4) Proper recording of collection, processing and export with regular updating,
- (5) Further scientific investigation on the important aspects of medicinal plants such as bioprospecting, genetic diversity, pharmacology, mass propagation, industrial prospects and conservation

## Cultivation of Medicinal Plants

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Cultivation of medicinal plants in a grower's field is a recent phenomenon in India. Industry prefers raw material from cultivated source because of authentication, reliability and continuity. Collection of herbs from the wild by destructive harvesting followed by unscientific handling have also resulted in poor quality products. So the cultivation becomes the expected one for yield of quality raw materials. Cultivation of medicinal and aromatic plants (MAP) gives scope to improve the quality of the drugs.

Merits of commercial cultivation of MAP is the outcome of implementation of number of critical factors like locate-selection; good genetically stable planting materials; good agro-technological practices; nutrient input; harvesting management and implementation of suitable post harvesting techniques.

Cultivation of medicinal plants is undoubtedly a sustainable alternative to the present collection of medicinal plants from the wild. Moreover, all the valued plant species is under growing threat in their natural habitat and there is an urgent need to stop collection of them from wild sources.

So cultivation of important species may be a prospective provider of returns to the farmers/growers of medicinal plants. In particular, the cultivation of MAP can be a fruitful alternative for the farmers of NE India.

Cultivation of MAP is creating new dimension in the field of agriculture. The medicinal plant industry puts together the various facets of this multi-disciplinary industry and its global interest. Scientific cropping of industrially important MAP is an integrated approach with agricultural and forestry with optimum land and water resources utilization. In India, various MAP have already been cultivated and domesticated. Efforts continued for characterization and hybridization programs for improvement of the species, and conservation of species restoring their genetic resources for commercial cultivation.

Cultivation of medicinal plants in the states of NE India is a very recent story. Farmers are showing growing interest for cultivation of Patchouli and Safed Musali due to certain public sector and private sector initiative. Success has also been recorded in the cultivation of Citronella and Lemon grass.

## 4.1 Problems of cultivation

There are a number of problem exist in cultivation of medicinal plants. It is a challenging task because wild plants need a very specific micro-climatic condition. Moreover, seed biology of most of the valuable medicinal plants is very less known. Efforts are also in infancy or inadequate for scientific search to identify elite specimens and their multiplication to produce quality-planting material.

Indian farmers are facing various problems in cultivation of medicinal plants due to lack of proper agro-technology. Standardised agro-techniques are available in certain plant species but in many a times these are unaccessible to the farmers due to high fees for packages developed by various organizations. Reliable and standardized technology package is also not available in many plant species. Others constraints in medicinal plant cultivation include lack of planting material, lack of suitable market system, and lack of post-harvest processing technology of plants for the extraction of chemicals and preparations of active formulations.

## 4.2 Need for cultivation

Currently more than 85% of the herbal requirement is met through wild collections in India. While the demand for medicinal plants is increasing, their survival in their natural habitat is under growing threat. Collection of herbs from the wild by destructive harvesting followed by unscientific handling has resulted in poor quality products. The only solution of this situation is the organized commercial cultivation of medicinal (including aromatic) plants.

Cultivation of medicinal plants is gaining popularity among the farmers. Drug companies also prefer raw materials from cultivated source because of authentication and reliability. However, a number of constraints exist in the cultivation of medicinal plants in India. These are – (a) non-availability of quality planting material, (b) poor development and extension support in the cultivation and processing, and (c) the unorganized markets. These constraints cause stagnation in the way of commercialization of cultivation. Therefore, concentrated efforts are required, both in collection and cultivation of medicinal plants, in order to ensure sustainability of the Industry.

Cultivation of medicinal and aromatic species gives scope to improve the quality of the drugs. Merits of commercial cultivation of MAP is the outcome of implementation of number of critical factors like selection of location; good genetically stable planting materials; good agro-technological practices; nutrient input; harvesting management and implementation of suitable post harvesting techniques to preserve the end product till smart and effective marketing arrangements are made.

### 4.3 Cultivation strategies for medicinal plants

Since the beginning of this century, more than half of the world's tropical forest area has been destroyed. Experts estimate that only 5-10% of all plants in the world have been systematically investigated for their pharmacological activity. Many of them are threatened in the tropical forest. In this context, it is very much important to design a strong strategy in terms of conservation through biotechnology and legal matters. To address the need for conservation of native medicinal plant species of India, the country needs to establish a network of forest sites across the biogeographic regions of the country. However, a network of *in situ* (field) gene banks, in the forest habitats is the most cost-effective way to manage the intra- and interspecific diversity. Further, conservation and cultivation of medicinal plants can be promoted through the establishment of herbaria and medicinal plant gardens and developing cultivation packages with modern techniques including tissue culture and genetic engineering.

Cultivation of medicinal plants especially high value medicinal plants is creating new dimension in the field of agriculture. The medicinal plant industry puts together the various facets of this multi-disciplinary industry and its global interest. It is very much important to acquire technologies and techniques for programmed cultivation of medicinal plants.

### 4.4 Status of cultivation

Scientific cropping of industrially important medicinal plant is an integrated approach with agriculture and forestry with optimum land and water resources utilization. In India, various medicinal plants have already been cultivated and domesticated. India is also making efforts for collection, characterization, planned hybridization programs for improvement of the plant species, and conservation of medicinal plants restoring their genetic resources for commercial cultivation.

Quantum of cultivation of medicinal plants in the states of NE India is gradually increasing. Farmers are showing growing interest for cultivation of Patchouli and Safed Musali due to certain public and private sector initiative. Success has also been recorded in the cultivation of essential oil yielding plants like Citronella and Lemon grass.

### 4.5 Prioritized medicinal plants in India and their cultivation in NE India

National Medicinal Plant Board (NMPB), Ministry of Health & Family Welfare, Government of India, New Delhi, has prioritized 32 medicinal plant species for commercial cultivation, which are in high demand both in domestic and international markets. However, this list is not fixed and will naturally undergo changes from time to time. Name and demand of these plant species are given in the table-4.1. Out of these 32 species 19

species are naturally growing in NE Indian states. All these 19 plant species can be cultivated in various states of NE India. Moreover, the NMPB prioritised species that are not found wild in this area can also be tested for cultivation.

#### 4.6 Cultivation of aromatic plants

Besides medicinal plants, there are approximately 300 natural products used as raw materials in the flavor and fragrance industry. These raw materials can be found in the form of essential oils, extracts, oleoresins, concretes, absolutes, resinoids, and tinctures to name the major groups. Of these materials, about half are produced from cultivated plants while the remaining 50% are obtained either as by-products of a primary industry or are harvested from natural wild plants. The 20 major oils in the world market are presented in Table-5. Out of this 20 species, 14 species are available in India and they can be cultivated in NE Indian states (Names given in bold letter in table 4.2).

#### 4.7 Indigenous plant species prioritized for cultivation

A large number of plant species from wild sources of NE India is being exploited for medicinal purposes. Due to extensive extraction, the populations of such plant species are fast disappearing from nature. There is need to identify and develop agrotechnologies for cultivation of such medicinal plant species. Cultivation of these species will help in conservation of wild populations and at the same time assure continuous flow in medicinal raw material supply.

Several important species in this regard have been identified through a series of exercise. Out of these the most valuable are Sugandh mantri, *Rubia cordifolia*, Chop-cheni, *Panax pseudoginseng*, *Gloriosa superba*, Pipli, *Mesua ferrea*, Kala-haldhi, *Croton tiglium*, *Tinospora cordifolia* and *Aquilaria malaccensis*.

#### 4.8 Plant Species prioritized for cultivation in Assam by SMPB, Assam.

State Medicinal Plant Board (SMPB), Assam, which is the state chapter of National Medicinal Plant Board (NMPB), has identified and prioritized 15 plant species for trade and cultivation in Assam. These species includes 5 additional species of plant besides 10 species of NMPB prioritized plant. The list of these plant species is given in the table 4.3.

TABLE-4.1: MEDICINAL PLANTS PRIORITIZED IN INDIA BY NATIONAL MEDICINAL PLANT BOARD. (Names given in bold letters are found in NE India).

Sl.No.	Species	Demand (in ton)		Annual Growth Rate (%)
		2001-02	2004-05	
1	<b>Amala</b>	22729.5	41782.9	22.5
2	<b>Ashok</b>	7051.3	10724.2	15.0

3	<b>Ashwagandha</b>	7028.7	9127.5	9.1
4	<b>Atis</b>	270.1	448.4	18.4
5	<b>Bael</b>	5381.2	7084.5	9.6
6	<b>Bhumi amalaki</b>	2212.6	2985.3	10.5
7	<b>Brahmi</b>	3822.5	6621.8	20.1
8	<b>Chandan</b>	635.2	1073.1	19.1
9	<b>Chirata</b>	965.2	1284.7	10.0
10	<b>Daru haridra</b>	1187.3	1829.4	15.5
11	<b>Giloe</b>	2258.3	2932.6	9.1
12	<b>Gudmar</b>	NA	NA	NA
13	<b>Guggal</b>	1505.0	2548.9	19.2
14	<b>Isabgol</b>	NA	NA	NA
15	<b>Jatamansi</b>	674.9	866.8	8.7
16	<b>Kalihari</b>	65.4	100.5	15.4
17	<b>Kalmegh</b>	2005.0	2197.3	3.1
18	<b>Kesar</b>	NA	NA	NA
19	<b>Kokum</b>	NA	NA	NA
20	<b>Kuth</b>	1414.1	1826.3	8.9
21	<b>Kutki</b>	220.3	317.0	12.9
22	<b>Makoy</b>	2077.9	2192.2	1.8
23	<b>Mulethi</b>	873.4	1359.8	15.9
24	<b>Patharchur</b>	37.8	60.8	17.2
25	<b>Pippali</b>	3992.5	6280.4	16.3
26	<b>Safed Musali</b>	NA	NA	NA
27	<b>Sarpgandha</b>	423.6	588.7	11.6
28	<b>Senna</b>	6462.5	11677.3	21.8
29	<b>Shatavari</b>	10924.7	16658.5	15.1
30	<b>Tulsi</b>	3296.8	5402.9	17.9
31	<b>Vatsnabh</b>	322.3	3426.8	30.0
32	<b>Viavidang</b>	NA	NA	NA

**Table -4.2. The world's 20 top Essential oils and the names of the oil yielding plants.  
(Names given in bold letter are found in NE India)**

Sl.No	Essential oil	Species
1	<b>Orange</b>	<i>Citrus sinensis</i>
2	<b>Cornmint</b>	<i>Mentha arvensis</i>
3	<b>Eucalyptus cineole-type</b>	<i>Eucalyptus globulus, E. polybractea</i>
4	<b>Citronella</b>	<i>Cymbopogon winterianus</i> and <i>C. nardus</i>
5	<b>Peppermint</b>	<i>Mentha piperita</i>

6	<b>Lemon</b>	<i>Citrus limon</i>
7	<b>Eucalyptus citronellal-type</b>	<i>Eucalyptus citriodora</i>
8	<b>Clove leaf</b>	<i>Syzygium aromaticum</i>
9	<b>Cedarwood (US)</b>	<i>Juniperus virginiana</i> and <i>J. ashei</i>
10	<b>Litsea cubeba</b>	<i>Litsea cubeba</i>
11	<b>Sassafras (Brazil)</b>	<i>Ocotea pretiosa.</i>
12	<b>Lime distilled (Brazil)</b>	<i>Citrus aurantifolia</i>
13	<b>Native spearmint</b>	<i>Mentha spicata</i>
14	<b>Cedarwood (Chinese)</b>	<i>Chamaecyparis funebris</i>
15	<b>Lavandin</b>	<i>Lavandula intermedia</i>
16	<b>Sassafras (Chinese)</b>	<i>Cinnamomum micranthum</i>
17	<b>Camphor</b>	<i>Cinnamomum camphora</i>
18	<b>Coriander</b>	<i>Coriandrum sativum</i>
19	<b>Grapefruit</b>	<i>Citrus paradisi</i>
20	<b>Patchouli</b>	<i>Pogostemon cablin</i>

**Table - 4.3. Medicinal plant species prioritized by SMPB, Assam for trade and cultivation.**

Sl. No.	Botanical name	Common Name
1	<i>Terminalia arjuna</i>	Arjun
2	<i>Saraca asoca</i>	Ashok
3	<i>Withania somnifera</i>	Ashwagandha
4	<i>Acorus calamus</i>	Bach
5	<i>Jatropha curcus</i>	Bhotara
6	<i>Widelia calendulace.</i>	Bhringaraj
7	<i>Aloe vera</i>	Ghritakumari
8	<i>Tinospora cordifolia</i>	Guduchi
9	<i>Piper nigrum</i>	Jaluk
10	<i>Andrographis paniculata</i>	Kalmegh
11	<i>Pogostemon cablin</i>	Patchouli
12	<i>Piper longum</i>	Pippali
13	<i>Putranjiva roxburgni</i>	Putranjeeva
14	<i>Rauwolfia serpentina</i>	Sarpagandha
15	<i>Asparagus racemosus</i>	Satmul

#### 4.9 Strategies to be adopted for promotion of MP cultivation

Cultivation of medicinal plants is undoubtedly a sustainable alternative to the present collection of medicinal plants from the wild. On the other hand, this can be a prospective provider of returns to the farmers/growers of medicinal plants. More



particularly, cultivation of medicinal plants can be fruitful alternative for the farmers of NE India. In this context, several strategies are considered as important to be adopted to gear-up the speed and quantum of the commercial level cultivation of medicinal plants in NE Indian states. The key points and areas of these strategies are:

- (1) Improving awareness among the farmers/ growers.
- (2) Creating options for contract farming.
- (3) Development of methods for enhancement of planting stock.
- (4) Development of Agro-technique for all the important species.
- (5) Establishment of facilities for screening standards, quality control, efficacy and safety of MAP.
- (6) Establishment of facilities for Drug testing from ISM&H products.
- (7) Development and formulations of integrated marketing facilities, rules and regulations.
- (8) Efforts to be taken for agro-scientific screening and identification of species to be cultivated in NE India.
- (9) Set-up of semi processing units for medicinal raw materials.

## Species Wise Description of Medicinal Plant

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A wide-ranging list of medicinal plants found in the North Eastern Region of India is presented in this chapter. This list has been prepared on the basis of existing literature contributed by various workers and the personal collection and recording of this author through extensive field surveys during last two decades. The list includes indigenous and wild plant species, which have been recorded with certain medicinal uses or attributes either in traditional or modern medicinal practices. The list also embraces several introduced and cultivated plant species, which have become members of the natural flora. However, the list is not exhaustive, many more plant species may be included which are either not reported or less reported till date.

The plant species are organized alphabetically followed by the name of the family. The latest botanical name of the species is given with synonymous name (Syn.) wherever available. The known English name and common names, which are either used as 'trade name'(s) or a 'countrywide' name(s), is given against each species when available. The available and known local names of each species in Assamese, Bengali and Hindi are given for almost all the species but with a few exceptions. Local names in Khasi, Garo, Jaintia and Karbi are given where available. Khasi, Garo and Jaintia are the local languages of Meghalaya state and Karbi is the local language of Karbi tribe of Assam. Several local names are denoted with the name of the state in parenthesis after the plant name.

Each species is described giving a short account on the habit (morphology) of the plant and their availability in the North Eastern India. The status of the species has been specified by using the terminologies viz., rare, threatened, endangered and endemic. The medicinal uses are given mostly in common terms though specific medicinal terminologies are used frequently.

The available literature mainly consulted for confirmation of medicinal attributes of the species with latest nomenclature includes (alphabetically) those of Ambasta (Ed., 1987), Biswas (1934, 41) Bor (1938, 42), Bora and Kumar (2003), Bennet (1987), Caius (Reprint, 2003), Chopra *et al* (1956), Clarke (1989), Das (1942), Das and Rajkhowa (1968), Dev (1960), Gogoi *et al* (2005), Griffith (1847), Handique (94, 97, 2000, 01, 06), Handique

*et al* (1987), Haridasan and Rao (1985-86), Harper and Awksworth (1995), Hooker (1849), Hooker (1872-97, 1904), Kanjilal *et al* (1934-40), Kingdon (1960), Kirtikar and Basu (1935), Kumar (2002), Naik and Panigrahi (1961) Panigrahi and Joseph (1966), Pullaiah (2002), Rao<sup>1</sup> (1974), Rao (1981, 94), Rao and Hajra (1986), Rao and Haridasan (1991), Sarker *et al* (1989), Singh *et al* (Ed., 2001) and Singh *et al* (Ed., 2003).

A total of **751** plant species have been described in this chapter. The list includes several plant species, which have been recorded for the first time with medicinal uses.

***Abelmoschus manihot*** (L.) Medic. [*Malvaceae*]

**Sy.:** *Hibiscus manihot* L.

**Local Name:** Usipak (Assamese).

**Habit and Distribution:** A perennial undershrub. It is found in Assam in forest edges and scrub forests. It is rare in occurrence.

**Parts used:** Leaf and root.

**Medicinal uses:** Leaves are used as medicinal vegetable and considered as tonic. Roots are used in the treatment of tuberculosis. The mucilage of the plant possesses hypoglycemic activity. Roots yield viscous substance called 'Abelmosan', which is useful as antidiabetic medicine.

***Abelmoschus moschatus*** Medic. [*Malvaceae*]

**Syn:** *Hibiscus abelmoschus* L.

**English / Common Name:** Devil's cotton, Musk mallow, Lata Kasturika.

**Local Name:** Gorokhia koroï, Bon bhendi (Assamese), Pushing mento (Arunachal), Uichhuhlo (Mizo), Muskdada (Bengali, Hindi).

**Habit and Distribution:** A small shrub. Frequent throughout NE India. Mostly found in forest edges and scrub forests.

**Parts used:** Leaf, fruit, seed and root.

**Medicinal uses:** Leaf and root pastes are applied locally to cure gonorrhoea. Fruits and seeds are used as tonic, aphrodisiac, antiseptic, diuretic, stomachic, demulcent and carminative. Seeds are useful in treating intestinal disorders, dyspepsia, urinary discharge, nervous debility, hysteria, and skin diseases like itch and leucoderma. Aqueous and raw infusions of seeds are used for intestinal worms, rheumatism, asthma, bronchitis, flatulence, colic, diarrhea, neural disorders and general debility. Seeds are also used to protect woolen garments against moth. It is also used as a substitute for 'Kasturi' or 'Musk', an animal product. Powdered seeds are mixed with water and taken orally in

headache. Seeds yield an essential oil called *Musk Seed Oil* or *Ambrette* oil, used in perfumery. Bark yields good quality fibre.

*Abies spectabilis* (D.Don) Mirb. [*Pinaceae*]

**English / Common Name:** Himalayan Silver Fir.

**Local name:** Talishpatra (Assamese, Bengali, Sanskrit).

**Habit and Distribution:** An evergreen tree, pyramidal in shape. Found in Arunachal Pradesh, Assam, Meghalaya and Nagaland. Rare.

**Parts Used:** Leaf.

**Medicinal uses:** Leaves are used in asthma and bronchitis. Leaves are also used as carminative, digestive, aphrodisiac, diuretic, expectorant, stomachic and astringent. Leaves are considered as oral contraceptive.

*Abroma augusta* L. [*Sterculiaceae*]

**English/ common name:** Devil's cotton, Olat kambal.

**Local Name:** Gorokhia koroi, Bon-kopah (Assamese)  
Dieng tyrkham (Khasi).

**Habit and Distribution:** A large shrub with fluffy stems. Frequent in scrub forest of Assam, Arunachal Pradesh and Meghalaya.

**Parts used:** Leaf, stem and root.

**Medicinal use:** Leaves are considered as useful in diabetes and headache. Stem is used as demulcent. Stem also yields soft, lustrous and silky fibre. Roots are used as uterine tonic and emmenagogue. Powdered roots are used as abortifacient and anti-fertility agent. Seeds yield fatty oil, which lowers cholesterol level in blood.



*Abrus precatorius* L. [*Fabaceae*]

**English/ Common Name:** Indian Licourice, Rosary Pea, Ratti.

**Local name:** Latumoni, Rati (Assamese), Kunch (Bengali), Rati (Hindi), Changning meimubi (Manipuri).

**Habit and Distribution:** A profusely branching large woody climber. Found in scrub forest throughout NE India. The species is facing rarity due to over exploitation.

**Parts used:** Leaf, seed and root.

**Medicinal uses:** Boiled seeds are eaten and they are said to be wholesome. Leaves have a sweetish taste; are often eaten raw or used as vegetable or eaten with betel leaf.

Decoction of leaves is eaten in cold and cough. Paste of leaves, seeds and roots are applied in painful swellings and on leucodermic spots. Roots are tonic, diuretic and emetic. Roots are used as purgative, emetic, tonic, aphrodisiac and in nervous disorder. Bruised seeds are reported to be used for poisoning cattle and for homicidal purposes. The weight of a seed is called 'Rati' and have been used as a unit of weight by the goldsmiths in India since prehistoric time.

*Abutilon indicum* (L.) Sweet. [Malvaceae]

**Syn:** *Abutilon glaucum* Sweet.

**English/Common name:** Country Mallow, Indian mallow.

**Local name:** Jopa-petari, Pera-petari (Assamese), Jampi (Hindi), Mir-at (Karbi).

**Habit and Distribution:** A shrub or undershrub, common throughout NE India in forest edges and wastelands.

**Parts used:** Leaf, stem bark, flower, seed and root.

**Medicinal used:** Paste of whole plant is used as anti-inflammatory. Water infusion of seeds is used as drink to promote the flow of urine and secretions from the bronchial tubes. Same preparation is also taken to cure asthma and skin diseases. Leaves and seeds are also used as demulcent and laxative. Stem bark is used as astringent and diuretic. Seed paste is used in piles. Infusion of roots is used as demulcent and diuretic. Whole plant is used as drug in Ayurvedic and Unani systems.

*Acacia catechu* (L.f.) (Roxb.) Willd. [Mimosaceae]

**English/Common name:** Black Cutch, Katha Tree, Khair.

**Local name:** Khoyar (Assamese), Khoir (Bengali, Hindi), Ingtat kungri (Karbi).

**Habit and Distribution:** A medium sized tree. Found in the forests of Assam and Arunachal Pradesh. The species is facing rarity due to over exploitation.

**Parts used:** Leaf, flower, bark, wood, gum and root.

**Medicinal uses:** Leaves are used in dysentery. Heartwood and barks are used against irritation of throat, cough, diarrhoea, leucorrhoea, chest pain, mouth sores and nasal bleeding, chronic ulceration, epistaxis, eruptions of the skin, leprosy, leucoderma and wounds. It is also useful in treating anaemia, diabetes, inflammations and intermittent fever. It facilitates childbirth and also known to be abortifacient. Flowers are used in gonorrhoea. Roots are used in rheumatism and toothache. Heartwood is the source of catechu, which is marketed as 'Katha', used in pan preparation and as 'Cutch' used for printing and dying purposes.

*Acacia farnesiana* (L.) Willd. [Mimosaceae]

**English/Common name:** Cassie flower.

**Local name:** Tarua-kadam (Assamese), Gaya-babul (Bengali), Chigong-leinamthibi (Manipuri).

**Habit and Distribution:** A thorny large shrub or small sized tree. It is naturalized in all parts of NE India and occasionally planted as ornamental plant.

**Parts used:** Leaf, inflorescence, pod, seed, gum and bark.

**Medicinal uses:** Decoction/paste of tender pods is applied in ringworms. Gum is used in diarrhoea and dysentery. Bark is astringent, demulcent and used in malaria. Leaves are useful for eye complaints and gonorrhoea. Inflorescence is used in venereal diseases.

*Acacia pennata* Willd. [Mimosaceae]

**Local name:** Kuchai, Kuchia lata (Assamese), Kuchui (Bengali), Biswal (Hindi), Khemra (Karbi), Jher-chi-kli (Khasi), Remsu (Garó).

**Habit and Distribution:** A large woody climber. Found in the forests of Assam, Meghalaya and Arunachal Pradesh. Not common.

**Parts used:** Leaf and bark.

**Medicinal uses:** Juice of leaves mixed with milk is taken orally to cure indigestion. Chewing of leaves with sugar and cumin can cure bleeding gums. The decoction of bark is an antidote for snake poison. It is also used in biliousness, bronchitis and asthma. Fruits and stems are used as fish poison to stupefy fish. Barks are also used as raw materials of the fermentation cake used in the traditional alcohol preparation by the Karbis of Assam.

*Acacia polyacantha* Willd. [Mimosaceae]

**Syn:** *A. suma* Buch.-Ham.

**Local name:** Samidh (Assamese), Saikanta (Bengali), Shami (Sanskrit).

**Habit and Distribution:** Medium sized tree. Found throughout Assam, as wild and planted.

**Parts used:** Whole plant.

**Medicinal uses:** The heartwood is bitter, astringent, acrid, depurative, anthelmintic and revulsive. It is useful in leprosy, leucoderma, skin diseases, diabetes, helminthiasis, ulcers, epilepsy, insanity, rheumatism and obesity. The plant is also reported to have anticancer properties.

*Acacia sinuata* (Lour) Merr. [Mimosaceae]

**Syn:** *Acacia concinna* (Willd.) DC.

**English/Common name:** Soap pod, Shikakai.

**Local name:** Am-sirika (Assamese), Sirhup-arikang (Karbi), Riji (Arunachal), Ritha (Bengali, Hindi).

**Habit and Distribution:** A prickly climbing shrub. Found in the forests of NE India. Rare.

**Parts used:** Leaf and pod.

**Medicinal uses:** The decoction of the pods and leaves is used in bilious affections. Crushed pods are boiled and the extract is used as hair wash. It helps in the growth of hair and removes dandruff. It is purgative and useful in malarial fever and skin diseases.

*Acalypha indica* L. [Euphorbiaceae]

**English/Common name:** Indian Acalypha.

**Local name:** Mukuta-manjari (Assamese), Chhawntan (Mizoram), Muktajuri (Bengali), Khakali (Hindi), Harita-manjari (Sanskrit).

**Habit and Distribution:** An annual erect herb. Commonly found in wastelands and roadsides throughout NE India.

**Parts used:** Whole plant.

**Medicinal uses:** Juice and paste of leaves are applied externally in burns, scabies, itches, rash, syphilis and centiped bites. Leaves are also used as a safe and speedy laxative and also to cure tooth and ear ache. The herb is said to possess diuretic, carminative, expectorant and emetic properties, but it causes gastro intestinal irritation. In Homeopathy the herb is used as a remedy for severe cough associated with bleeding from the lungs, haemoptysis and incipient phthisis. With limejuice it is useful in early cases of ringworm. Fresh juice of the leaves is applied with oil, salt or lime in rheumatoid arthritis and to cure scabies and other skin affections. The powdered leaves are used for bedsores and maggot-infested wounds.

*Acampe papillosa* Lindle. [Orchidaceae]

**Local name:** Rasna (Assamese, Bengali, Hindi), Nakuli Rasna (Sanskrit).

**Habit and Distribution:** An epiphytic orchid. Found in Assam, Arunachal Pradesh and Meghalaya. Less frequent.

**Parts used:** Root.

**Medicinal uses:** Roots are used as a substitute for sarsaparilla (*Hemidesmus indicus* R.Br.) and considered specific in rheumatism.

*Achyranthes aspera* L. [Amaranthaceae]

**English/ Common name:** Prickly Chaff Flower.

**Local name:** Hati-huria, Ultasoth (Assamese), Soh-byrthried (Khasi), Buchhaw

(Mizoram), Latjira (Hindi).

**Habit and Distribution:** A perennial Herb. Commonly grows in wastelands, roadsides and forest edges throughout NE India.

**Parts used:** Whole plant.

**Medicinal uses:** Leaves paste is applied locally for cut injuries and wound healing. Juice of the crushed plant is taken orally in dysentery, piles, skin eruptions, wounds, ulcer and sore-worms. It is purgative and diuretic. Also used in dropsy, boils, colic and snakebite. Root is astringent.

*Aconitum ferox* Wall. [*Ranunculaceae*]

**English/ Common name:** Indian aconite, Vatsnabh.

**Local name:** Bih (Assamese), Chandu sheng (Arunachal), Katbish (Bengali), Bacchang (Hindi), Visha (Sanskrit).

**Habit and Distribution:** Biennial, tuberous, erect herb. Found in moist forest of Arunachal Pradesh. It is a threatened plant species due to over exploitation for commercial purposes. This species is prioritized by National Medicinal Plant Board (NMPB), Ministry of Health & Family Welfare, Government of India, for trade and cultivation.

**Parts used:** Tuber.

**Medicinal uses:** The tuber is poisonous and used for poisoning arrows. Tubers contain an alkaloid Aconitine, which is used externally in neuralgia, rheumatism and inflammation. Tubers are also used as a medicine for its action as narcotic and sedative. The roots are anodyne, anti-inflammatory, diaphoretic, diuretic, expectorant, nervine tonic, stomachic, appetizer, carminative, digestive, stimulant, cardiotoxic, emmenagogue and febrifuge. Tuber paste is applied locally in rheumatism. The roots are useful in cephalalgia, neuralgia, painful inflammations, rheumatism, cough, asthma, bronchitis, hypotension, dyspepsia, flatulence, colic, leprosy, skin diseases, fever, cholera, and paralysis.

*Aconitum heterophyllum* Wall. ex Royle [*Ranunculaceae*]

**Local name:** Bor-Bih (Assamese), Chandu, Seli, Manseng (Arunachal), Atis (Hindi), Atibisha (Sanskrit).

**Habit and Distribution:** Biennial erect herb. Found in Arunachal Pradesh. This plant species is facing extreme rarity due to over exploitation for commercial purposes. This species is prioritized by National Medicinal Plant Board (NMPB), Ministry of Health & Family Welfare, Government of India, for trade and cultivation.

**Parts used:** Tuberous root.

**Medicinal uses:** Tuber is highly poisonous. Tubers contain an alkaloid Aconitine, which is used externally in neuralgia, rheumatism and inflammation. Roots are considered as



diaphoretic, diuretic, antiperiodic, anodyne, antidiabetic, antiphlogistic and antipyretic in very small doses. In large doses it is virulent poison, narcotic and powerful sedative. It reduces the frequency and tension of the pulse and paralyzes the respiratory center.

*Acorus calamus* L. [Araceae]

**English/ Common name:** Sweet flag, Bach.

**Local name:** Bos (Assamese), Sueta ralia (Arunachal), Hnim-rimtui (Mizoram), Bach (Bengali, Hindi), Vasha (Sanskrit).

**Habit and Distribution:** A perennial herb growing in marshy habitat. Less frequent in wild. It is cultivated as household medicinal plant throughout NE India. The species has commercial importance. This species is prioritized by State Medicinal Plant Board (SMPB) of Assam for commercial cultivation. .

**Parts used:** Leaf and rhizome.

**Medicinal uses:** Dried rhizomes of the plant constitute the drug calamus. Infusion of rhizome is taken orally as a remedy for chronic diarrhoea and dysentery. The rhizome is appetizer and is also useful in the treatment of epilepsy, delirium, hysteria and loss of memory. In unani literature, the rhizome has been described as having a very bitter taste and is said to be useful as brain tonic.

The fresh rhizomes are used in confectionary and also as a substitute for ginger. It is considered a household remedy for flatulent colic. Due to its essential oil contents, it acts as an expectorant. Rhizomes are used to treat epilepsy, delirium, amnesia, convulsions, depression and other mental ailments, dyspepsia, remittent fever, colic, in various kinds of cancers (glandular and abdominal tumours) and in cases of snake-bites. Calamus also acts as emetic and in larger doses can cause violent vomiting. The rhizomes are also used as stimulant. It also possesses anti plasmodic properties. Powdered rhizome is used as vermifuse. The plant is extensively used in many Ayurvedic formulations.

*Actephila excelsa* (Dalz.) Muell. Arg. [Euphorbiaceae]

**Local name:** Moiteleng (Mizoram).

**Habit and Distribution:** Shrub. Found in dense forests of Mizoram. It is a rare species.

**Parts used:** Leaf.

**Medicinal uses:** Juice of bruised leaves is applied externally in tonsillitis and throat pain.

*Actinodaphne angustifolia* Nees. [Lauraceae]

**English/Common name:** Pisa.

**Local name:** Petari-chawa (Assamese).

**Habit and Distribution:** A small tree. It is found occasionally in the forests of entire

North-Eastern India.

**Parts used:** Leaf and seed.

**Medicinal uses:** Infusion of leaves is used in diabetes and urinary disorders. Seeds yield a fat called as 'Pisa' fat, which is a good source of lauric oil.

*Adenanthera pavonina* L. [Mimosaceae]

**English/Common name:** Coral wood tree.

**Local name:** Kuchandan (Assamese), Dienng Jhing (Khasi), Raktachandan (Bengali), Barigumchi (Hindi), Kuchandana (Sanskrit).

**Habit and Distribution:** A large deciduous tree. Found frequently in the forests of entire NE India. It is occasionally cultivated in this area.

**Parts used:** Leaf, seed and wood.

**Medicinal uses:** Leaves are used in chronic rheumatism. The barks and leaves are astringent, vulnerary and aphrodisiac. They are useful in haematuria, ulcers, pharyngopathy and gout. A decoction of the seeds and wood is used in pulmonary affections and externally applied in chronic ophthalmia. The heartwood is astringent, aphrodisiac, haemostatic and is useful in dysentery and haemorrhages.

*Adhatoda zeylanica* Medic. [Acanthaceae]

**Syn:** *Adhatoda vasica* Nees., *Justicia adhatoda* Linn.

**English/Common name:** Malabar nut, Vasaka.

**Local name:** Boga bahek, Tita bahak (Assamese), Jok-an-kelok (Karbi).

**Habit and Distribution:** A shrub. Found wild as well as cultivated as household medicinal plant throughout North East. It is often cultivated as hedge plant.

**Parts used:** Whole plant.

**Medicinal uses:** The leaves, flowers, fruits and roots are used for the treatment of cough, cold, whooping cough, chronic bronchitis and asthma. These also considered as antiseptic. The plant is extensively used in a number of Ayurvedic formulations as vasaka. The drug vasaka comprises the fresh or dried leaves of the plant. Leaves contain alkaloids vasicine and vasicinone. Vasicine has also been found to be promising uterotonic abortifacient. Leaves are rich in vitamin C and carotene. Leaves yield an essential oil. Leaf juice is also used to cure diarrhoea, dysentery and glandular tumours. The plant is said to be a good insecticide.



*Adiantum Capillus-veneris* L. [Adiantaceae]

**English/Common name:** Maidenhair fern.

**Local name:** Pan-dhekia (Assamese), Mayurasikha (Bengali), Hansraj (Hindi).

**Habit and Distribution:** An erect rhizomatous herbaceous fern. Found commonly on the forest floor and hill slopes throughout North East India.

**Parts used:** Whole plant.

**Medicinal Uses:** Plant is used as expectorant, pectoral demulcent, emmenagogue and tonic. Leaf paste is applied locally in wounds and boils. This fern contains an alkaloid adiantone and an essential oil.

*Adiantum caudatum* L. [Adiantaceae]

**Local name:** Khojkarha dhekia (Assamese), Mayurasikha (Bengali, Hindi, Sanskrit).

**Habit and Distribution:** A rhizomatous herbaceous fern occasionally attains a twining habit. Found commonly on the forest floor and hill slopes throughout North East India.

**Parts used:** Leaf.

**Medicinal Uses:** Leaf paste is used in skin diseases. The whole plant is used in diabetes, cough, fever and hemicrania. It yields adiantone, isoadantone, fernene and -sitosterol.

*Adiantum philippense* L. [Adiantaceae]

**Syn:** *Adiantum lunulatum* Burn.

**English/Common name:** Walking Maidenhair fern.

**Local name:** Bidyapat (Assamese), Kalikat (Bengali), Kalijant (Hindi), Hangsapadi (Sanskrit).

**Habit and Distribution:** A small rhizomatous, herbaceous fern. Commonly found on wet hilly places and old brick walls in Assam and Meghalaya.

**Parts used:** Whole plant.

**Medicinal uses:** The plant is used in fever and erysipelas. Rhizomes are used as a stimulant, expectorant, demulcent and emmenagogue. Rhizomes prescribed for strangury and in fever due to elephantiasis. Whole plant paste is applied on itch and skin diseases.

*Adiantum venustum* G. Don. [Polypodiaceae]

**English/Common name:** Hansraj.

**Local name:** Hangkharaj (Assamese), Hansaraj (Hindi), Hansapadi (Sanskrit).

**Habit and Distribution:** A small rhizomatous, herbaceous fern. Commonly found in wet hilly places and on old brick walls in Assam and Meghalaya.

**Parts used:** Leaf.

**Medicinal uses:** Leaves- tonic, resolvent, expectorant, diuretic, emmenagogue, astringent, emetic. It is mostly used as an anodyne in bronchitis; also used against tumours, biliousness, inflammatory diseases of the chest, ophthalmia and in scorpion sting.

*Adina cordifolia* B & H.f [*Rubiaceae*]

**English/Common name:** Haldu.

**Local name:** Kelikadam (Assamese, Bengali), Halda (Hindi), Dharakadamba (Sanskrit).

**Habit and Distribution:** A large tree. Commonly found in the forests of Assam. It is also cultivated as timber yielding tree.

**Parts used:** Stem bark.

**Medicinal uses:** Juice of the bark is used in killing worms and in sores. Decoction of bark is used to cure wounds. It is also used in indigestion and dysentery. Haldu is considered as grade-I commercial and moisture proof plywood timber. Barks yield tannin. Leaves are also used as fodder.

*Aeginetica indica* L. [*Orobanchaceae*]

**Local name:** Sangharvaibel (Mizoram).

**Habit and Distribution:** An annual, leafless, parasitic herb, growing on the roots of bamboo and some other grasses, upto 50 cm tall. Found in dense forests. Rare.

**Parts used:** Rhizome.

**Medicinal uses:** Juice of the crushed rhizome is applied externally in mumps and inflammation. .

*Aegle marmelos* (L.) Correa ex Roxb. [*Rutaceae*]

**English/ Common name:** Bael tree, Holly fruit tree, Bel Fruit.

**Local name:** Bael (Assamese), Bilva (Sanskrit), Thepli (Karbi), Hai-khagok (Manipur), Bethel (Mizoram).

**Habit and Distribution:** A large tree, found throughout NE India, less frequent in wild, cultivated as household fruit tree. National Medicinal Plant Board (NMPB), Ministry of Health & Family Welfare, Government of India has prioritized this plant species, for trade and cultivation.

**Parts used:** Leaf, fruit, seed, bark and root.

**Medicinal uses:** Ripe fruit pulp extract in water is taken in empty stomach in the morning to cure stomach ulcers, dyspepsia and dysentery. Leaves are expectorant, febrifuge; fresh ones used in dropsy, efficacious in bronchial asthma. Leaf juice extract is applied externally in abscess. Barks (stem and root) are beneficial in intermittent fever, melancholia and palpitation of heart. Root bark is also useful in hypochondriasis and stomach pain. Ripe fruits yield mucilage and pectin, which is useful in indigestion, dysentery and chronic diarrhoea, loss of appetite and habitual constipation. Unripe fruits are antidiarrhoeal, astringent, demulcent, digestive and stomachic. Roasted fruit pulps mixed with milk is taken as rejuvenating food after dysentery. Seeds are laxative. Roots are useful in cases of seminal weakness, diarrhoea, dysentery, eye trouble, cholera, diabetes, dyspepsia, stomachalgia, cardiospasm, vomiting, uropathy, swelling and gastric irritability in infants. Poultice made of leaves are used for ophthalmia and ulcers. Leaves are also used for abortion.

*Aesculus assamica* Griffith. [*Sapindaceae*]

**Local name:** Raman-bih (Assamese), Bol-rimot, Bol-rimmu (Garó), Dieng-dula, Dieng-sangkenrop (Khasi).

**Habit and Distribution:** Middle sized tree with a beautiful, sub-globose crown. It is reported to be endemic to North East India. It is found common in deciduous forests of Assam, Meghalaya and Manipur.

**Parts used.** Bark.

**Medicinal uses:** Bark is used in skin diseases. Bark is also used as fish poison.

*Aganosma dichotoma* K. Schum. [*Apocynaceae*]

**Syn:** *Aganosma caryophyllata*, G. Don.

**Local name:** Malati-lota (Assamese), Malati (Bengali, Hindi, Marathi, Gujrati, Sanskrit).

**Habit and Distribution:** A climber. Found rarely in the forests of Assam.

**Parts used:** Whole plant.

**Medicinal uses:** The plant is used as an emetic. Leaves are used in biliousness and flowers are used in eye diseases. Whole plant is used as an ingredient of an Ayurvedic compound 'Vishgarbha thaila', which has anodyne and sedative properties and used in paraplegia, sciatica and neuralgia.

*Agave americana* L. [*Agavaceae*]

**English/ Common name:** Century plant, American aloe.

**Local name:** Bilati-anaras (Assamese), Bilatipat (Bengali), Kantala (Hindi), Kalakantala (Sanskrit).

**Habit and Distribution:** A perennial stemless, scapigerous shrub. Cultivated throughout NE India and often found as an escape in wastelands.

**Parts used:** Leaf and root.

**Medicinal uses:** Juice of leaves is laxative, diuretic and emmenagogue. Leaves are used as resolvent in syphilis, scrofula and cancer. It is also used in scurvy. The plant is used as fish poison. The roots are used as diuretic, diaphoretic and antiseptic. Leaves contain steroidal hecogenin.

*Ageratum conyzoides* L. [Asteraceae]

**English/ Common name:** Goat weed.

**Local name:** Sagun-tulashi (Assamese), Mishap (Arunachal), Dochunty (Bengali), Khongjai-napee (Manipur), Voilenhlo (Mizoram).

**Habit and Distribution:** Annual erect aromatic herb. Found to grow in wastelands throughout NE Indian states.

**Parts used:** Leaf, flower, seed and root.

**Medicinal uses:** Leaf extract is applied to cure fresh cut injuries. Fresh leaves and shoots are used as ingredient in the preparation of herbal hair lotion, locally known as 'Chingee-hee' in Manipur. The plant is reported to be antilithic for kidney stones. Tribal populations in NE India use this plant for a number of diseases such as leprosy, piles, prolapse of anus, swelling of body, uterine disorders, and skin diseases and also for snakebite. A wide range of chemical compounds including alkaloids, flavonoids, chromones have been isolated from this plant.

*Alangium salvifolium* (L.f.) Wang. [Alangiaceae]

**Syn:** *Alangium lamarckii*, Thw

**Local name:** Akarkata (Assamese), Akarkanta (Bengali), Ankola (Hindi, Sanskrit).

**Habit and Distribution:** A large deciduous shrub or tree. Found wild throughout NE India. Frequent in occurrence.

**Parts used:** Root bark and Leaf.

**Medicinal uses:** Crushed leaves are used as poultice in rheumatic pain. Roots are purgative and anthelmintic. Also used in fever and skin diseases. Root barks are used for cutaneous troubles. The bark exhibits antitubercular activity. Bark contains alkaloid alangine. Root extract shows hypotensive action. Fruits are acidic, astringent, laxative, tonic and refrigerant.

*Albizia chinensis* (Osborne) Merr. [Mimosaceae]

**Local name:** Vang (Mizoram).

**Habit and Distribution:** An unarmed, deciduous or evergreen tree with a flat, spreading crown. Frequent throughout Mizoram.

**Parts used:** Stem bark.

**Medicinal uses:** Juice of stem bark is applied as lotion for cuts, scabies and skin diseases.

*Albizia julibrissin* Durazz. [*Mimosaceae*]

**English/ Common name:** Mimosa, silk tree, powderpuff tree.

**Local name:** Ranga shirish (Assamese), Kalkora (Bengali), Lalsirish (Hindi).

**Habit and Distribution:** A small tree. Found common in NE India.

**Parts used:** Whole plant.

**Medicinal uses:** All parts of the plant are useful in snakebite and scorpion sting. The stem bark and seeds are astringent, tonic and restorative. These are used in piles and diarrhoea. Roots are used in hemicrania. Leaves are used in night blindness. Leaves are used for the treatment of neuralgia and headaches. Flowers are used in asthma

*Albizia lebeck* (L) Willd. [*Mimosaceae*]

**English/ Common name:** Siris tree, Indian walnut, Amaltas, Chimchola.

**Local name:** Shirish (Assamese, Bengali, Hindi), Shirisha (Sanskrit), Dieng-sah-rin (Khasi).

**Habit and Distribution:** Large tree. It is found throughout NE India but not very common. It is also planted for its wood.

**Parts used:** Whole plant.

**Medicinal uses:** Uses are similar with that of *Albizia julibrissin*. All parts of the plant are useful in snakebite and scorpion sting. The stem bark and seeds are astringent, tonic and restorative. These are used in piles and diarrhoea. Roots are used in hemicrania. Leaves are used in night blindness. Flowers are used in asthma. Leaves and seeds are used for eye troubles. Bark is used in boils. Tree yields a gum used as an adulterant of Gum Arabic.

*Albizia odoratissima* Benth. [*Mimosaceae*]

**English/ Common name:** Black Siris, Kala siris.

**Local name:** Cham koroi, Shirish (Assamese), Kakur Shirish (Bengali), Kala Shirish (Hindi), Dieng-saw (Khasi), Sisso (Garo), Kangtekpa (Mizoram).

**Habit and Distribution:** A large deciduous tree. Found in Assam from Goalpara to Darrang. Less frequent in Mizoram and Meghalaya.

**Parts used:** Stem bark and leaf.

**Medicinal uses:** Juice of stem bark is applied externally in ulcers and leprosy. Dried bark powder is considered as anthelmintic and used as fish poison to catch fish in the river. Bark is also used to cure insect bites. Leaf extract is applied in cutaneous infections. Tree yields a gum similar to the gum from *A. lebbek*.

*Albizia procera* Benth. [Mimosaceae]

**English/ Common name:** White Siris.

**Local name:** Koroï, Boga shirish (Assamese), Kori (Bengali), Safed Siris (Hindi), Dieng Saw (Khasi), Khelvi (Garo), Kangteknu (Mizoram).

**Habit and Distribution:** A large deciduous tree. Found throughout NE India, frequent in forest, occasionally cultivated. The species is also planted in the tea gardens as shade tree.

**Parts used:** Leaf and bark.

**Medicinal uses:** Leaves are made into poultice and applied to ulcers. Bark is used to treat rheumatism and haemorrhages.

*Albizia stipulata* Boiven. [Mimosaceae]

**Local name:** Saw koroï (Assamese), Chaku (Bengali), Sirau (Hindi), Borphi (Garo), Dieng-phallut (Khasi).

**Habit and Distribution:** A large deciduous tree. Found throughout NE India, frequent in forest, occasionally cultivated.

**Parts used:** Leaf and stem bark.

**Medicinal uses:** Leaves paste is applied in ulcers. Infusion of bark is used as a lotion for cuts, scabies and skin diseases. Bark is also used as fish poison.

*Aleurites moluccana* Willd. [Euphorbiaceae]

**English/ Common name:** Candle nut tree.

**Local name:** Mota bhela (Assamese), Jangli akhrot (Bengali, Hindi), Akhshota (Sanskrit).

**Habit and Distribution:** A large evergreen tree. Found in the forests of Assam and Arunachal Pradesh.

**Parts used:** Leaf, bark and seed.

**Medicinal uses:** Leaves, bark and seeds are used in the treatment of piles, asthma and tumors. Seeds are laxative and seed oil is purgative. Seed oil is used in constipation. Seed oil is also used as substitute for castor oil. Candles shaped from the paste of kernels are used for illumination.



*Allamanda cathartica* L. [Apocynaceae]

**English/ common name:** Golden trumpet, Allamanda.

**Local name:** Gilachphul (Assamese), Ghantaphul, Harkakra (Bengali).

**Habit and Distribution:** An erect shrub. A naturalized species found throughout NE India. The plant is also cultivated as ornamental.

**Parts used:** Leaf, stem bark and root.

**Medicinal uses:** Leaves are cathartic. Leaf extract and infusion is used in colic. Leaves are also used as antidote for poisoning. Decoction of stem bark is used as hydragogue in ascites. The active principle is 'Allamandin' and 'Allmandacin', which show antileukaemic activity.

*Allium chinensis* D. Don. [Liliaceae]

**Local name:** Bhui-champa (Assamese), Tej anglasing (Nagaland).

**Habit and Distribution:** An annual herb. It is found scattered in grasslands and forests edges in Assam and other parts of NE India.

**Parts used:** Bulb.

**Medicinal uses:** Grounded bulb is boiled in mustard oil and rubbed on the body to reduce fever. It is also used to cure stomachache.

*Allium hookeri* Thw. [Liliaceae]

**English/ Common name:** Winter leek.

**Local name:** Talap (Arunachal), Yenua- napakpi (Meghalaya), Maroi-na-pakpi (Manipur).

**Habit and Distribution:** A perennial herb. Found throughout NE India particularly in Meghalaya, Nagaland and Manipur upto an altitude of 1500-2000m.

**Parts used:** Leaf and bulb.

**Medicinal uses:** Leaf paste is applied locally on forehead in fever and vertigo. Lukewarm juice of the bulb is massaged on the body to relieve bodyache. One or two bulbs are taken to control excessive gas formation in the stomach.

*Allium sativum* L. [Liliaceae]

**Local name:** Rahun, Naharu (Assamese), Rasun (Bengali), Lasun (Hindi), Lashuna (Sanskrit).

**Habit and Distribution:** Perennial herb with a compound bulb. It is cultivated all over NE India.

**Parts used:** Bulb.

**Medicinal uses:** Bulb is carminative, aphrodisiac, expectorant and stimulant. Used in fevers, coughs, and febrifuge and in intermittent fevers. Juice is rubefacient. Used in skin diseases and as eardrops in earache, useful in dyspepsia, flatulence and colic. Bulb paste is applied for wound healing. Bulb decoction mixed with 'hing' (gum-resin of *Ferula assafoetida*) and butter is applied locally in paralysis.

*Allium tuberosum* Rottl. Ex. Spreng. [*Liliaceae*]

**English/Common name:** Bon rasun.

**Local name:** Bon naharu (Assamese), Habit harsun (Karbi), Yenum-nakupi (Manipur).

**Habit and Distribution:** A perennial herb. This species grows wild in the forests and waste places of Assam, Arunachal Pradesh and Meghalaya.

**Parts used:** Leaf.

**Medicinal uses:** leaves are used in boils, arteriosclerosis, constipation, influenza, gallstone, high blood pressure, diphtheria, pharyngitis, urinary trouble etc.



*Allophylus cobbe* (L.) Raeusch [*Sapindaceae*]

**Syn:** *Allophylus serratus* (Roxb.) Kurz

**Local name:** Rakhalphul (Assamese, Bengali).

**Habit and Distribution:** A small tree. Found wild in Assam and Khasi Hills of Meghalaya.

**Parts used:** Fruit, leaf, bark and root.

**Medicinal uses:** Fruits are edible and used as medicine against tapeworms. Leaves and barks are used for elephantiasis. Crushed and pulverized leaves are inhaled as sternutatory. Leaf decoction is given in colic. Root is used to check diarrhoea. It has also astringent properties.

*Alnus nepalensis* D. Don. [*Betulaceae*]

**English/Common name:** Indian alder.

**Local name:** Udis (Arunachal), Intounglong (Nagaland), Rupuo pareng (Manipur).

**Habit and Distribution:** A medium sized tree. Found wild in Arinachal Pradesh, Manipur and Nagaland.

**Parts used:** Bark.

**Medicinal uses:** Bark paste is taken orally to cure stomachache and dysentery. Bark contains tannin. It is also used in dyeing to deepen the colour yielded by *Rubia cordifolia*.

*Alocasia cucullata* Schott [Araceae]

**Local name:** Kola kachu (Assamese), Kal- kachhu (Meghalaya).

**Habit and Distribution:** A rhizomatous herb. Found common throughout NE India.

**Parts used:** Leaf and rhizome.

**Medicinal uses:** Leaf petiole is used as ear bud. Petiole decoction is applied on forehead to reduce dizziness. Leaf and rhizome paste is used to cure bodyache.

*Alocasia indica* Schott. [Araceae]

**English/Common name:** Indo-Malayan Taru, Giant taru.

**Local name:** Mankachu (Assamese, Bengali), Mankanda (Hindi), Manaka (Sanskrit).

**Habit and Distribution:** A robust rhizomatous herb. Common in NE India also cultivated.

**Parts used:** Leaf, petiole and tuber.

**Medicinal uses:** Leaves are styptic and astringent. Petiole is cooked and eaten to purify blood. Tubers are used in piles, constipation and anasarea. Petiole decoction is applied on forehead to reduce dizziness. Rootstocks are considered as diuretic and laxative. Leaves are styptic and astringent.

*Alocasia macrorrhiza* Schott [Araceae]

**English/ Common name:** Giant Taro.

**Local name:** Bar-Mankachu (Assamese), Hong-ngoo (Manipur).

**Habit and Distribution:** A robust rhizomatous herb. Found scattered in NE India, occasionally cultivated.

**Parts used:** Leaf, petiole and tuber.

**Medicinal uses:** The tubers and petioles may be preserved for months and are eaten in curries after proper cooking. The leaves are a good source of protein. Leaves are used in the treatment of scorpion sting, cut, earache and cough. Juice of the petioles is used as eardrop in children for otorrhoea, used to expel worms and in urine complaints. It is also useful in toothache and cough. The rootstock is pungent, fragrant, cooling, and useful in inflammation and diseases of abdomen. After boiling it is given as a mild laxative and is useful as diuretic and also in piles. The leaves are styptic and astringent. The chopped roots and leaves are used against tumours. Petioles are used in fermented food products of dry fish in Manipur.

*Aloe barbadensis* Mill. [Liliaceae]

**Syn:** *Aloe vera* Tourn. ex L.

**English/ Common name:** Indian Aloe, Ghrita kumari.

**Local name:** Chalkuwari (Assamese), Ghrita kumari (Bengali, Sanskrit), Kumari (Hindi), Bap engsu (Karbi), Ghrita-kumar (Manipur).

**Habit and Distribution:** A succulent perennial herb. Commonly found in NE India. Now it is widely cultivated for commercial purposes. State Medicinal Plant Board (SMPB) of Assam (Which is the state chapter of NMPB) prioritizes this species for trade and cultivation.



**Parts used:** Succulent leaf.

**Medicinal uses:** Leaf extract is given in dysentery, cut injuries, wound and dizziness. Leaf paste is applied externally on burns and sprains. Leaf pulp is used to treat liver disorder, rheumatism, skin disorders, and intestinal worms. Fresh juice of the leaves is cathartic and cooling. It is used for jaundice, habitual constipation, loss of appetite, gas formation in the stomach and leucorrhoea. The plant is considered as bitter purgative, stomachic, alternative, aphrodisiac, anthelmintic, and emmenagogue and blood purifier. Fresh aloe gel is well known for its domestic medicinal value. It is used as antihelmintic in children. Cathartic properties of aloe are due to the presence of glycosides called alonin, which is used, in chronic constipation.

*Alpinia allughas* (Retz.) Rosc. [Zingiberaceae]

**Syn:** *Alpinia nigra* (Gaertn.) Burt

**Local name:** Tora (Assamese), Taro (Bengali), Taraka (Sanskrit).

**Habit and Distribution:** A rhizomatous large erect herb. Found wild in evergreen forests of Assam, Arunachal Pradesh, Meghalaya and Manipur.

**Parts use:** Rhizome.

**Medicinal uses:** Rhizome is used in gout and colic. Rhizome paste or extract is used externally in headache, lumbago and rheumatic pains. Rhizomes are also used as edible medicine to cure sore throat, pain in the chest, diabetes, liver disorders, tubercular glands and kidney problems. Rhizomes yield an essential oil.



*Alpinia galanga* (L.) Willd. [Zingiberaceae]

**English/Common name:** Greater Galangal.

**Local name:** Bogi tora, Sugandhi-bach (Assamese), Barakulanjan (Bengal, Hindi), Sugandha Vacha (Sanskrit), Phikangnek (Karbi), Aichol (Mizoram).

**Habit and Distribution:** Rhizomatous large and erect herb. Found wild in dense evergreen forests of Assam, Arunachal Pradesh and Meghalaya. The species is facing rarity due to over exploitation from wild for commercial purposes.

**Parts used:** Flower, seed and rhizome.

**Medicinal uses:** Flowers are eaten raw or pickled. The dried rhizome of this plant is called 'Greater Ganlangal' which is an important drug in Ayurvedic and Unani systems of medicine. Rhizomes are used for pickling, as a condiment and for seasoning fish; also substituted for ginger. Bulbs are eaten raw. Rhizomes are considered to be effective in the treatment of impotence. It is also used as a disinfectant, bronchodilator and anti-inflammatory agent and for treating asthma, bronchitis, hiccup, obesity, rheumatism and diabetes. Seeds contain antiulcer agents and they are used to control diarrhoea and vomiting. The drug is also considered useful in stomach complaints and as a tonic, deodorant and stimulant. Rhizome yields an essential oil, used in perfumery as a source of methyl cinnamate and cinol.

*Alstonia scholaris* (L.) R. Br. [Apocynaceae]

**English/Common name:** Dita Bark, Chatiyan, Shatian wood.

**Local name:** Chatiana (Assamese), Chattin (Bengali), Chatian (Hindi), Saptaparna (Sanskrit), Dieng-ryteng (Khasi), Sakchuan (Garo), Thuamriat (Mizoram).

**Habit and Distribution:** A large evergreen tree. Very frequently found in the tropical forests of NE India. The plant is also cultivated for the wood and bark.

**Parts used:** Leaf, stem bark and root bark.

**Medicinal uses:** Decoction of stem bark and root bark is taken internally for hypertension, stomach ulcer and fever. Bark is bitter tonic, febrifuge, anthelmintic and galactagogue. Liquid extract of bark is used for chronic diarrhoea, asthma and cardiac troubles. Leaves used in beri-beri, dropsy and congested liver. Latex applied to sores, ulcers, tumours and rheumatic swellings. Bark contains alkaloid echitamine. Flowers yield an essential oil and the alkaloid picrinine, which acts as a depressant on the central nervous system.

*Alternanthera sessilis* DC [Amaranthaceae]

**Local name:** Matikaduri (Assamese), Shanchi (Bengali)

**Habit and Distribution:** A variable prostrate to erect herb. Common throughout NE India in crop fields, forest edges, waste lands.

**Parts used:** Whole plant.

**Medicinal uses:** The plant is considered as galactagogue, cholagogue and febrifuge. The whole plant is roasted wrapped with banana leaf and eaten to cure indigestion and dysentery. Used as a medicinal vegetables in the entire NE India. Whole plant is also used to treat burning sensation, diarrhoea, leprosy, skin diseases, night blindness and fever. Aerial portion is used as medicinal fodder to increase milk in the cattle.

*Altingia excelsa* Noronha. [Altingiaceae]

**Local name:** Jutuli (Assamese), Silaras (Hindi).

**Habit and Distribution:** A large tree. Found throughout NE India. The species is facing rarity due to over exploitation for commercial purposes.

**Parts used:** Resin.

**Medicinal uses:** The resin obtained from this plant is known as 'Rasamala'. This resin is carminative, expectorent, stomachic, antiscorbutic and antipyretic. It is used externally in scabies, leucoderma, vesicular calculi, lumbago, menorrhagia, renal and pulmonary troubles. Resin is also used in perfumery.

*Amaranthus spinosus* L. [Amaranthaceae]

**English/Common name:** Prickly amaranth.

**Local name:** Hati-Khutura, Kata-khutura (Assamese), Katanota (Bengali), Katidar (Hindi), Tanduliya (Sanskrit).

**Habit and Distribution:** Small spiny annual herb. It commonly grows in fields, wastelands, forest edges and roadsides throughout NE India.

**Parts used:** Tender aerial part and root.

**Medicinal uses:** Used as a pot-herb. The aerial parts of the plant are used as a refrigerant, diuretic and purgative, for stomach troubles, piles, against cholera and also as a sudorific, it prevents vomiting. In traditional practices in Assam the root is used for abortion. A well grown, long root with a pinch of 'hing' (gum resin of *Ferula assafoetida*) pasted on the root-tip is inserted into the vagina in the evening. The inserted root is allowed to remain inside the vagina overnight till abortion is achieved. Roots are used in menorrhagia, gonorrhoea, eczema, colic, as lactagogue. Cooked leaves and roots are given as laxative to children, applied as emollient poultice to abscesses, boils and burns.

*Amaranthus tricolor* L. [Amaranthaceae]

**Syn:** *Amaranthus gangeticus*. Linn

**Local name:** Marisha hak (Assamese), Datha (Bengali), Lalsag (Hindi), Marisha (Sanskrit).

**Medicinal uses:** Fruits are used as a spice. Seeds yield an essential oil. A paste prepared from fresh seeds is applied for abortion. Plant is also used in the treatment of pox.

*Amomum subulatum* Roxb. [Zingiberaceae]

**English/Common name:** Greater or Nepal cardamom.

**Local name:** Bar-elachi (Assamese), Bara-elachi (Bengali, Hindi), Illaichi-achouba (Manipur).

**Habit and Distribution:** A perennial large herb. Found wild in Arunachal Pradesh, Manipur and Nagaland. The species is cultivated occasionally and rare in wild.

**Parts used:** Fruit and seed.

**Medicinal uses:** Seed powder is taken to cure high blood pressure. Dry fruit powder is used as a spice. Seeds are stomachic, useful in neuralgia, used in gonorrhoea, as aphrodisiac, antidote to scorpion sting and snakebite. Seeds possess properties more or less similar to those of the true cardamoms (*Elettaria cardamomum*), for which they are often substituted. Oil extracted from seeds is applied locally in inflamed eyelids.

*Amoora cucullata* Roxb. [Meliaceae]

**Local name:** Bar-amari (Assamese), Amur (Bengali), Samphal (Sanskrit).

**Habit and Distribution:** A large tree. Found in the forest of Upper Assam. The species is extremely rare.

**Parts used:** Leaf.

**Medicinal uses:** Crushed leaves are applied to remove inflammation

*Amoora rohituka* W & A [Meliaceae]

**Local name:** Bandardima (Assamese), Tiktaraj (Bengali), Harinhara (Hindi), Dieng-rata (Khasi), Bol samphal (Garo).

**Habit and Distribution:** A medium sized tree. Found frequently in Assam, Arunachal Pradesh and Meghalaya.

**Parts used:** Stem bark.

**Medicinal uses:** The stem bark is used in spleen and liver diseases, tumours and abdominal complaints.

*Amorphophallus paeoniifolius* (Dent.) Nicols. var. *campanulatus* Bl ex. Decne [Araceae]

**Local name:** Ol-kachu (Assamese), Ol (Bengali), Zaminkand (Hindi), Arshaghna (Sanskrit), Telhawng (Mizoram).

**Habit and Distribution:** A stout herb with underground corm. It grows wild in moist shady places in Assam



and other parts of NE India.

**Parts used:** Corm.

**Medicinal uses:** Powdered corms mixed with water are taken orally to cure dysentery. Paste of fresh corm is applied locally in piles and rheumatic pain. It is stomachic, tonic, restorative and carminative. When fresh, it acts as an acrid stimulant and expectorant.

*Anamirta cocculus* W&A [*Menispermaceae*]

**Syn.:** *Anamirta paniculata* Colebr.

**English/Common name:** Levant berries, Fish berries.

**Local Name:** Kakamari (Assamese, Bengali, Hindi, Sanskrit).

**Habit and Distribution:** A large climbing shrub. It is found in the forests of Khasi Hills (Meghalaya) and Assam but rare in occurrence.

**Parts Used:** Fruit and seed.

**Medicinal uses:** Fruits and seeds as narcotic. Ointment prepared from fruit is used as insecticide to destroy pediculi and in chronic skin diseases. Fruit is very bitter and used to poison crows and fish.

*Ananas comosus* Mar (Merr) [*Bromeliaceae*]

**Syn:** *Ananas sativus*. Schult.

**English/Common name:** Pineapple.

**Local name:** Matikothal, Anaras (Assamese, Bengali), Anannas (Hindi), Anannasa (Sanskrit).

**Habit and Distribution:** A tall perennial herb with rigid, densely tufted leaves. It is cultivated throughout Assam and Meghalaya.

**Parts used:** Leaf and fruit.

**Medicinal uses:** Juice of tender leaves is taken internally to expel intestinal worms. Unripe fruit is purgative and abortifacient. Juice from the ripe fruits is diuretic and antiscorbutic.

*Anaphalis contorta* Hook. f [*Asteraceae*]

**Local name:** Phunil (Manipur).

**Habit and Distribution:** A large herb. Found throughout NE India.

**Parts used:** Flower, leaf, shoot and seed.

**Medicinal uses:** The flower heads and hairs are used to check bleeding. The dried flower



heads and leaves are made into wicks. Seed powder is taken to cure high blood pressure. Tender shoots are eaten in intestinal disorder. The plant yields an essential oil that shows antibacterial activity.

*Andrographis paniculata* Wall. ex Nees. [Acanthaceae]

**English/Common name:** Creat, Kalmegh.

**Local Name:** Kalpatita, Kalmegh, Sirota (Assamese), Kalmegh (Bengali), Kirayat (Hindi), Kirata (Sanskrit), Nari kolom (Karbi), Bhubati (Manipur).

**Habit and Distribution:** An annual herb. A common weed grows in populations in the plain areas of NE India. However, natural population is decreasing due to extensive collection of the plant for commercial purposes. This species is prioritized by National Medicinal Plant Board (NMPB), Ministry of Health & Family Welfare, Government of India, for trade and cultivation.



**Parts used:** Whole Plant.

**Medicinal uses:** The drug kalmegh consists of entire aerial parts of the plant. Kalmegh is a bitter tonic. It is useful in curing chronic fevers, malarial intermittent fever, hyperdipsia, torpid liver and inflammation, burning sensation, wounds, influenza, itching, wounds, ulcers, skin diseases, intestinal worms, dyspepsia, flatulence, colic, dysentery, general weakness and excessive gas formation in stomach. A decoction prepared from this plant is blood purifier and useful in sluggishness of liver, jaundice and digestive complaints. The plant has antityphoid and antibiotic properties. The entire plant is used to treat snakebite. The hot water extract of the whole plant is used for acute jaundice, where the powder is mixed with garlic and 2 gm of mixer is given orally with buttermilk for 4 days. The extract of the dried leaf is used to treat intestinal worms.

Whole plant is acrid, cooling, laxative, vulnerary, antipyretic, alternative, cholagogue, stomachic, antiperiodic, anti-inflammatory, expectorant, anodyne, antifebrile, anthelmintic, alexipharmic, astringent, useful in bronchitis, leprosy, diabetes, gonorrhoea, itches, stomach ulcers, liver troubles, colic, diarrhea, haemorrhoids, piles and swellings. It is also a major constituent of the Ayurvedic drug Switradilapa, effective in treating vertilago.

*Anisomeles indica* Ktze. [Lamiaceae]

**Local name:** Ban-til (Assamese), U-nei maias (Khasi), Thoiding-angouba (Manipur).

**Habit and Distribution:** An erect shrub or undershrub. It grows wild in the scrub forest and forest edges. Frequent in Assam, Arunachal Pradesh and Meghalaya.

**Parts used:** Seed.



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