

## **Traditional Tribal knowledge and Status of some Rare and Endemic Medicinal Plants of North Cachar Hills District of Assam, Northeast India**

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### **Abstract**

An ethnobotanical survey carried out in the district of North Cachar hills, Assam, North East India during the period of February 2006 – November 2006, has revealed 34 species of plants to be threatened in several parts of the country, and in the district itself. More than 6 species of plants are included in the red Data Book of Indian Plants, 5 numbers of species have already been included in the Red Data List of the IUCN. 13 species documented in the present paper have not been reported about its threat status earlier, but are now threatened in the district. These plants are used in various ways such as, medicinal, wild edibles, ornamentals, building materials and other miscellaneous uses in their daily life. Because of the declining population of species like, *Taxus baccata*, *Renanthera inschootiana*, *Swertia chirata* etc, the area warrants conservation in order to preserve them from extinction. The present paper documents on the botanical name, parts used, local name, and also compares the threat status relative to other regions of the country as per IUCN Guidelines.

**Key words :** Traditional healthcare system, North Cachar Hills, Threat Status.

### **Introduction**

Plants have been used in the traditional healthcare system from time immemorial, particularly among the tribal communities. Numerous wild and cultivated plants play a vital role in their culture, customs, traditional healthcare system, rituals etc, and this interrelationship has evolved over generations of experience and practice. Ayurveda, which is one of the oldest system of traditional healthcare system and yet living traditions practiced widely in India, Sri Lanka and other countries has a sound philosophical and sound basis [1]. Atharvaveda (around 1200 BC), Charak Samhita and Shusrut Samhita [2]

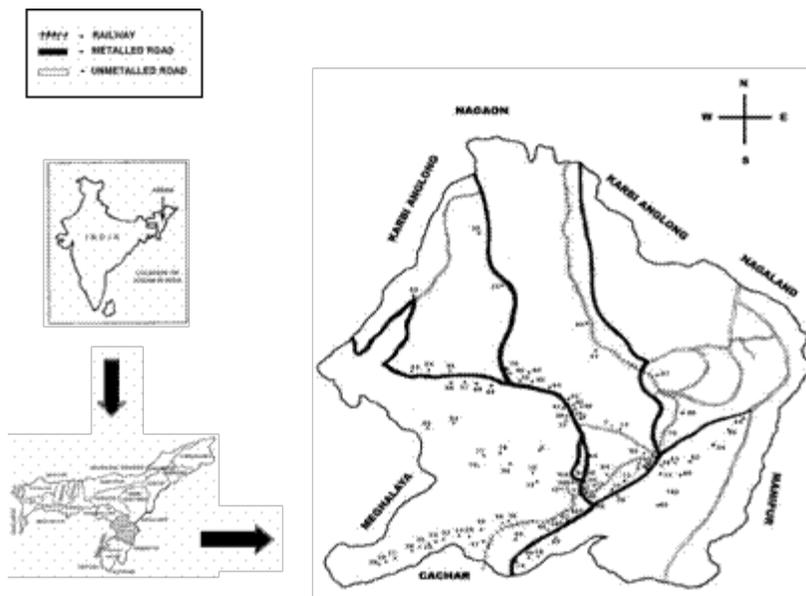
(1000-500 BC) are the main classics that gives a detailed description of over 700 herbs. Herbal medicines are becoming popular worldwide due to its growing recognition of natural products being cheaper and without any side effects. Demands for medicinal plants are increasing in both developing and developed countries. As per WHO estimate, about 80% of the population in the developing countries depends directly on plants for its medicine [3, 4]. Out of the 20,000 medicinal plants listed by the WHO globally [5] India's contribution [6] is 15 – 20%. In India, about 2,000 drugs used are of plant origin [7].

India contains over 5% of the worlds' diversity though it covers only 2% of the earth's surface but it is also one of the biodiversity hotspots of the richest and highly endangered eco-regions of the world [8]. At present, there is a worldwide movement for assessing the plant resources and researches for new plants which are of medicinal and economical value and importance. Researchers are focusing mainly on ethnobotanical and ethnomedicinal investigation to fulfill the increasing demand of herbal products. Medicinal plants are now under great pressure due to their excessive collection or exploitation [9]. Continuous exploitation of several medicinal plant species and substantial loss of their habitats have resulted in the population decline of many high value medicinal plant species over the years [10, 11]. The degree of threat to natural populations of medicinal plants has increased because more than 90% of medicinal plant raw material for herbal industries in India and also for export is drawn from natural habitats [12]. The primary threat to medicinal plants is those used by human beings that affect any kind of biodiversity [11, 13]. The weakening of customary laws has often proved to be easily diluted by modern socio-economic forces [15]. There are many other potential causes of rarity in medicinal plant species, such as habitat specificity, narrow range of distribution, land use disturbance, introduction of non-natives, habitat alteration, climatic changes, heavy livestock grazing, explosion of human population, fragmentation and degradation of population, population bottleneck and genetic drift [14, 16 – 18].

The North Eastern States of India comprising 8 states harbour more than 180 major tribal communities of the total 427 tribal communities found in India [19]. Assam itself shares 12.8% of the total tribal population of India (2001 census). The tribal people of the region still practice their own traditional healthcare system. They have a vast and in-depth understanding about plants, both conventional and non conventional for food and for medicine. In continuance of our studies on the ethnomedicinal plants on the district of North Cachar Hills of the state of Assam, India, we have documented several threatened plants species which have been declared rare, endangered or extinct in the wild in other states of the country. Some species documented here have also been found to be listed in the Red Data Book of Indian Plants. At present, some of these plants are on the verge of being rare in the district due to extensive indiscriminate collection either for medicine or for food. Urgent attention is needed to conserve and preserve these medicinally important plants. The present paper seeks to highlight some of the rare and endangered species of plants from the North Cachar Hills district of Assam.

## **Methodology**

### **Study Area :**



**Fig. 1. Map of the Study area.**

The North Cachar Hills district is one of the hill districts of Assam, covering an area of 4890 sq. km. It is located between  $92^{\circ}37' E - 93^{\circ}17' E$  longitude and  $25^{\circ}3' N - 25^{\circ}27' N$  latitudes. It is a place of immense interest and potential for Ethnobotanist as well as Anthropologist. More than 12 ethnic tribes namely Dimasa, Zeme, Biata, Jaintia, Hrangkhoh, Hmar, Kuki, Vaiphei, Khelma etc live harmoniously with one another. Most of the villages are situated far from modern conveniences and inaccessible by road or rail. The entire district has only one Civil Hospital with a few community healthcare centers and medical sub centers and modern medical facilities are lacking. Thus the tribal villagers have deep faith in their traditional healthcare system and in most cases prefer them to the modern system of medicine. 'Jhum' or Shifting cultivation is the traditional means of agriculture practiced by the tribal villagers. Besides these, they raise livestock such as cows, goats, pigs, chicken etc and also grow a variety of both wild and cultivated plants in their residential compounds. Although the region is one of the richest regions in the world in terms of natural resources, it is the abode of one of the poorest groups of people. The district face problems like drinking water, healthcare, transportation, electricity and to make it worse, insurgency in the small hill district is causing a halt to developments in the entire district.

The present paper reports on the plants species documented from the surveys carried out during the period February 2006 – November 2006. First hand information about the medicinal use of plants was collected from the traditional healers and the *jhum* cultivators. The age of the respondents ranges between 27 years to 78 years and the number of male respondents was higher (67%) as compared to the female respondents (33%). Most of the traditional healers were reluctant to reveal any information but a few consented for collection from the forest. The *jhum* cultivators also reveal many plants used for daily ailments and also agreed for field trips to collect the plant species. The respondents were selected randomly and prior informed consent was obtained from each respondents. The plants were collected in its flowering state and data concerning its method of use, plant type, mode of preparation, doses, local name etc have been recorded with a photograph of all specimens. The plants samples were collected and

processed following the routine method of plant collection and herbarium technique [20]. The specimens have been identified using relevant floras and standard literature [21-23]. All voucher specimens have been deposited at the Department of Ecology and Environmental Science, Assam University, Silchar, India. In course of the collection we came across a few rare and endangered species which have been included in the Red Data Book of Indian Plants [24], CITES plants [25], IUCN Red List of threatened species [26] and several other papers from the country. Other plants which have not been listed in the Red Data Book but are now rare or endangered in the study area are also documented. Rarity of species is determined by field study, visual estimation, literature, herbaria and from discussions with the traditional healers and the aged citizens. The criterion for categorization of threatened species is based on the IUCN [27]. A total of 32 species of plants belonging to 29 genera and 25 botanical families have been documented. These plants are used in various ways such as medicinal, wild edibles, ornamentals, building materials and other miscellaneous uses in their daily life.

## Results

Out of the 32 species of plants documented, 19 species have also been reported from other regions of the country about its threat status. More than 6 species of plants are included in the Red Data Book of Indian Plants [24], 5 number of species have already been included in the Red Data Book of the IUCN [26]. 13 species documented in this paper have not been reported about its threat status earlier, but the study has revealed that these plants are now being threatened in the district due to its excessive collection from the wild. It has also been observed that a few plants that have been declared, rare or endangered or extinct in the wild in other regions of the country are still found in abundance in the wild in the district. The plant species are enumerated in alphabetical order, giving information on its botanical name, family, local name in different languages, uses and threat status of the plants in the study area relative to other regions as per IUCN Guidelines.

### 01. Botanical Name : *Alsophila costularis* Bak.

**Family** : Cytheaceae

**Local name** : Kokicha (**Bi**ate), Thingkokcha (**Hmar**), Kokpuizikzial (**Vaiphei**).

**Uses** : The stem is used in making flower vase, ash trays, pots and other decorative.

**Threat status** : 1.It is included in Appendix II of Convention on International Trade of Endangered Species of Wild Flora and Fauna (**CITES**)\* which restricts its export.

2.Near threatened (**NT**) in the district.

### 02. Botanical Name : *Alsophila gigantia* Wall ex Hook.

**Family** : Cytheaceae

**Local name** : Kokicha (**Bi**ate), Thingkokcha (**Hmar**), Kokpuizikzial (**Vaiphei**).

**Uses** : The stem is used in making flower vase, ash trays, pots and other decorative.

**Threat status** : 1.It is included in Appendix II of Convention on International Trade of Endangered Species of Wild Flora and Fauna (**CITES**)\* which restricts its export.

2.Near threatened (**NT**) in the district.

**03. Botanical Name** : *Alstonia scholaris* R. Brown.

**Family** : Apocynaceae

**Local name** : Gumbuthlen (**Jaintia**), Chongpereng (**Hmar**), Thingdonkai (**Vaiphei**), Henampuatungduipa (**Zeme**).

**Uses** : Bark is used in the treatment of malaria (**Jaintia**) and dysentery (**Hmar**)

**Threat status** : 1.Near threatened (**NT**) in the Red List of IUCN (ver.2.3, 1994).

2.Least concerned (**LC**) in the district.

**04. Botanical Name** : *Angiopteris evacta* Forst.

**Family** : Marattiaceae

**Local name** : Kokicha (**Biate**), Partlunlo (**Hmar**)

**Uses** : Rhizome is used in the treatment of infected wounds (**Biate**)

**Threat status** : 1.Endangered (**EN**) in the Red Data Book of IUCN

2.Near Threatened (**NT**) in the district.

**05. Botanical Name** : *Aralia sikkimensis* Parry.

**Family** : Araliaceae

**Local name** : Rakadap chheh (**Jaintia**), Thingkokcha (**Hmar**), Chimchok (**Vaiphei**), Namturebang (**Zeme**)

**Uses** : Young leaves are used as vegetables. The bark is used as medicine.

**Threat status** : 1.Near threatened (**NT**) in the district.

**06. Botanical Name** : *Artocarpus lakoocha* Roxb.

**Family** : Moraceae

**Local name** : Chham (**Jaintia**), Tat (**Biate**), Tatthei (**Vaiphei**), Tabelechi (**Zeme**)

**Uses** : Seeds and barks are used in the treatment of tumour and dysentery (**Biate**). Fruit is edible and the tree is used for timber and firewood.

**Threat status** : 1.Near threatened (**NT**) in the district.

**07. Botanical Name** : *Canarium bengalense* Roxb.

**Family** : Burseraceae

**Local name** : Umchhiang (**Jaintia**), Berothing (**Hmar**), Bero (**Biate**), Keruta (**Zeme**)

**Uses** : Latex is used in the treatment of wounds and gum infection (**Jaintia**). It is also collected and sold in the market by the tribals.

**Threat status** : 1.Near threatened (**NT**) in the district.

**08. Botanical Name :** *Cinnamomum tamala* Nees & Ebern.

**Family** : Lauraceae

**Local name** : Lapanriang (**Jaintia**), Thingdogimtui (**Vaiphei**), N'teumaneu (**Zeme**)

**Uses** : Leaves and barks are used in the treatment of stomach disorder (**Jaintia**).

**Threat status** : 1.Near threatened (**NT**)/Low Risk (**LR**) in Darjeeling Himalaya.  
2.Endangered (**EN**) in Himachal Pradesh  
2.Least concerned (**LC**) in the district.

**09. Botanical Name :** *Cinnamomum obtusifolium* Nees.

**Family** : Lauraceae

**Local name** : Lapanriang sniang (**Jaintia**), Thingbaithum suak (**Vaiphei**), N'tumapali (**Zeme**)

**Uses** : Bark is used in the treatment of fever (**Zeme**) and roots in body ache  
(**Vaiphei**)

**Threat status** : 1.Vulnerable(**VU**) in the district.

**10. Botanical Name :** *Citrus medica* Linn.

**Family** : Rutaceae

**Local name** : Sauphria (**Jaintia**), Serte (**Hmar**), **Gareuchi** cheibezet (**Zeme**)

**Uses** : Bark is used in the treatment of malaria (**Jaintia**) and dysentery (**Hmar**)

**Threat status** : 1.Rare in the Eastern Ghats.  
2.Near Threatened (**NT**) in the district.

**11. Botanical Name :** *Cycas revoluta* Thunb.

**Family** : Cycadaceae

**Local name** : Snikor (**Jaintia**), Thapin (**Dimasa**).

**Uses** : Female cone is used as medicine (**Dimasa**). The stem is cut to pieces to make brush for cleaning floors. (**Jaintia**)

**Threat status** : 1.Near threatened (**NT**) in the Red List of IUCN (ver.3.1, 2001).  
2. It is included in Appendix II of Convention on International Trade of Endangered Species of Wild Flora and Fauna (**CITES**)\* which restricts its export.  
3. Vulnerable (**VU**) in the district.

**12. Botanical Name :** *Cissampelos pareira* Linn.

**Family** : Menispermaceae

**Local name** : Khauchhim (**Hmar**), Nampi Heuria (**Zeme**).

**Uses** : Root used in the treatment of fever (**Hmar**)

**Threat status** : 1.Vulnerable (**VU**) in Darjeeling Himalaya  
2. Least Concerned (**LC**) in the district.

**13. Botanical Name :** *Dioscorea deltoidea* Wall ex Kunth. Thunb.

**Family** : Dioscoreaceae

**Local name** : Ram bahra (**Hmar**), Baha (**Vaiphei**).

**Uses** : Tubers are edible, also used as medicine (**Hmar**)

**Threat status** : 1. Vulnerable (**VU**) in the Assam (Red Data Book of Indian Plants. Nayar & Shastri, 2000)

2. Vulnerable (**VU**) in Himalaya, Jammu and Kashmir.

3. Vulnerable (**VU**) in the district.

**14. Botanical Name :** *Entada pursaetha* DC. Linn.

**Family** : Mimosaceae

**Local name** : Tangnot (**Jaintia**), H'garia (**Zeme**), Poi (**Biate & Hmar**).

**Uses** : Seeds are used in the treatment of scorpion's sting. Seeds are used by the tribal children (**Hmar. Biate, Hrangkhoh, Vaiphei, Kuki, Zeme**) for playing traditional game.

**Threat status** : 1. Endangered (**EN**) in the Eastern Ghats.

2. Vulnerable (**VU**) in the district.

**15. Botanical Name :** *Gloriosa superba* Linn.

**Family** : Liliaceae

**Local name** : Khindaula (**Dimasa**).

**Uses** : Leaves are used to remove intestinal worms (**Dimasa**). Ornamental.

**Threat status** : 1. Extinct (**EW**) in the wild in Darjeeling Himalaya.

2. Endangered (**EN**) in Himachal Pradesh.

3. Endangered plant of Asia and Africa.

4. Least concerned (**LC**) in the district.

**16. Botanical Name :** *Helicia robusta* Wall.

**Family** : Proteaceae

**Local name** : Pasaltakaza (**Hmar**), Pasalpa kutizia (**Biate**).

**Uses** : Used as timber and firewood. Bark is used in the treatment of gastric (**Hmar**)

**Threat status** : 1. Vulnerable (**VU**) in the district.

**17. Botanical Name :** *Hedyotis scendens* Roxb.

**Family** : Rubiaceae

**Local name** : Lochangdum (**Vaiphei**), Tamringma (**Zeme**), Kelhrangdon (**Hrangkhoh**), Jarmadawai (**Jaintia**).

**Uses** : Root used in the treatment of malaria (**Jaintia**), fever (**Vaiphei & Hmar**), and leaves are used to remove kidney stone.

**Threat status** : 1. Vulnerable (**VU**) in the district.

**18. Botanical Name :** *Ipomoea coccinea* Linn.

**Family** : Convolvulaceae

**Local name** : Nipuipek (**Vaiphei**), N'retpa (**Zeme**).

**Uses** : Ornamental. Root used in the treatment of piles. (**Zeme**)

**Threat status** : 1.Near threatened (**NT**) in the district.

**19. Botanical Name :** *Ipomoea quamoclit* Linn.

**Family** : Convolvulaceae

**Local name** : Gei N'kiapa (**Zeme**), Lengchonghoi (**Kuki**).

**Uses** : Ornamental. Root used in the treatment of piles. (**Zeme**)

**Threat status** : 1.Vulnerable (**VU**) in the district.

**20. Botanical Name :** *Messua ferrea* Linn.

**Family** : Clusiaceae

**Local name** : Selse (**Vaiphei**), N'gaibang (**Zeme**), Laternga (**Jaintia**).

**Uses** : Ornamental. Leaves are also used as medicine, stem used as firewood

**Threat status** : 1.Endangered (**EN**) in Darjeeling Himalaya.

2.Vulnerable (**VU**) in the district.

**21. Botanical Name :** *Milletia pachycarpa* Benth.

**Family** : Papilionaceae

**Local name** : Chheh pli (**Jaintia**), Rulei (**Hmar**), Tebamria (**Zeme**), Rujao (**Dimasa**).

**Uses** : Bark used in skin disease (**Hmar & Dimasa**). The barks are used for catching fishes (crushed barks are thrown in the streams in large quantity).

**Threat status** : 1.Vulnerable (**VU**) in the district.

**22. Botanical Name :** *Myrica farquhariana* Wall.

**Family** : Myricaceae

**Local name** : Makei (**Biate**).

**Uses** : fruits edible, used in the treatment of constipation (**Biate**). The tree is used for firewood.

**Threat status** : 1.Near threatened (**NT**) in the district.

**23. Botanical Name :** *Pinus roxburghii* Sargent

**Family** : Coniferae

**Local name** : Far thing (**Hmar**), Far (**Biate & Vaiphei**).

**Uses** : Used for timber, firewood and furnitures.

**Threat status** : 1.Low Risk/Near threatened (**NT**) in the Red List of IUCN (ver.2.3, 1994).

2.Near threatened (**NT**) in the district.

**24. Botanical Name :** *Rauvolfia serpentina* (L) Benth ex Kurtz .

**Family** : Apocynaceae  
**Local name** : Thingzungkha (**Hmar**), Argamgajao (**Dimasa**).  
**Uses** : Stem used in the treatment of stomach ache. (**Dimasa/Hmar**)  
**Threat status** : 1. Endangered (**EN**) in Himachal Pradesh.  
2. It is included in Appendix II of Convention on International Trade of Endangered Species of Wild Flora and Fauna (**CITES**)\* which restricts its export.  
3. Vulnerable (**VU**) in the district.

**25. Botanical Name** : *Renanthera inschootiana* Rolfe.

**Family** : Orchidaceae  
**Local name** : Senri (**Biate**), Nauban (**Vaiphei**).  
**Uses** : Ornamental, high value in the market.  
**Threat status** : 1. Endangered (**EN**) in Manipur.  
2. It is included in Appendix II of Convention on International Trade of Endangered Species of Wild Flora and Fauna (**CITES**)\* which restricts its export.  
3. Vulnerable (**VU**) in Mizoram, Nagaland.  
4. Rare in eastern Himalayas and North East Region of India.  
5. Critically Endangered (**CR**) in the district.

**26. Botanical Name** : *Rhus semialata* Murr.

**Family** : Anacardiaceae  
**Local name** : Sama (**Jaintia**), Gembao (**Dimasa**), K'meu (**Zeme**), Khongma (**Biate & Hmar**).  
**Uses** : Fruits used in the treatment of stomach ache. (**Dimasa, Hmar, Biate, Jaintia, Zeme, Hrangkhoh, Kuki, Vaiphei etc.**)  
**Threat status** : 1. Vulnerable (**VU**) in Darjeeling Himalaya.  
2. Least Concern (**LC**) in the district.

**27. Botanical Name** : *Sapindus mukorossi* Gaertn.

**Family** : Sapindaceae  
**Local name** : Lingsi (**Vaiphei & Kuki**), Lingseru (**Biate**), Smubi (**Jaintia**), Tegauchibang (**Zeme**), Sukathaiphang (**Dimasa**).  
**Uses** : Fruits used as medicine. It is also used as a substitute for soap in the villages by the tribals.  
**Threat status** : 1. Vulnerable (**VU**) in the district.

**28. Botanical Name** : *Swertia chirata* Buch Ham.

**Family** : Gentianaceae  
**Local name** : Chirota (**Jaintia**)  
**Uses** : Whole plant is used in the treatment of High blood pressure and Diabetes.  
**Threat status** : 1. Vulnerable (**VU**) in Darjeeling Himalaya.

2. Endangered (**EN**) in Himachal Pradesh.
3. Extinct in the wild (**EW**) in the district.

**29. Botanical Name :** *Taxus baccata* Linn .

**Family** : Taxaceae

**Local name** : Ksheh (**Jaintia**).

**Uses** : Stem used in the treatment of septic wounds.

**Threat status** : 1. Endangered (**EN**) in Central Himalaya.

2. It is included in Appendix II of Convention on International Trade of Endangered Species of Wild Flora and Fauna (**CITES**)\* which restricts its export.

3. Critically Endangered (**CR**) in the district.

4. Critically Endangered (**CR**) in Darjeeling Himalaya.

5. Data Deficient (**DD**) in the Red data List of IUCN (Ver. 2.3, 1994).

**30. Botanical Name :** *Terminalia chebula* (DC) W&A.

**Family** : Combretaceae

**Local name** : Gilpina damdoi (**Vaiphei**), Sohartaki (**Jaintia**) Leuciduichibang (**Zeme**).

**Uses** : Fruits used in the treatment of stomach ache.

**Threat status** : 1. Near Threatened (**NT**) in the district.

**31. Botanical Name :** *Vanda coerulea* Griff ex Lindl.

**Family** : Orchidaceae

**Local name** : Truilo/Tlunpui (**Hmar**), Nauban (**Vaiphei**).

**Uses** : Ornamental, high value in the market

**Threat status** : 1. Rare in Meghalaya.

2. Rare in Arunachal Pradesh, Eastern Himalaya and North East regions of India

3. Vulnerable (**VU**) in the district.

**32. Botanical Name :** *Zanthoxylum armatum* DC.

**Family** : Rutaceae

**Local name** : Yejur (**Jaintia**), Yaulaishak (**Dimasa**), Neuneiysi (**Zeme**).

**Uses** : Leaves and fruits are used in the treatment of intestinal worms. It is also eaten as vegetable.

**Threat status** : 1. Near Threatened (**NT**) in the district.

\* Convention on International Trade of Endangered Species of Wild Flora and Fauna (**CITES**) regulates the removal of species from the wild conditions and trade across international borders. Appendices are of 3 categories, Appendix I list the **Threatened** species, Appendix II include those that are **Vulnerable** and Appendix III include species which are close vigil.

## Discussion

North Cachar Hills district is a region characterized by diverse physiography ranging from plains, plateaus to hills and valleys of various dimension. The area is rich in flora and fauna and it lies in one of the most biodiversity rich regions of the world. The forest is of sub-tropical type which harbours different varieties of plants and animals. Most of the tribal villagers in the hill district are *jhum* cultivators and hunters and greatly depend on forest based products for their livelihood. Wild edible plants are a necessary supplement in their daily diet. The tribal villagers also have great faith in their traditional system of medicine and prefer them to allopathic medicine.

From the enumeration of the plant species collected it can be inferred that many threatened plants are being routinely used by the tribal villagers of the area for the treatment of ailments and also for other purposes. A perusal of the available literature has revealed that atleast 19 species of plants have been reported elsewhere [25-35] and also mentioned in the Red Data Book of Indian Plants [24] to be rare, endangered or vulnerable in various parts of the country. Some are still found abundantly in the study area, as for example *Cissampelos pareira* is vulnerable (VU) [31] in Darjeeling Himalaya but is least concerned (LC) in the present area. Similarly, *Gloriosa superba* is extinct in the wild (EW) [31] in Darjeeling Himalaya, or endangered (EN) in Africa and other parts of Asia [32] but is least concerned (LC) in the study area. On the contrary, species like *Swertia chirata* while vulnerable (VU) in Darjeeling Himalaya [31] and endangered (EN) in Himachal Pradesh [35] are now extinct in the wild in the district and are found cultivated in home gardens or *jhums*. Several critically endangered (CR) species like *Renanthera inschootiana*, *Taxus baccata* needs immediate conservation in order to prevent extinction in the district. Many near threatened (NT) species like *Terminalia chebula*, *Ipomoea coccinea*, *Pinus roxburghii* and vulnerable species like *Ipomoea quamoclit*, *Mesua ferrea* needs conservation.

The study has shown that continuous exploitation of several individual plant species from the wild, legally or illegally and substantial loss of their habitats has resulted in the population decline of many high value medicinal plant species in the district. As for example, it was learnt from the Jaintia villagers of Jatinga village that in the early 1980s different establishments paid money to the local people to collect indiscriminately the raw biomass of *Taxus baccata* which was abundant at that time. Presently the natural population of *T. baccata* is critically endangered and has almost been obliterated due to that practice. Most of the villagers in the district are illiterate and they have no idea or consequences or loss if a species become extinct. The forest department and a few NGOs have been working to preserve the rich flora and fauna with little success. The present study has also revealed some information on a few conservation strategies, that can be applied to give a more or atleast some effective result.

In the district, forest is under the control of the Autonomous council or the *Gaon Burah* (village headman) and it makes little or no meaning to classify land as reserved forest, because, the tribals are dependent on the forest and forest products. Besides, the legislation recognizes *jhum* cultivation in this area as a customary right. Therefore, it would be more agreeable to them if they are taught on using the forest resources in an economical way. The idea of inter-cropping, silviculture, and crop rotation should be encouraged so that shifting of *jhumland* is done after longer intervals. It was also

found out that the recent system of *jhum* practice is not only having low output but are also eco-hazardous. The present farmers lack the knowledge that their fore fathers have. Forest is burned indiscriminately without even cutting or making a boundary. Therefore steps have to be taken in this direction and educating the minds of the people and teaching proper *jhuming* techniques to stop large scale deforestation.

Another thing that's comes to highlight to safe guard the forest is by rehabilitation of the biodiversity of the area. Those species on which the tribals mostly depend such as, wild edibles and timber trees, firewood species etc. can be planted in large scale or cultivated. This would rejuvenate the eco-system with maximum indigenous floral and faunal elements. This will also bring in several associated species which will automatically sustain the traditional lifestyle of the tribals as well as protect the forest.

There is also several forests which are related to myth and some of them are sacred to the tribals and these forests are preserved by them. Scientific and modern methods are not known to them and very often difficult to explain to them. Therefore, the message of conservation would be more meaningful to them through myth, faith and traditions rather through scientific approach.

And most important of all is spreading awareness among the people, and active initiation from policy makers, NGO's, research workers etc, is a must to bring a permanent solution to the ever increasing environmental problems. People participation in general and the younger generation in particular will bring about changes in their mindset. And tribals have to be educated on the need of sustained utilization and regeneration of the species related to their traditional lifestyle. With their active involvement in rehabilitation programmes and other such steps, coupled with more effective protection of the forest and education, the conservation of the biodiversity of the area can be achieved.

## **Conclusion**

It can be thus concluded that the study area having rich flora and fauna, is in urgent need of conservation. Some rare and endangered species of plants are still found abundantly in the region, but without protection, these may, in the near future, become endangered. The present study has shown that the area warrants a detail and more scientific floristic studies to identify the threatened plants. Besides these, taxonomy and studies on the wild edibles and medicinal plants have immense potential for researchers. Further, such studies not only benefit the scientific community but also the region and the tribal community as well.

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