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CONSERVATION OF RARE ENDANGERED AND THREATENEDPopular(RET) MEDICINAL PLANTS OF WESTERN GHATSArticle

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ABSTRACT

In the process of rapid modernization and advancement of medical sciences, partially documented or undocumented knowledge on ethno-medicine began to deplete drastically. The Western Ghats is very rich in its medicinal wealth. The RET medicinal plants are rare, endangered and threatened forest species, that are grown and multiplied naturally in restricted areas. These RET medicinal plant species play a very important role as folk remedies against many diseases. It is important to conserve the RET medicinal plants in its natural environment or cultivating it in favourable environments and to bring the information in various sources into one roof.

Introduction

(IUCW, UNEP & WWF, 1980) defines conservation as "the management of human use of the biodiversity so that it may yield the greatest sustainable benefit to present generation while maintaining its potential to meet the needs and aspirations of future generations".

The primary goals of biodiversity conservation as envisaged in the World Conservation Strategy can be summarized as follows:

- 1. Maintenance of essential ecological processes and life support systems on which human survival and economic activities depend.
- **2.** Preservation of species and genetic diversity and
- **3.** Sustainable use of species and ecosystems which support millions of rural communities as well as major industries.

Strategies for conservation of medicinal plants

- Legislations
- In-situ conservation
- *Ex-situ* conservation

Legislations

There are no separate policies or regulations for conserving medicinal plants growing in forests in India. There conservation is covered under existing laws pertaining to forestry.

Following are the laws formulated by government of India for conservation of forests which directly or indirectly protects the wild herbal flora.

- 1. Forest Act, 1927
- 2. Wildlife (Protection) Act 1972
- 3. Forest (Conservation) Act, 1980
- 4. Environment Protection Act, 1986
- 5. National forest policy, 1988
- 6. National biodiversity act, 2002
- 7. The scheduled tribes and other traditional forest dwellers act, 2006

In-situ conservation: Conservation of a given species in its natural habitat or in the area where it grows naturally is known as in-situ conservation.

• It includes Biosphere reserves, national parks, sacred sites, Sacred grooves etc.

- It is only in nature that plant diversity at the genetic, species and eco-system level can be conserved on long-term basis
- It is necessary to conserve in distinct, representative biogeographic zones inter and intra-specific genetic variation

It is cost-effective way of protecting the existing biological and genetic diversity is the 'in-situ' or on

the site conservation wherein a wild species or stock of a biological community is protected and preserved in its natural habitat. The prospect of such a 'ecocentric', rather than a species centred approach is that it should prevent species from becoming endangered by human activities and reduce the need for human intervention to prevent premature extinctions.

Sl. No.	Botanical name (common name)	Family	Threat status	Habit
1.	<i>Adenia hondala</i> (Kempuchendu, Hanninaballi)	Passifloraceae	Vulnerable	Tuberous climber
2.	Drosera indica (Kriminashini)	Droceraceae	Endangered	Herb
3.	Persea macrantha (Kulurmaava, Kurmamara)	Lauraceae	Endangered	Tree
4.	Tinospora sinensis (Sudarsanaballi)	Menispermaceae	Near threatened	Climber
5.	Operculina turpethum (Nagadanti, Devadanti)	Convolvulaceae	Vulnerable	Climber
6.	<i>Oroxylum indicum</i> (Alangi, Bunepaale)	Bignoniaceae	Vulnerable	Tree
7.	<i>Terminalia arjuna</i> (Bileematthi)	Combretaceae	Lower risk near threatened	Tree
8.	Artocarpus hirsutus (Hebbalasu, Kaduhalasu)	Moraceae	Vulnerable	Tree
9.	<i>Embelia ribes</i> (Vaayuvilana, Hulimeese)	Myrsinaceae	Vulnerable	Woody climber
10.	Decalepis hamiltonii (Magadiberu)	Periplocaceae	Endangered	Woody climber

 Table 1. Some Red listed medicinal plants of Western Ghats

Establishment of biosphere reserves, national parks, wild life sanctuaries, sacred groves and other protected areas forms examples of 'in-situ' methods of conservation. The idea of establishing protected area network has taken a central place in all policy decision process related to biodiversity conservation at national, international and global level. In India 4.5% of its total geographical area constitute protected area network, comprising 8 designated biospheres, 87, national parks, 447 wild life sanctuaries. This network encompasses various biogeographic zones and biomes rich in biotic diversity, including medicinal and aromatic plants. In addition to this there area number of sacred groves in different parts of the country particularly in South, West and Eastern parts which are also active centres on in- situ conservation of medicinal plants. Such conservation area network can attribute significantly towards the conservation and sustainable management of biological resources of our country.

Table 2. Biosphere Reserves in India

Sl. No.	Biosphere reserves	State
1.	Nokrek	Meghalaya
2.	Nilgiri	Kamataka, Kerala, Tamil Nadu
3.	Namdapha	Arunachal Pradesh
4.	NandaDevi	Uttar Pradesh .
5.	Sundarbans	West Bengal
6.	Great Nicobar	Andaman &Nicobar Islands
7.	Gulf of Mannar	Tamil Nadu

Table 3. Some sacred groves of India

Sl. No.	Vernacular names	State
1	Devbhumi	Uttarakhand
2	Oran	Rajasthan
3	Kovilkadu	Tamil Nadu
4	Deo van	Himachal Pradesh
5	Devarakadu	Karnataka

Table 4. Number of Sacred groves of India

State	No. of documented groves
Andhra Pradesh	750
Arunachal Pradesh	58
Assam	40
Chhattisgarh	600
Gujarat	29
Haryana	248
Himachal Pradesh	5000
Jharkhand	21
Karnataka	1424
Kerala	2000
Maharashtra	1600
Manipur	365
Meghalaya	79
Orissa	322
Rajasthan	9
Sikkim	56
Tamil Nadu	448
Uttaranchal	1
West Bengal	670
Total	13720

However, experiences have amply demonstrated that in a densely populated developing country like India, where a sizeable population are living in close proximity to forests, declaring protected areas will not entirely be sufficient to ensure conservation on the fast eroding biological diversity. The success of any conservation programme vests solely on the efficient management of protected areas. The involvement of local communities in conservation activities has now been increasingly realised. A people nature-oriented approach thus becomes highly imperative. This will help to generate a sense of responsibility among the local people about the values of biodiversity and the need to use it sustainably for their own prosperity and maintenance of ecosystem resilience.

In-situ conservation of medicinal plants in India can be accomplished through the active support and participation of people who dwell in or near and around the protected forest areas. Involving the local mass in all phases of conservation programmes, such as planning, policy decision process, implementation etc. will be a significant component in achieving efficient management and utilization of medicinal plant resources. A few such in-situ conservation areas have been marked and declared as medicinal plant in-situ conservation areas on the forests of three Southern States of Kerala, Tamil Nadu and Karnataka by the joint efforts of the forest departments of these States and FRLHT, Bangalore.

Sacred groves: Sacred groves are small or large patches of vegetation protected on the basis of cultural and traditional practices on the religious background.

Haat kali sacred grove of gangolihat tehsil is one of the important sacred grove of the kumaun Himalaya, representing 22 species of 22 genera belonging to 22 families of angiospermic plants. Berberis asiatica, Msalaxis acuminate, Hedychium spicatum, Valeriana wallichii, Berginia ciliate and Rubia cordifolia are threatened medicinal plants found in the grove. Sacred groves have higher richness and regeneration of medicinal plants than reserve forests. these important medicinal plants of haat kali sacred grove are used in Indian system of medicine for various diseases and generally used by local community known as rawal of rawalgaun. They maintain these grove as a part of their tradition and culture. In addition to the medicinal plants, this grove supports 94 species of both flowering and non-flowering of plants, out which 42 species are angiosperms,4pteridophytes,15 bryophytes and 35 lichens. Thus this sacred grove supports a wide variety of different life forms.

Sl. No.	Botanical name	Local name	Therapeutic use
1	Berberis asiatica	Kilmora	Fever and eye drop
2	Malaxis accuminata	Lehsunia	Febrifuge
3	Hedychium spicatum	Van haldus	Anti inflammatory
4	Valeriana wallichii	Shumiya	Cardiac stimulant
5	Berginia ciliate	Patharchur	Kidney stone
6	Rubia cordifolia	Junglimanjith	Paralysis, jaundice
7	Urtica dioca	Shinna	Haemostatic
8	Rhododendron arboreum	Buras	Headache
9	Asparagus recimosus	Keru	Stomach disorder
10	Smilacx aspara	Kukar	Diureatic

Table 5. Medicinal plant diversity in newly protected sacred grove of Pithoragarh Dist. Uttarakhand

NMPB projects under implementation

Table 6. In-situ conservation and Ex-situ cultivation of medicinal plants in Karnataka was given required importance and implemented the following projects

Sl. No.	Project title	Location	Area (ha)
1.	Saraca ashoka promotion and conservation of this	Kudremukha &	60
	endangered medicinal plant in Western Ghats.	Dharwad division	
2.	In-situ conservation of medicinal plants in Forest	Yellapur	100
	area of Karnataka		
3.	Resource augmentation of medicinally important	Sirsi, Yellapura,	500
	trees in Karnataka (Moist area)	Haliyala,	
		Honnavar, Karwar,	
		Belgaum, Hunsur	
4.	Resource augmentation of medicinally important	Dharwad, Gulbarga,	500
	trees in Karnataka (dry area)	Mandya,	
		Bangalore (R), Gadag,	
		Bellary, Belgaum	
5.	Conservation & propagation on RET medicinal	Hassan	6000
	plants in Hirekalgudda state forest of Arasikere		
	range.		

Table 7. Location of medicinal plants conservation area(MPCA) in Karnataka.

Sl. No.	Name of MPCA	Height above MSL(m)	Forest type sub-group			
1.	BRT hills	790-1050	Southern dry mixed deciduous forest			
2.	Sandur	550-773	Southern dry mixed deciduous forest			
3.	Savanadurga	800-970	Dry Deciduous scrub			
4.	Karpakapalli	600-750	Dry Deciduous scrub			
5.	Talacauvery	1000-1355	West coast semi-evergreen forest			
6.	Subramanya temple	250-800	West coast semi-evergreen forest			
7.	Charmadi	300-1250	West coast semi-evergreen forest			
8.	Devimane	50-500	West coast semi-evergreen forest			
9.	Kudremukha	760-820	Southern hill top tropical evergreen forest			
10.	Kemmanagundi	1300-1700	Southern hill top tropical evergreen forest			
11.	Devarayanadurga	850-1040	Southern thorn forests			
12.	Agumbe	600-700	West coast tropical evergreen forest			
13.	Kollur	1000-1343	West coast tropical evergreen forest			

• In order to develop ex-situ conservation strategies for Rare Endangered and Threatened (RET) species in the Western Ghats, a Network Project involving 10 research centres in the state of Karnataka, Kerala, Tamil Nadu and Assam is under implementation.

• The Indian Institute of Horticulture Research (IIHR) coordinates the projects and about more than 80 species has been conserved.

• There are 32 on-going promotional projects sanctioned by the National Medicinal Plants Board (NMPB), Government of India, which have been diligently monitored by KaMPA.

Ex-situ Conservation: Conservation of medicinal plants can be accomplished by the ex-situ i.e. outside natural habitat by cultivating & maintaining plants in botanic gardens, other suitable sites and through long term preservation of plant propagules gene banks (seed bank, pollen bank, DNA library, etc.) and plant tissue culture repositories and by cryopreservation.

Botanical gardens can play key role in ex-situ conservation of plants, especially those facing imminent threat of extinction. Several gardens in the world are specialised in cultivation and study of medicinal plants, while some contain a special medicinal plant garden or harbour special collection of medicinal plants.

India has a network of about 140 botanical gardens which include 33 botanical gardens attached to 33 universities botany departments. But hardly 30 botanical gardens have any active programme on conservation. Tropical Botanical Gardens & Research Institute (TGBRI), located in a degraded forest region of Western Ghats Mountains in Kerala has an excellent example in ex-situ conservation of plant diversity in India. The field gene bank programme launched by TBGRI from 1992-1999 is now well acclaimed as a very effective method of conservation of medicinal and aromatic plant genetic resources. This field gene bank of medicinal and aromatic plants at TBGRI, Thiruvananthapuram is essentially a blend of the exsitu and in-situ situations.

Ethno-medicinal plant gardens: Creation of a network of regional and sub-regional ethno-medicinal plant gardens which should contain accessions of all the medicinal plants known to the various ethnic communities in different regions of India. This chain of gardens will act as regional repositories of our cultural and ethno medicinal history and embody the living traditions of our societies knowledge of medicinal plants.

There are estimated to be around 50 such gardens in the country ranging from 20 acre to 40 acres some of them were set up by an All India Health Network.

More recently networks of 15 such gardens have been set up in 3 states of South India with the initiative of FRLHT. One of the gardens is located in TBGRI, (Tropical botanical garden research institute) Palode at Thiruvananthapuram.

Gene banks: The precautionary principles would suggest that an immediate and country- wide exercise be taken up to deposit seeds of wild medicinal plants with a first priority to known Red listed species and endemic species.

The department of bio-technology, Government of India has recently taken the initiative to establish 3 gene banks in the country. One is with ICAR at the NBPGR (National Bureau of plant genetic Resources) Campus, the second is with CIMAPs, (Central Institute of Medicinal and Aromatic plants) Lucknow and the third with TBGRI in Thiruvananthapuram.

Nursery network: The most urgent and primary task in order to ensure immediate availability of plants and planting materials to various user groups is to promote a nationwide network of medicinal plant nurseries, which will multiply all the regional specific plants that are used in the current practice of traditional medicine.

These nurseries should become the primary sources of supply of plants and seed material that can be subsequently multiplied by the various users.

Planting material for 40 odd species of medicinal and aromatic plants is reportedly available in the ICAR and CSIR (CIMAP) network. In South India FRLHT has recently set up a network of 55 supply nurseries.

Cultivation: One estimate puts the figure of world trade in medicinal plants and related products at US \$ 5 trillion by A.D. 2050 (World Bank report, 1996). The demand so far has been met mainly from wild sources. This can't go on for much longer; policy intervention is urgently needed to encourage and facilitate investments into commercial cultivation of medicinal plants.

In the Govt. sector agro-technology of 40 odd species has been developed by ICAR- Agricultural University System and CSIR (CIMAOs & RRL, Jammu and Jorhat).

In recent years industries like Dabur, Zandu, Indian Herbs, AryaVaidyaShala, and AryaVaidya Pharmacy and others have made some symbolic efforts to initiate cultivation.

Since 1984 NABARD (National Bank of Agricultural and Rural Development) has formulated schemes for financing cultivation and processing of medicinal plants.

Guidelines for Ex-situ conservation from IUCN

- Each country should have at least one functioning botanic garden.
- Botanic garden(s) should set up seed banks for the native medicinal plants and those cultivated in the country.
- Botanic gardens should set up alternative means of ex situ conservation for those species which cannot be stored in seed banks.

Table 8.	Conservation	of	biodiversity	of	highly	important	medicinal	plants	of	India	through	tissue	culture
technolog	<u>y</u>												

Plant species	Explants	Nature of response
Bacopa monnieri	Leaf explants &	Mass propagation
	Nodal Segments	
Calastrus paniculatus	Nodal segments	Shoot culture
Clitoria tematea L.	Nodal segments	Shoot culture
Glycyrrhiza glabra	Nodal segments	Axillary bud culture
Gymnema sylvestre	Seeds	Seed culture
Saussurea lappa	Shoot tip	Shoot culture
Swertia chirata	Shoot tip	Shoot culture

Table 9. Medicinal	plants of Western	Ghats for which	cryopreservation	protocols have	been standardized.
			2 I		

Species	Stored material	Method	Germination (%)
Celastrus paniculatus	Zygotic embryos	Desiccation	65
Dioscorea bulbifera	Embryogenic callus	Pregrowth + Encapsulation-	67.8
		dehydration	
Holostemma	Shoot tips	Pregrowth + Encapsulation-	54.2
annulare		dehydration	
Kaempferia galangal	Shoot tips	Pregrowth + Vitrification	50
Rauvolfia serpentine	Nodal segments	Pregrowth + Vitrification	66

Cryopreservation

Cryopreservation involves storage of plant material at ultra-low temperatures in liquid nitrogen $(-196^{\circ}C)$ and is a useful method for germplasm preservation.

This is the only available method for long-term germplasm conservation of vegetatively propagated plants and those with recalcitrant seeds.

Conclusion

Since the diversity of medicinal plants are depleting in an alarming rate by improper and destructive collection from wild sources .There is an immense need for conservation of diversity of medicinal plant wealth for the present and fore coming generations, by adapting the suitable strategy with most appropriate method of conservation. Forest land is losing its natural flora at an alarming rate and only 8 per cent is left at present as against a mandatory 33 per cent of the geographical area. There is an immense need for conservation of diversity of medicinal plant wealth for the present and fore coming generations, by adapting the suitable strategy with most appropriate method of conservation.

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