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Full Length Research Paper

Forest-based medicinal plants rendering their services to the rural community of Assam, India

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Forests are the main biological resource areas from where reportedly 80% of the medicinal plants are collected by the rural communities of the state. Traditional folk medicines, mainly based on plants, occupy a significant position today, especially in the developing countries, where modern health care service is limited. Medicinal plants are gaining global importance owing to the fact that herbal drugs are cost-effective, easily available and most reportedly, with negligible side effects. Safe, effective and inexpensive indigenous remedies had been practiced by the people of both tribal and rural society of Assam from time immemorial. Therefore, the need of the hour is to harness this natural resource sustainably for the socio-economic development of the indigenous communities. Hence, a strategy for sustainable harvesting practice needs to be developed that would ensure preservation of the valuable medicinal plants *in situ* while addressing the needs of the rural communities. The present study is, thus, an attempt to highlight the common medicinal plants of forested region as used by the rural poor community for different kinds of treatment as the rural local healers usually practice the treatment of diseases in their locality.

Key words: Folk medicine, medicinal plants, forest, sustainable collection, indigenous communities and local healers.

INTRODUCTION

Forests offer a huge repository of diverse medicinal plants with high potential for alleviating poverty and thus boosting rural economy while conserving the valuable resources. Forests occupy the largest landmass in India after agriculture, and are the storage of herbal plants' resource of the country, especially, for its rural people. Highest numbers of medicinal plants are used in folk (tribal) traditions (Prakash et al., 2008). More than a quarter of India's poorest citizens, many of whom are indigenous people, are indulged in the use of herbal plants directly from the forest area. Tribal people in different parts of India, use their Traditional Ecological Knowledge (TEK) received from their ancestors and contemporary society for primary health care. Moreover, the TEK of tribal people is intimately linked with geography as well as ecological and cultural factors (Gesler, 1992; Wiley, 2002).

Plants have been used since ancient times for the treatment of various ailments. The traditional systems of medicine together with folklore systems continue to serve a large portion of the population, particularly in rural and tribal areas of the state, in spite of the advent of modern medicine. Out of about 15,000 species of higher plants in India, medicinal uses have been attributed to 1500 species (Handa, 1998). Traditional medical practices based on plants are an important component of the primary healthcare system in the developing world (Sheldon et al., 1997). According to the World Health Organization (WHO) as many as 80% of the world's population depend today on traditional medicine for their primary health care needs (Azaizeh et al., 2003). Safe, effective and inexpensive indigenous remedies are gaining popularity among the people of both the urban and rural areas, especially in India and China (Katewa et al., 2004). Many tribal communities in India still practice

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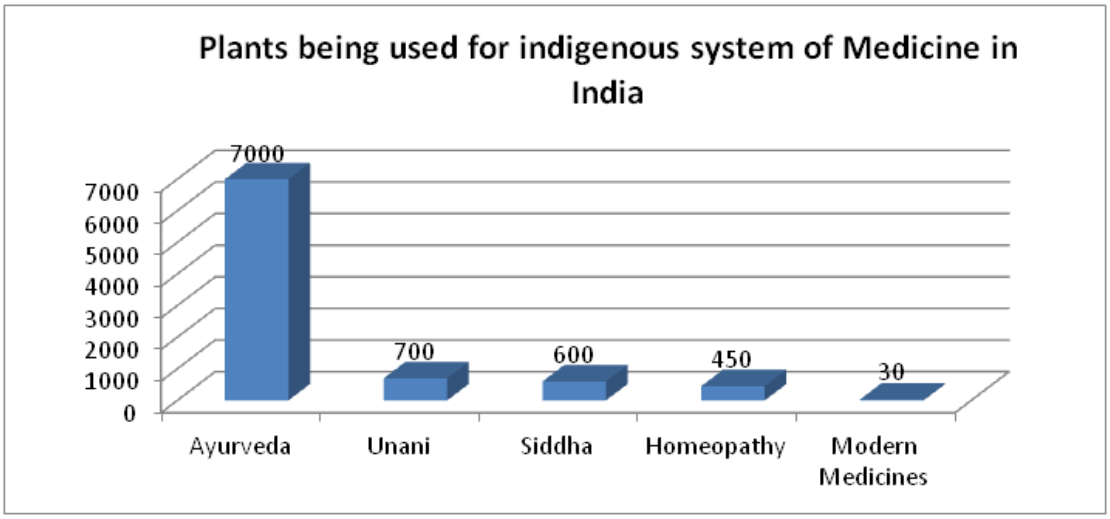

the use of their TEK to cure a variety of diseases and ailments (Jain and Dam 1979; Katewa et al., 2001; Kshirsagar and Singh, 2001; Jagtap et al., 2006; Kala and Sajwan, 2007; Sajem et al., 2008; Katewa, 2009).

Northeast Indian states are the storage of medicinal plants which are naturally grown and available in the forests (Das, 2006). This region is known for high ethnic and biological diversity and is often referred to as biological hotspot (Ramakrishnan, 1984; Myers et al. 2000). Assam, one of the biodiversity hotspots, occupies a special place in Northeastern India located between $24^0$44' N to $27^0$45'N latitude and $89^0$41'E to 96^o02'E longitude, covering 2.4% of the geographical area of the country, i.e. 78,438 sq. km. The annual rainfall ranges between 305 cm. max. to 178 cm. min. with an average of 211.76 cm. The temperature recorded in summer is 37^0C max. and 18^0C min. and 26^0C max. and 7^0C min. in winter, with an average humidity of 83.00%. These types of climatic factors of Assam provide a congenial environment for growing diverse medicinal plants.

In Assam, herbal plants are used at the household level in a self-help mode by the rural community. The rural people of Assam also consume many herbs as nutritional diet used in Indian system of medicine viz. *Bacopa monnieri* (L.) Penn., *Centella asiatica* (L), *Dioscorea bulbifera* Linn., *Emblica officinalis* Gaertn, *Eryngium foetidum* Linn., *Terminalia chebula* Retz., *Zanthoxylum alatum* Roxb., *Mentha spicata* Linn., *Ocimum sanctum* Linn., *Terminalia bellirica* (Gaertn.) Roxb., *Paederia foetida* Linn., *Euryale ferox* Salisb., *Solanum nigrum* Linn., *Piper longum* Linn., *Garcinia cowa* Roxb. Ex D.C., *Garcinia Morella* (Gaertn.) Desr., *Garcinia pedunculata* Roxb., *Dillenia indica* Linn., *Calamus rotang* Linn., *Parkia roxburghii* G. Don., *Alpinia allughas* Rosc., *Clerodendrum glandulosum* Lindl., etc. This shows that people in this region are adopting the use of herbal plants in their day to day life which help in keeping their body healthy and preventing ailments. The Jaintias of North Cachar hills are using 39 medicinal plant species in healing and curing different ailments (Sajem & Gosai, 2006). Basumatary et al. (2004) reported that 33 numbers of species of 22 genera are being used by Bodo communities of Goalpara district of Assam. Saikia et al. (2006) reported that 85 medicinal plants are used by Assamese people against skin diseases. The survey of Nath et al. (2011) have reported that about 34 plant species belonging to 33 genera from 29 families are being used by the Dimasa tribe of Barak Valley to cure 8 types of major diseases. It is believed that these herbal medicines can give good effect to the body without causing side effects to human's life. Besides, the usage of medicinal plants have been increasing and playing an important role that can support the livelihood and economy of the rural community. Medicinal plants for health care are being used for herbal treatments and therapies and are practiced by the village level healers and practitioners widely.

Conservation and sustainable use of medicinal plants by the rural people of this region are issues on which immediate focus is required in the context of conserving biodiversity and promoting and maintaining the health of local communities, besides generating productive and healthy forest ecosystem in tribal and rural areas of the state of Assam.

HISTORY OF MEDICINAL PLANTS

If we glance over the history of medicinal plants it would reveal that it was used long back to 5000 BC with the emergence of the Indus Valley Civilization. The indigenous system of medicine, viz.-Ayurvedic, Siddha and Unani, have been in existence for several centuries. The country has 45,000 different plant species and 15000 medicinal plants that include 2000 plants used in Ayurveda, 700 in Unani, 600 in Siddha, 450 in homoeopathy

Table 1. Medicinal plant species used by the rural people of Assam as obtained from Forests.

Sl. No.	Plant species	Family	Vernacular name	Part used	Application
1	*Adhatoda zeylanica* Medic.	Acanthaceae	*Bahak tita*	Leaves	Leaf juice is used for cough, diarrhoea, dysentery and grandular tumours.
2	*Ageratum conyzoides* Linn.	Compositae	*Gondhuabon*	Leaves/ Roots	The juice is used in cut or injuries. It has healing properties.
3	*Alternanthera sessilis* R. Br.	Amaranthaceae	*Matikaduri*	Leaves	Juice used for growth of hair and stomach trouble. Given to mothers to increase the flow of milk after birth.
4	*Amaranthus spinosus* Linn.	Amaranthaceae	*Hatikhutora*	Roots/ Stems	Used as antidote against snakebite, given to cows to increase the flow of milk. The root is good for menorrhagia, gonorrhoea
5	*Amaranthus viridis* Linn.	Amaranthaceae	*Khutora*	Stem/ Leaves	Stem is used as antidote against snakebite. Leaves are good against scorpion sting.
6	*Argemone maxicana* Linn.	Papaverceae	*Sialkatahi*	Roots/ Seeds	Used in leprosy, scabies, and syphilis and gonorrhoea; seed smoke in toothach. Also used as antidote against snakebite.
7	*Argyreia speciosa* Sweet.	Convolvulaceae	*Takoria alu*	Leaves/ Tuber	Paste of the leaves, latex is used to suppress small boils. The tuber is used as a contraceptive and also used in skin diseases.
8	*Ardisia humulis* Vahl	Myrsinaceae	*Talotha poka*	Leaves, fruits and roots	It is used as a stimulant and a carminative.
9	*Artemisia vulgaris* Linn.	Compositae	*Chirota*	Leaves	The juice is used as a blood purifier. Used against worm troubles, asthma, brain disorder and nervous problems
10	*Asparagus racemosus* Willd.	Liliaceae	*Satamul*	Roots	Roots are used as demulcents; diuretics, prepared medicated oil is good for rheumatic pain, nervous disorders. Also useful in dyspepsia, diarrhoea and dysentery.
11	*Bonnaya reptans* Spreng	Scrophulariaceae	*Kasidoria*	Leaves	Roasted leaves in banana leaves are used for cold bite and cut injuries.
12	*Bryophyllum pinnatum* Kuntz.	Crassulaceae	*Dupartenga*	Leaves	Leaves are useful in wounds, bruises, boils, jaundice, snakebite, dysentery, urinary trouble and for quick healing of wounds.
13	*Calotropis gigantea* (L) R.Br.	Asclepidaceae	*Akon*	Roots/ leaves/ flower	Leaves are used in sprain and pain. Flowers are used as digestive remedy and for cough, asthma, and cold. Root bark is used in dysentery; cough, skin disease, cutaneous disease, and elephantiasis.
14	*Cannabis sativa* Linn.	Cannabinaceae	*Bhang*	Leaves/ flower	Dried flower is used medicinally as sedative, analgesic, narcotic.
15	*Cardiospermum halicacabum* Linn.	Sapindaceae	*Lota kopal-phuta*	Whole plant	Paste made with water is useful in pain, stiff-neck, rheumatism, fever, piles. Leaves mixed with castor oil are used in lumbago, nervous disorder.
16	*Cassia occidentalis* Linn.	Caesalpiniaceae	*Charudoi ghigha/ Bonoria daldol*	Roots/ leaves/ seeds	Used as remedy in skin disease, leprosy, psoriasis, ulcers, etc.
17	*Cassia tora* Linn.	Caesalpinaceae	*Bon medelua*	Roots/ leaves/seeds	Leaf paste is used against skin diseases and leprosy. Roots are an antidote against snakebite, ring worm, psoriasis and eczema.

and 30 in modern medicines. The drugs are derived either from the whole plant or from different parts like leaves, stem, bark, root, flower, seed etc. Some drugs are prepared from excretory plant product such as gum,

Table 2. Cont**.**

18	*Catharanthus roseus (Linn.) G. Don.*	Apocynaceae	*Nayantara*	Roots/ leaves	The parts of the plant are used as an anti-carcinogenic agent.
19	*Centella asiatica* (Linn.) Urban.	Apiaceae	*Bor manimuni*	Whole plant	Used in dysentery, liver trouble, nerve disorder, and stomach problems. It stimulates appetite, taken with milk to improve memory, good for skin disease and a blood purifier, given to women after childbirth.
20	*Cissus quadrangularis* L.	Vitaceae	*Hasjora/ Harbhanga*	Leaves/stems	It is used for muscular-skeletal disorders. It is considered as a tonic and analgesic, and is believed to help heal broken bones.
21	*Citrus macroptora* var *assamensis* D. et Bhat.	*Rutaceae*	*Satkora*		For digestion, rheumatic pains, colic.
22	Clerodendrum colebrookianum Walp.	Verbenaceae	Nefafu	Bud / leaf	For the control of high blood pressure.
23	*Clerodendrum infortunatum* Gaertn.	Verbenaceae	*Dhopat tita*	Roots/ leaves	Leaves can be used against malarial fever. Roots are used externally against tumours and skin disease.
24	*Clitoria ternatea* Linn.	Fabaceae	*Aparajita*	Leaves	Juice of leaves mixed with salt applied around ears in earache and swelling of adjacent glands to relive pain. The juice is also an antidote against snake poison.
25	*Coccinia grandis* (L.) J. Voigt	Cucurbitaceae	*Belipoka*	Fruits	It is useful for treating diabetes, leprosy, fever, asthma, bronchitis and jaundice.
26	*Coffea bengalensis Roxb.ex Schult.*	Rubiaceae	*Kothona phool*	Leaves/Flowers	Young shoots and leaves used as medicine for cattle eye boil.
27	*Colocasia esculenta* (Linn.) Schott.	Araceae	*Kola Kachu*	Whole plant	Leaves used for blood coagulation in small injuries, roots used in pharyngitis.
28	*Commelina bengalensis* Linn.	Commelinaceae	*Kana simolu*	Juice of the branch	Root juice is applied in eye-lid sore. Roots are useful in fever, bilious disease, snakebite and leprosy.
29	*Datura stramonium* Linn.	Solanaceae	*Boga dhotura*	Whole plant	Smoke of leaves is used medicinally for asthma. A seed causes sleepiness. Poisonous and necrotic. Roots are good for toothache.
30	*Diplazium esculentum* (Retz.) Sw.	Athyriaceae	Dhekia	Leaves	Used in urinal complaints and to enhance sexual power.
31	*Drymaria cordata* Willd.	Caryophyllaceae	*Lai jabori*	Whole plant	Juice of the plant is laxative and anti febrile. The plant has cooling properties.
32	*Eclipta alba* (Linn.) Hassk.	Compositae	*Kehraj*	Entire plant	Fresh leaves are used in elephantiasis, liver disease and dropsy. Juice is also used for jaundice and fever.
33	Enhydra fluctuans Lour.	Asteraceae	Helosi sak	Leaves	Leaves are useful for cough, skin diseases, nervous disease, gonorrhoea, etc.
34	*Erechthites valerianaefolia* DC.	Compositae	*Bon kopah*	Leaves	Juice of the leaves is used in cut wounds for quick healing.
35	*Eryngium foetidum* Linn.	Apiaceae	*Man dhania*	Leaves/roots	An aromatic herb used as a condiments in soups, meat etc.
36	*Eupatorium odoratum* Linn.	Asteraceae	*Naga bon*	Leaves	Leaves and flower tops are used medicinally as emetic, cathartic, in cut wounds.

resins and latex. The bar diagram given above shows the numbers of plants utilised in the Indian Systems of Medicine.

OBJECTIVE OF THE STUDY

The study deals with a definite objective in relation to forest-based medicinal plants used by the rural communities residing in the state of Assam, their usage in day to day activity as nutritional food and healing nature and contribution to the socio-economic development of the rural communities of the state. The brief objective of the study can be stated as under:

- Finding out the role, value and potentiality in treating common diseases.

Table 2. Cont.

37	*Euphorbia hirta* Linn.	Euphorbiaceae	*Dudh bon /Gakhiroti bon*	Whole plant	The entire plant is considered as sedative, haemostatic, soporific, used medicinally in asthma, chronic bronchitis. The milky juice is useful in destroying warts.
38	*Garcinia cowa* Roxb. ex D.C.	Clusiaceae	*Kau-thekera*	Fruits/ stems/ resin /latex	Used in dysentery, diarrhoea and in stomach pain.
39	*Garcinia laneaefolia*	Clusiaceae	*Rupohi-thekera*	Leaves/fruits	Used in treatment of dysentery.
40	*Garcinia morella* (Gaertn.) Desr.	Clusiaceae	*Kuji-thekera*	Fruits	Used in dysentery, diarrhoea and as purgative or cathartic.
41	*Garcinia pedunculata* Roxb.	Clusiaceae	*Bor-thekera*	Fruits	Used in dysentery and diarrhoea.
42	*Garcinia xanthochymus* Hook. f.	Clusiaceae	*Tepor tenga*	Fruits, leaves	Used in dysentery, diarrhoea and, skin disease, diabetes etc.
43	*Gnetum gnemon* Linn.	Gnetaceae	*Mejherguti, Letera*	Leaves/fruits	Used to purify blood, stimulates urination.
44	*Gymnopetalum cochinchinensis* (Lour.) Kurz.	Cucurbitaceae	*Kauri kerala*	Leaves/Roots	Roots made into paste and rubbed on body in body pain, pneumonia.
45	*Heliotropium indicum* Linn.	Boraginaceae	*Hatisuriya*	Whole plant	The juice of the plant is used in ulcers, wounds and local inflammation. Leaf paste is used against insect bite and boils.
46	*Hibiscus subdariffa* Linn.	Malvaceae	*Mesta tenga*	Leaves/fruits/ Seeds	It is used for dysentery, fever, dyspepsia, general debility, etc.
47	*Houttuynia cordata* Thunb.	Saururaceae	*Masandari*	Whole plant	Used in stomach complaint and anaemia and in burn injuries.
48	*Hydrocotyle rotundifolia* Roxb.	Apiaceae	*Soru manimuni*	Whole plant	Used in dysentery, liver trouble, nerve disorder, and stomach problems. It induces appetite, taken with milk to improve memory, good for skin disease and is also a blood purifier.
49	*Hydrocotyle sibthorpioides Lamk.*	Umbelliferae	*Bor manimoni*	Whole plant	For wound healing.
50	*Impatiens roylei* Walp.	Balsaminaceae	*Bijolkoria*	Leaves/ fruits	Leaf and fruit paste is used on the head as a remedy in high fever.
51	*Ipomoea aquatica* Forsk.	Convolvulaceae	*Pani kolmou*	Leaves	Lefs juice is used in jaundice and also in urinary trouble and nervous disorders.
52	*Ipomoea quamoclit* Linn.	Covolvulaceae	*Kunjalata*	Leaves	Pounded leaves are used in piles.
53	*Justicia japonica* Linn.	Acanthaceae	*Jooron*	Leaves	Leaves are used in ophthalmia.
54	*Jussiaea suffruticosa* Linn.	Onagraceae	*Bon jolokia*	Whole plant	Used in dysentery and fever.
55	*Lawsonia inermis* Linn.	Lythraceae	*Jetuka*	Leaves	It is astringent, sedative, detergent and is used as a prophylactic against skin diseases.
56	*Leucas aspera* Spreng.	Labiatae	*Duron bon*	Whole plant	Used against rabies; leaf juice mixed with garlic is good for the stomach, liver and spleen.
57	*Melastoma malabathricum* Linn.	Melastomaceae	*Phut kola*	Leaves	Leaf powder is used in wounds to prevent marks on the skin; wood tar is used in for blackening teeth.
58	*Mikania micrantha* Linn.	Asteraceae	*Japanihabi*	Leaves/ roots	Juice is useful in insect bite and scorpion sting.

- Common forest-based medicinal plants.
- Their usage as food and rural healers practicing their usefulness.
- Finding out the MAPs which are utilized for commercial purposes.

METHODOLOGY

The data/information required for the study was generated using a combination of tools running from the secondary to primary data sources. The tools used for

Table 2. Cont.

59	*Mimosa pudica* Linn.	Mimosaceae	*Lajuki lata*	Leaves	Leaf juice with milk is used as a good remedy for piles.
60	*Mirabilis jalapa* Linn.	Nyctaginaceae	*Godhuli gopal*	Roots	Roots are used in dropsy.
61	*Momordica charantia* Linn.	Cucurbitaceae	Tita kerela	Leaves/fruits/seeds	Useful remedy for diabetes, rheumatism, night blindness, and dysmenorrhea.
62	*Murraya koenigii* (Linn.) Spreng.	Rutaceae	*Narasingha*	Leaves	Leaves are used in diarrhoea, dysentery, digestion problems, as memory enhancer and for curing vomiting.
63	*Nasturtium indicum* (Linn.) D.C.	Brassicaceae	*Bonhariah*	Seed	Seed juice is used in kidney trouble.
64	*Ocimum canum* Sims.	Labiatae	*Bon tulsi*	Leaves	Leaves made into paste applied to the fingers to relieve from fever. Seeds are used as remedy for dysentery. Leaves are used in skin disease.
65	*Ocimum gratissimum* Linn.	Labiatae	*Ram tulsi*	Whole plant	Plant juice is used as insect repellent. Seeds are used in headache. Leaves are used in for gonorrhoea, rheumatism and paralysis.
66	*Oldenlandia corymbosa* Linn.	Rubiaceae	*Bon jaluk*	Whole plant	Juice is applied in burning sensation of palms; it is also good for liver trouble, urinary disorder in children, jaundice, fever and bilious infection.
67	*Oxalis corniculata* Linn.	Oxalidaceae	*Soru tengesi*	Whole plant	Juice is used in stomach problems, wine intoxication and dysentery.
68	*Paederia foetida* Linn.	Rubiaceae	*Bhebeli lata*	Leaves	The plant is very good in stomach, kidney and liver problems. Decoction of leaves increases appetite.
69	*Peperomia pellucid* (L) H.B. and K	Piperaceae	*Ponownoa*	Leaves/ roots	Plant paste is used on the head to reduce temperature.
70	*Phlogacanthus thyrsiflorus* Nees.	Acanthaceae	Tita phool	Flower/fruits	Useful in chronic bronchitis, asthma and phthisis, dysentery, neuralgia, scabies and malarial fever.
71	*Phyllanthus niruri* Linn.	Euphorbiaceae	*Bon amlokhi*	Whole plant	The whole plant is used in jaundice. Young leaves are good for dysentery. Root juice is used in urogenital troubles and gonorrhoea.
72	*Polygonum microcephalum* D.Don.	Polygonaceae	*Madhu holeng*	Whole plant	It is useful in female weakness, bruises, piles and inflammation.
73	*Pouzolzia indica* Gaud.	Urticaceae	*Dudhmor goch*	Whole plant	Used against snakebite, syphilis, gonorrhoea. It is also used to heal children.

primary data generation were traditional and standardized supplemented by sample survey. The secondary sources, which include books, review of literature in technical journals and government reports. Visits and discussions on the subjects were conducted with the field Forest Officials, State Medicinal Plants' Board (SMPB), different Institutions under Government of Assam as well as Government of India**.**

The study captured the information about availability, diversity and documentation of forest-based medicinal and aromatic plants, through an intensive investigative probing exercise and socio-economic parameter assessment. Thus, the study adopted a comprehensive methodology, which was explorative and diagnostic in nature providing justification and guidelines towards the preparation of common forest-based medicinal and aromatic plant species of this region. The study was strongly relied on both secondary and primary data resources; however, more emphasis was given to primary sources. The primary data sources used are not only traditional tools, but also include sample survey and diagnostic research tools.

Secondary Data Sources

The secondary data sources used for the data on forest

Table 2. Cont.

74	*Rhynchotechum ellipticum* A. DC.	Gesneriaceae		Leaves	Useful in cough.
75	*Ricinus communis* Linn.	Euphorbiaceae	*Era*	Leaves/ roots	Roots are used in urinary trouble; juice with lime is used to suppress newly formed boils.
76	*Siegesbekia orientalis* Linn.	Compositae	*Katampam*	Whole plant	Used in healing gangrenous ulcers and skin disease. Useful against worms.
77	*Solanum indicum* Linn.	Solanaceae	*Tita bhekuri*	Roots/ leaves	Roots are used to cure toothache, asthma and in cough.
78	*Solanum nigrum* Linn.	Solanaceae	*Pokmou*	Roots	Roots juice is used against asthma and whooping cough.
79	*Solanum spirale* Roxb.	Solanaceae	*Tita kuchi*	Whole plant	It is used against worms. The root is narcotic and diuretic.
80	*Solanum xanthocarpum* Schrad. & Wendl.	Solanaceae	*Kanta kori*	Roots/ leaves	Roots are used in asthma and in chest pain. Leaf juice with black pepper is used in rheumatic pain.
81	*Spilanthes paniculata* Wall. Ex. D.C.	Asteraceae	*Huhoni bon*	Whole plant	Used in toothache, sore mouth
82	*Urena lobata* Linn.	Malvaceae	*Bor sonborial*	Roots/ leaves	Roots are diuretic, good in rheumatic pain.
83	*Xanthium strumarium* Linn.	Compositae	*Ogaro*	Roots/ leaves	Used against chronic malarial fever, urinary trouble.
84	*Zanthoxylum oxyphyllum* Edgew.	Rutaceae	*Mejenga*	Tender shoots	For deworming of tapeworms

area, current status of species diversity of medicinal and aromatic plants has been generated from:

- State MAP profile.
- Highly traded and endemic MAP species of the state.
- State Natural Forest scenario.
- State Medicinal Plants Board.
- Forest Department.
- Horticulture Department.
- Agriculture Department.
- Government Ayurvedic College.

Primary data source

Traditional Tools

- Questionnaire Survey - A semi-structured questionnaire is used for generating the required information on the major forest-based medicinal and aromatic plants handled by the rural people, officers of SMPB, Forest department, Horticulture department, Agriculture department and also the Ayurvedic College.
- Diagnostic interview with Forest Officials – A semi-structured format is used to generate information on species diversity, availability and uses of forest-based medicinal and aromatic plants of the state.

MEDICINAL HERBS AND PLANTS OF ASSAM

With its vast hills and forests, Assam is the home to a variety of medicinal herbs and plants
such as eg. Sarpagandha (*Rauvolfia serpentina* (Benth) ex.Kurz.), Pippali (*Piper longum* Linn), Amlakhi (*Emblica officinalis* Gaertn), Hilikha (*Terminalia chebula* Retz.), Bhomora (*Terminalia belerica* (Gaertn.) Roxb.), Arjuna (*Terminalia arjuna* Wight & Arn.), Vaividang (*Embelia ribes* Burm.f.), Chaulmoodgra (*Hydnocarpus kurzii* King.), Mezankori (*Litsea citrate* Blume.), etc.

About 900 species of medicinal herbs and plants are known to exist in abundance in the forest area of the state with the Brahmaputra valley itself having 50 species of herbs and plants of commercial value. Many of the important plants are yet to be explored and documented from the forest areas as revealed from recent scientific explorations.

It is estimated that only about 5-10% of the plants and herbs are currently utilised though most of the rest species hold a vast potential.

COMMON FOREST-BASED MEDICINAL PLANTS

The total recorded forest area of the state is 28,748 sq. km. out of which 359 sq. km. come under water bodies

and covers 32% of the total geographical area. On the other hand, forest and tree cover is 36.67% of the total geographical area including homestead forest land (*Source: Assam Forests at a Glance, 2005- 06).* The rural communities residing in the hilly, rural and remote areas of the state have easy access to different species of plants having medicinal properties found in forests. Traditional medical practice include all kinds of folk medicine and unconventional preparation of local medicine at the household level in a self-practiced mode for healing common ailments prevailing in their local areas. The traditional health care system of 80% of the population in the rural areas of this region is still dependent on their surrounding vegetation / forests and pastures. They rely on medicinal plants because of their effectiveness, lack of modern healthcare alternatives and socio-cultural preferences.

The forest of Assam, which is known for its rich bioresources and ethnocultural diversity, is also a source of various medicinal plants to various ethnic communities. It has a valuable heritage of herbal remedies. A wide range of plants with ethnomedicinal value against some very important diseases have been reported but much larger numbers of folk medicines have remained endemic to certain tribal pockets of the state. Various works have been undertaken to document different types of medicinal plants used by various ethnic groups in all over Assam.

The beliefs, practices and treatment of various diseases by different communities inhabiting in this part of India help us to understand the human-nature relationship from its long past. Each and every community has developed their individual device to cure various illnesses and in this context they take the help of different kind of plants available in their surrounding environment. Though understanding the vast experiences of different health care system by documenting the different plant species has been carried out at different intervals, most of the works were concentrated among the tribal communities inhabiting in different geographical regions.

Different plants which have been documented along with their mode of use in different health treatment by the people are being depicted. Among these plants the species belonging to the *Compositae* family is mostly used by the villagers. The women are found to be more familiar with the use of various medicinal plants. It is found that the rural community of this region is rich in ethno-medicinal knowledge which is transmitted from generation to generation, that is, mostly through the process of inheritance.

When the economy of people in a village is not good enough, its people prefer herbal treatment rather than allopathic treatment. Their medicinal use is preventive in nature and most of these plants are said to improve immunity to the diseases and capacity to convalesce. Apart from this, the phytotherapy is used to treat various types of diseases, ailments, injuries, fractures and pains. It has been found that the people apply their traditional knowledge of different medicinal plants to cure simple and common diseases as cold and fever but also deadly ones, as complicated as cancer. It is interesting to note that the roots and leaves of *Catharanthus roseus* are used as anti-carcinogenic medicine. Other major ailments for which there are trade of medicinal plants include *leprosy, jaundice, dropsy, pneumonia, asthma, elephantiasis, piles, hysteria, malaria, calculi* both *gall-bladder* and *kidney, bronchitis, pharyngitis and rheumatism*. Highest numbers of plants are found to be used against snakebite. Several parts of a plant such as roots, leaves, flowers, seeds, tubers, stems, fruits are used as medicine. Different parts of plants used by the community according to their preference are being presented in the Table 1. Among the different parts of the documented plants they utilise the leaves mostly (43%), followed by roots (28%), sometimes the whole plant (17%), seeds (4%), flowers (4%), stems (2%), tubers (1%) and fruits (1%).

Out of 84 common medicinal plants of forest origin given below (Table 1), parts of 8 (13%) plants are found to be used in snakebite, 7 (11.3%) in asthma, 6 (9.6%) in jaundice, 5 (8.0%) each in dropsy and gynaecological problems, 3 (4.8%) each in piles, elephantiasis, bronchitis, rheumatism, 2 (3.2%) in leprosy, one (1.6%) each in cancer, pneumonia, paralysis, hysteria, pharyngitis and the rest for curing different other ailments like ulcer, skin disease, fever etc.

The herbal treatment is said to be very effective by them and the sustainable extraction of the medicinal plants from the wild sources is indicative of their dependence on wild plants from their age old interaction.

CONSERVATION OF MEDICINAL PLANTS

The traditional knowledge system in regards to the herbal medicine in Assam is being practiced by the rural communities since long back. Now it is becoming an urgent need for the rural dwellers of the region for scientific way of collecting the medicinal plants species from forest areas as few of them are in the endemic stage. Conservation of biodiversity which nourishes the tribals and forest dwellers is also equally important, if traditional knowledge has to be preserved just like habitat conservation for species and as a whole if tribals are to be protected from extinction, forests are also to be preserved accordingly. It has to be appreciated that wherever tribal exist there exist the forests. Dutta *et al*. (2013) have emphasized the fact that there must Government intervention regarding conservation and cultivation of medicinal and aromatic plant species within a particular region. Commercial collection of traditional medicinal plants from tribal dwelling, habitats also are to be controlled. Apart from the conservation of forests, tribals should be encouraged to raise their own ethno-biological gardens or herbal gardens in their vicinity

(Ballick, 1996). Such gardens serve the interests of the tribal and they at the same time ensure conservation of the depleting biodiversity in medicinal plants of India (Rao, 1996).

From the recent survey and assessment conducted by the Department of Environment and Forests under the NaRMIL (AACP) Project for "National Consultancy for Formulation of a Marketing Framework, Training and Extension support to the Joint Forest Management Committees (JFMCs) on Marketing of Non-Timber Forest Products (NFTPs)", through the "Green cover Overseas" (website: www.greencover.org), it is apparent that many of the rare and endangered species of MAPs are sold out departmentally under the pretext of NTFPs. Table 2 depicts the quantity of such species annually sold out at rates and prices which are abysmally low. The collection of such plants and herbs also does not conform to any kind of management plan which quantifies the process of harvest and collection. One could only presume that such sales of this commodity are destructive in nature.

SUSTAINABLE MANAGEMENT OF MEDICINAL PLANTS OF COMMERCIAL IMPORTANCE

Of the numerous species of medicinal plants obtained from the forest regions of this area, some are of a very high commercial value. Some of the medicinal plants are being exploited from the wild, without much thought for the sustainability and survival of the species concerned. To avert an eventuality of this kind, it is essential to take preventive and conservation measures for the survival of the species.

These may be *either in situ* or *ex situ* methods and would cover:

- Habitat protection;
- Restriction and regulation of exploitation from wild sources;
- Survey and assessment of resources;
- Creation of medicinal plant kitchen garden;
- Large-scale plantations;
- Development of rural policy and programmes.

DISCUSSION AND CONCLUSION

Despite the wealth of forest resources available, the sector has not developed in the absence of suitable standardization, quality control and efficacy of drugs. The development of medicinal plants from production to consumption are yet to be maintained and integrated to boost rural communities of this region. Traditional knowledge of herbal remedies for treating human diseases is fast declining in many parts of the world, including India. Even today, tribal and certain local communities in India still practice herbal medicine to cure a variety of diseases and disorders. They collect and preserve locally available and wild plant species from forest regions.

The forests of Assam comprise a great share of natural resources. Medicinal plants obtained from the forest regions have the efficiency to heal many diseases. The rural communities of the state prepare herbal drugs in their own mode to cure diseases like bleeding from the nose, fever, malarial fever, asthma, tuberculosis, calculi, kidney stones, gallbladder and urinary troubles, hypertension, diabetes, stomach ache, stomach ulcer, dysentery, diarrhoea, jaundice, hepatomegaly, bone fractures, gynaecological disorders, snake bite, etc.

Medicinal plants readily available in the forest region are the prime resources for the rural community of this region. Several constraints exist in the collection of these plants by the rural people due to inadequate awareness; inadequate knowledge and preservation techniques of herbal medicine. While the demand for medicinal plants is growing in the rural areas, some of them are increasingly being threatened in their natural forest habitat. To meet future needs, cultivation of medicinal plants has to be encouraged among the rural dwellers of the state.

It is seen that practically, every household in Assam, particularly in the rural areas, grows some of the common herbs for treatment and remedy of common ailments like indigestion, flatulence, deworming, and such herbs are consumed on a regular basis to cure or prevent such diseases. That mode of practice could be extended to urban households as the people from urban areas are well aware on these kinds of herbal treatments and venture the local markets to obtain such herbs. Some more species of seasonal herbs could be added to the lists which are coined as "Kitchen Herbal Garden" to efficiently utilize the herbs throughout the year in the absence of a particular plant. These are *Adhatoda zeylanica/vasica* Medic, *Allium sativum* Linn, *Andrographis paniculata* (Burm.f.) Wallich ex Nees., *Bacopa monnieri* (L.) Penn., *Carica papaya* Linn., *Centella asiatica* (Linn.) Urban., *Citrus spp, Eryngium foetidum* Linn., *Homalomena aromatica* (Roxb.) Schott., *Houttuynia cordata* Thunb., *Lawsonia inermis* Linn., *Mentha arvensis* Linn., *Murraya koenigii* (Linn.) Spreng., *Nyctanthes arbor tris-tis* Linn., *Ocimum sanctum* Linn., *Paederia foetida* Linn., *Passiflora edulis* Sims. and *Sesbania grandiflora* (Source: Assam Forest Department, Govt. of Assam, India).

The last few decades have seen significant changes occurring within several aspects of ethnomedicine as a result of environmental degradation and tremendous changes in modern, social, and economic systems. Due to the aforesaid factors, acting in concert, the traditional knowledge system in India is eroding fast. Hence, there is an urgent need to record all ethnobotanical information among the diverse ethnic communities before the traditional culture is completely lost (Rai and Lalramnghinglova, 2010). Often, rural and tribal people of

Table 2. Local price list of MAP species for the state of Assam.

Sl. No.	Botanical Name	Quantity Traded (MT)		Local Price (Rs./Kg.) (Collectors' price)
		2010	2011	
1.	*Aquillaria malaccensis* Lam.	60	40	20-100/-
2.	*Embelica officinalis* Gaertn.	375	380	5-7/-
3.	*Terminalia arjuna* (Roxb.) Wight & Arn.	150	130	3-5/-
4.	*Acorus calamus* Linn.	245	300	10-15/-
5.	*Litsea glutinosa* (Lour.) C.B. Robinson	80	135	8-10/-
6.	*Adhatoda vasica* Nees.	340	435	5-6/-
7.	*Mucuna pruriens* (L.) DC.	70	55	25-30/-
8.	*Aegle marmelos* (L.) Corr.Serr.	150	175	8-10/-
9.	*Tinospora cordifolia* (Thunb.) Miers.	40	25	8-10/-
10.	*Asparagus racemosus* Willd.	200	130	10-15/-
11.	*Cinnamomum tamala* (Buch.-Ham. T.Nees C.H.Eberm.)	325	250	8-10/-
12.	*Oroxylum indicum* L. (Benth.) ex Kurz.	35	60	12-15/-
13.	*Terminalia belerica* (Gaertn.) Roxb.	250	340	5-7/-
14.	*Centella asiatica* (L.) Urban	285	320	10-15/-
15.	*Smilax glabra* Roxb.	1800	2300	50-60/-
16.	*Hydnocarpus kurzii* (King) Warb.	80	40	15-20/-
17.	*Cinnamomum verum* Presl.	150	200	15-20/-
18.	*Homalomena aromatica* (Roxb.) Schott.	1250	1600	20-25/-
19.	*Terminalia chebula* Retz.	200	375	8-10/-
20.	*Andrographis paniculata* Nees.	110	180	10-12/-
21.	*Curcuma zedoaria* Rosc.	800	1650	2-3/-
22.	*Chrozophora prostrata* Dalz. & Gibs.	80	45	6-7/-
23.	*Sapindus mukorossi* Linn.	75	110	15-20/-
24.	*Dillenia indica* Linn.	500	850	2-3/-
25.	*Piper longum* Linn.	50	90	30-35/-
26.	*Rauvolfia serpentina* (L.) Benth.ex.Kur	125	180	50-60/-

Estimated annual requirement of medicinal plants by Indian pharmacies (2000)

this region are being exploited by the modern societies of the state and they are forbidden to use the forest resources with which their lives are strongly interwoven. Policy makers should secure the TEK of tribal people, whose socio-economic life is interwoven with the forests from where they derive most of their commodities, including their foodstuffs and healthcare means.

Systematic cultivation of many medicinal plants needs

specific cultural practices and has its agronomical requirements. These are species-specific and are dependent on soil, water and climatic conditions. Hence, the rural communities of the state should be made aware through training programmes on scientific methods of collection of medicinal plants from forest areas, their storage technique and the safe preparation of herbal medicine. These aspects have to be made known to the rural inhabitants of the state for the conservation and sustainable utilization of medicinal plants of the forest regions of Assam.

REFERENCES

Azaizeh H, Fulder S, Khalil K, Said O (2003). Ethnomedicinal knowledge of local Arab practitioners in the Middle East Region. Fitoterapia 74, 98–108.

Balick MJ (1966). Transforming Ethnobotany for New Millenium. Arrn. *Missourri Bot. Gard.*, 83:58-56.

Basumatary SK, Ahmed M, Deka SK (2004). Some medicinal plant leaves used by Bodo (tribal) people of Goalpara district, Assam. Natural Product Radiance. Vol 3(2) pp *88-90*.

Das AK (2006). Study of Medicinal Plants used by different communities of Cachar District, Assam, India (Ph.d Thesis, Assam University, Silchar).

Dutta SK, Baishya RA, Singh B (2013). Potential Tradable Medicinal and Aromatic plants of Meghalaya, India. *Indian Forester,* 139 (5) : 467-468.

Gesler WM (1992). Therapeutic landscapes: medical Issues in Light of the new cultural geography. Social Science & Medicine 34, 735.

Handa SS (1998). Indian efforts on standardization and quality control of medicinal plants using scientific parameters. Amruth (The Traditional Healthcare Magazine) 2,10.

Jagtap SD, Deokule SS, Bhosle SV (2006). Some unique ethnomedicinal uses of plants used by the Korku tribe of Amravati district of Maharashtra, India. J. Ethnopharmacol. 107, 463–469.

Jain SK, Dam N (1979). Some ethnobotanical notes from northeastern India. Economic Botany 33 (1), 52-56.

Kala CP, Sajwan BS (2007). Revitalizing Indian systems of herbal medicine by the national medicinal plants board through institutional networking and capacity building. Current Science 93(6), 797-806.

Katewa SS (2009). Indigenous People and Forests: Perspectives of an Ethnobotanical Study from Rajasthan (India) K.G. Ramawat (ed.), Herbal Drugs: Ethnomedicine to Modern Medicine, 33, Springer-Verlag Berlin Heidelber p. 33.

Katewa SS, Chaudhary BL, Jain A (2004). Folk herbal medicines from tribal area of Rajasthan, India. J. Ethnopharmacol. 92, 41–46.

Katewa SS, Guria BD, Jain A (2001). Ethnomedicinal and obnoxious grasses of Rajasthan India. J. Ethnopharmacol. 76, 293– 297.

Kshirsagar RD, Singh NP (2001). Some less known ethnomedicinal uses from Mysore and Kodagu districts, Karnataka State, India. J. Ethnopharmacol. 75, 231-238.

Myers N, Mittermeier RA, Mitterrneier EG, da Fronseca GAB, Kent J (2000). Biodiversity hot spots for conservation priorities. Nature. 403:853.

Nath M, Dutta BK, Hajra PK (2011). Medicinal Plants used in Major Diseases by Dimasa Tribe of Barak Valley. Assam Univ. J. Sci. Technol. *Vol-7:18-26.*

Prakash IW, Anpin RD, Asbin AN, Williams C, Regini GS, Bensar K, Rajeev R, Kiruba S, Jeeva S, Das SSM (2008). Ethnomedicinal plants used by Kani tribes of Agasthiyarmalai Biosphere Reserve, Southern Western Ghats. Indian J Tradit. Knowl. 7 (3): 410.

Ramakrishnan PS (1984). Problems & prospects of conservation of north-eastern hill region of India. In: Conservation of plant Resources by Lain, S.K & Mehra, K.L. Botanical Survey of India, Howrah. pp. 172-180.

Rai PK, Lalramnghinglova H (2010). Ethnomedicinal Plant Resources of Mizoram, India: Implication of Traditional Knowledge in Health Care System, *Ethnobotanical Leaflets 14: 274-305*

Rao RR (1996). Traditional Knowledge and sustainable development: Key role of Ethnobiologists. *Ethnobotany*. 8:14-2.1

Saikia AP, Ryakala VK, Sharma P, Goswami P, Bora U (2006). Ethnobotany of medicinal plants used by Assamese people for various skin ailments and cosmetics; J. Ethnopharmacol. 106: 149-157.

Sajem AL, Gosai K (2006). Traditional use of medicinal plants by the Jaintia tribes in North Cachar Hills district of Assam, northeast India. J. Ethnobiol. Ethnomed.*Vol.2:33*.

Sajem AL, Rout J, Nath M (2008). Traditional Tribal knowledge and Status of some Rare and Endemic Medicinal Plants of North Cachar Hills District of Assam, Northeast India. Ethnobotanical Leaflets 12, 261-275.

Sheldon JW, Balick MJ, Laird SA (1997). Medicinal plants: can utilization and conservation coexist? Economic Botany 12, 1–104.

Wiley AS (2002). Increasing use of prenatal care in Ladakh (India): the roles of ecological and cultural factors. Social Science & Medicine 55(7), 1089-1102.