

## Conservation of Medicinal Plants in Karnataka: Initiatives so far, Gaps and Challenges ahead



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### **1. Introduction**

Medicinal plants are not new to us: their therapeutic significance is well studied and discussed. However, their significance as an integral element of the biodiversity is being realized in the forestry sector lately, as it is brought to light that about 85% of known and recorded medicinal plant diversity of the country is captured in forests and wild habitats (FRLHT, 2006). It is also being realized that, 82% of high consumption botanicals (>100 MT per annum) in trade originates from wild sources (Ved & Goraya, 2008). This realization has consequently led to a widespread concern in the forestry sector about medicinal plant resources.

The state of Karnataka boasts an unparalleled diversity of medicinal plants in the country. It is estimated that, Karnataka is the home to about 4800 species of flowering plants out of which about 2000 species are medicinal (FRLHT, 2010 b). This is quite remarkable, as this number accounts for about 27% of the country's flora, with just 10% of the geographical area. Karnataka with its unique wild habitats spread across the Western Ghats and the Deccan Peninsula is also the home to several endemic species of commercial importance. Many species of *Cinnamomum*, *Dysoxylum*, *Garcinia*, *Myristica*, *Hydnocarpus*, *Pterocarpus*, *Canarium*, *Ochreanauclea*, *Ochrocarpus*, *Vateria* and many others which are highly

medicinally valuable and yield commercially important non timber forest produce, are endemic to Karnataka.

### **Medicinal Plants across Medical streams**

These medicinal plants are the true backbones of a wide range of local health traditions, in addition to the codified medical systems such as Ayurveda, Siddha, Unani and Homoeopathy. Several medicinal plants species constitute many classical drug formulations and hundreds of home remedies. Medicinal plants are largely put to use in 3 different forms: Curative, promotive and preventive.

While the general understanding of a medicinal plant is rooted in the use of a plant to cure a disease, it should be noted that more than two third of the total medicinal plant diversity is used for preventive and promotive uses, which usually go unnoticed. Such preventive and promotive use, which is more predominant than the curative uses, is seen in the form of routine practices amongst us for body care, dental care and eye care, and in the form of cosmetics and special applications for beauty care and many special preparations for overall healthcare. It is a traditional practice to use different medicinal plants for hygiene and sanitation, fumigation and water purification in a household. Communities have different modes of using specific medicinal plants during many rituals and customary observances, and in the form of season specific diet and special preparations during festivals and celebrations in a year.

Hundreds of home remedies and household formulations have been interwoven into the lifestyles of several local communities. Besides, there are region-specific and community-specific medicinal plant usages that have further broadened the health traditions. Added to these, there are specialized fields of healthcare in the form of bone setting, antidotes and treatment of poisonous bites, traditional birth attendants, mother and post natal care and child care.

The diversity of medicinal plants in use across the different medical streams in the country - both codified and folk streams –is quite astounding. In the Indian context, they collectively appear as below.

**Table 1: Medicinal Plants diversity in use across different medical streams**

	AYURVEDA	FOLK	HOMEO	MODERN	SIDHA	TIBETAN	UNANI
AYURVEDA	2351	900	189	80	1028	341	880
FOLK	900	5137	164	86	971	235	573
HOMEO	189	164	506	100	167	77	173
MODERN	80	86	100	204	65	25	75
SIDHA	1028	971	167	65	1785	277	641
TIBETAN	341	235	77	25	277	350	275
UNANI	880	573	173	75	641	275	979

The matrix above shows the huge diversity of plants in use across different streams- some are unique to a system while many others go across the medical streams.



## **Medicinal plants and drug industry**

These medicinal plants are a major industrial resource too. As the natural pharmaceuticals they are well known to us, however they are also significant as nutraceuticals and cosmeceuticals. Some of the major plant products and derivatives used by the drug industry include Paclitaxel, Vincristine, Vinblastine, Artemisinin, Camptothecin, Podophyllotoxin and such. Around 80% of such products preferred in the pharmaceutical industry are of plant origin (Somashekhar, 2011). This indicates that these medicinal plants play a significant economic role too, in terms of trade turn over, employment generation, value chains, foreign currency and contribution to overall economy.

The herbal drugs and traditional medical treatment are the most popular forms in the international market and the drug industry has good revenue. The retail sale of pharmaceutical products was estimated at US\$ 80-90 billion globally in 1997, with medicinal plants contributing very significantly. The total sales' value of drugs (such as Taxol) derived from just one plant species (*Taxus baccata*) was US\$ 2.3 billion in 2000. In the Indian context, the total annual turnover of medicinal plants and products is estimated at Rs. 8800 crores while the annual demand for the botanical raw drugs is estimated at 319,500 MT for 2005-06. The annual trade value of these raw drugs amounts to 1069 crores (Ved & Goraya, 2008).

All this information emphasizes the importance of drug industry as one of the major industries of the world involving hefty profits and huge turnovers. However the diversity of medicinal plants found in the global drug market and the total quantity of the raw material traded matters most in this industry. In the Indian context, the data regarding the medicinal plants involved and the drugs traded reveals some alarming results. A recent study brings to light >960 medicinal plant species which are in the trade in the country, whose 1289 raw drug forms are in use (Ved & Goraya, 2008). Of these 960 species, 178 species witness high volume trade with each one registering a trade of >100 MT per year.

## **2. Status of medicinal plants in the wild and need for Conservation**

That on one hand, these medicinal plants imply a flourishing pharmaceutical industry, raw drug trade and commerce, it is also true that, these plants hint at the possibility of high levels of pressures these might be undergoing. That is indeed true! The international pharmaceutical industry, considers the tropical medicinal plants as the source of rare drugs worth millions. The foremost pressure comes in the form of High levels of demand for the raw material of these life saving medicinal plants. This high demand sets in an interlocking loop affecting the overall survival of the species. It begins with high demand that results in high volume extraction, which might also trigger destructive methods of harvesting, to make up the produce in the least available time; such destructive harvesting measures, will invariably damage the population and subsequently the regeneration process of the species gets affected. Once the regeneration is affected, the total quantum of raw material available from a population also gets affected.

To compound the situation, not many raw drugs in the country originate from cultivated sources. Of the 178 medicinal plants species that register high volume trade of >100MT per year, only 36 are found to be entirely sourced from cultivation (Ved & Goraya, 2008). Among these 36, only 4 species including, Isabgol, Senna, Henna, Aswagandha register large scale cultivation in the country, while acreage details of others are not available. It also brings to light that, besides these 4 species, Muskdana (*Abelmoschus moschatus*), Sweet flag (*Acorus calamus*), *Adhatoda zeylanica*, Aloe (*Aloe barbadensis*), Aswagandha (*Withania somnifera*), whose agro-technology practices are stabilized, have already entered into local agricultural systems.

The case of Amla, (Goose berry, *Embllica officinalis*) is worth mentioning, whose cultivation is seen in sizeable plantations in north India. The Amla growers association claims that the acreage of Amla plantations is about 70,000 ha. However, it is interesting to note that, only about 60% of the total produce from these plantations is used by the medicinal industry, while the rest goes for culinary preparations such as pickles, candies, jam and juice.

Species such as Neem, Tulasi, Coleus, Long Pepper, Sweet Basil, and Guggul are found in sizeable cultivation while common spices and condiments such as Black Pepper, Cinnamon, Clove, Nutmeg, Cardamom, and Coriander originate from cultivated sources. Apart from these examples, medicinal plants cultivation for supply of raw material for pharmaceutical industry is too fragmented and seen only on small holdings.

Thus, it only tells that, all is not well with medicinal plants, while many of them being subjected to different kinds of threats, often affecting the very survival. Several species are feared to be threatened, while the population size of some species is severely reduced and in certain cases the availability of the produce has become scarce.

This has set in an alarming situation, to register an urgent need to conserve the medicinal plants resource base. However, considering the large number of medicinal plant species under threat, the challenge is how to assign the conservation priorities.

In order to address this challenge and to arrive at an efficient strategy that helps prioritize the species for an appropriate conservation measure, FRLHT conducted rapid threat assessment exercises, using **IUCN Red List Categories and Criteria**. This methodology was put to use to identify the threatened species and to assess their threat status in 17 different states of the country during 1994-2005. As a result of 17 such CAMP exercises, India's "First list of Threatened species of Medicinal plants" emerged, which lists 326 threatened species of medicinal plants, with their assigned threat status (FRLHT, 2006).

### **3. MPCA: A Novel initiative for Medicinal Plants Conservation**

This threatened list of medicinal plants offers a list of prioritized medicinal plants in the country, which are in need of conservation. But the challenge is to find an effective model that ensures their conservation. While there are tested conservation models available in respect of wildlife and many other forms of biodiversity, the conservation of medicinal plants has not been as easy as it appeared. Our current understanding of the entire scenario is not so comprehensive and it is quite challenging, for, the available information about the natural distribution and size of medicinal plant populations, the causes and kinds of threats that affect such populations, the issues related to their regeneration, the critical socio-economic elements that operate in a habitat, the prevailing harvesting mechanisms and other trade related pressures, the reproductive biology and phenology, the propagation methods, the management priorities and so on is quite cursory. Thus the challenge is to evolve an appropriate conservation strategy given such grey areas as the leads.

However, a convincing model appears in the form of a MPCA. The term MPCA (**Medicinal Plants Conservation Area**) denotes a forest patch of about 200 ha selected for conserving unique populations or diversity of medicinal plants in their natural ecosystem. The MPCA model is thus an insitu conservation initiative in which the populations are allowed to

flourish, while the conventional forestry management operations are kept to minimum (FRLHT, 2006).

This novel initiative came into place in 1993 in Karnataka, Kerala and Tamil Nadu with the funding support by DANIDA (Danish International Developmental Aid, Netherlands). The initiative was implemented in 34 forest sites across south India during 1993-2004 by FRLHT Bangalore, with the active collaboration of the state forest departments of Karnataka, Kerala and Tamil Nadu.

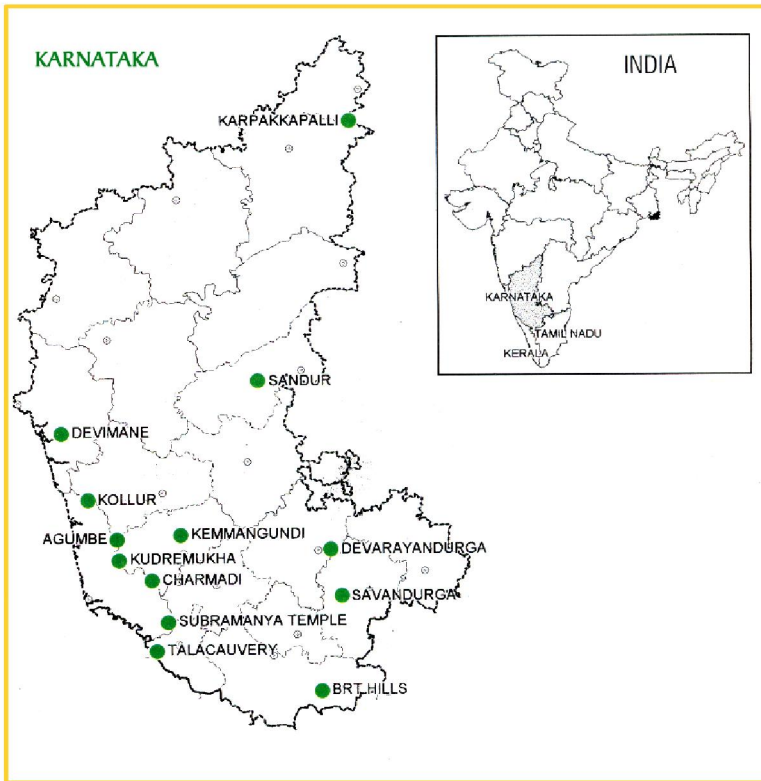
### **MPCAs of Karnataka**

In Karnataka, 13 such MPCAs were established representing all major forest types and different altitude zones of the state. They are as below:

**Table 2: Location and Forest types of 13 MPCAs in Karnataka**

<b>MPCA</b>	<b>Area(ha)</b>	<b>Lat.</b>	<b>Long.</b>	<b>Altitude</b>	<b>Forest type</b>
BRT Hills	150	11° 59'	77° 08'	790-1050	Southern Dry Mixed Deciduous Forest
Talacauvery	80	12° 23'	75° 29'	1000-1355	West Coast Semi-Evergreen Forest
Savandurga	280	12° 55'	77° 20'	800-970	Dry Deciduous Scrub
Subramanya	200	12° 40'	75° 37'	250-800	West Coast Semi-Evergreen Forest
Charmadi	283	13° 05'	75° 28'	300-1250	West Coast Semi-Evergreen Forest
Devarayanadurga	178	13° 23'	77° 14'	850-1040	Southern Thorn Forest
Kudremukha	110	13° 17'	75° 08'	760-820	Southern Hilltop Tropical Evergreen Forest
Kemmangundi	310	13° 32'	75° 45'	1300-1700	Southern Hilltop Tropical Evergreen Forest
Agumbe	210	13° 29'	75° 07'	600-700	West Coast Tropical Evergreen Forest
Devimane	210	14° 32'	74° 34'	50-500	West Coast Semi-Evergreen Forest
Sandur	350	15° 03'	76° 31'	550-773	Southern Dry Mixed Deciduous Forest
Karpakkapalli	150	17° 37'	77° 26'	600-750	Dry Deciduous Scrub
Kollur	275	13° 43'	77° 49'	120-240	West Coast Semi-Evergreen Forest

**Figure 1: Network of Medicinal Plants Conservation Areas (MPCAs)**



Even though the total geographical expanse of these MPCAs in Karnataka is quite small, but their conservation significance is quite enormous. It is noteworthy here that, these MPCAs have captured more than 1000 species of medicinal plants and about 60 Red listed medicinal plants of Karnataka. This would mean that these MPCA sites amounting to just 0.01% of the forest area of the state, have been able to capture almost 60% of the total medicinal plants diversity and 75% of the red listed plants of Karnataka, while many significant populations of these species are already conserved in the MPCA sites (Somashekhar, 2010).

### **Salient features of the MPCAs and the outcomes**

A forest area identified and declared as a MPCA will remain as a protected site and would typically exhibit the following features:

- § A wild habitat spread over an average expanse of about 200 ha.
- § Traditionally known for Medicinal plants availability which have nurtured different local health traditions of the region.



- § Rich in medicinal plants diversity with their viable breeding populations.
- § Known presence of species populations of conservation concern.
- § Remain as ‘hands off’ areas kept free from any kind of human interventions and forestry operations.
- § Conservation related activities such as enumeration of medicinal plants, vegetation profiling, propagation of medicinal plants, sustainable harvesting and other conservation research activities would be taken up.

#### **4. Significant Outputs and Outcomes from the MPCA initiative**

This pioneering work initiated by FRLHT was quite incredible and it resulted in several significant conservation outcomes. Noteworthy among these is a notable shift in the conservation priorities of the forestry sector. After witnessing the novel conservation activities in the MPCAs of south India, the Forest managers all over the country started admitting the need for broadening the conservation priorities in the forestry sector so as to cover the hitherto ignored medicinal plants. From a conventional timber focused or wildlife focused conservation attempts, the priorities slowly got expanded to include medicinal plants too. Thus, the MPCA program caused a profound change and brought in a fresh breeze of innovativeness into the entire forestry sector in the country.

After witnessing the success of this unique conservation program, it was realized across the country that the medicinal plants conservation strategies developed in this novel initiative, were worth emulating in other forest areas too and thus the MPCA program got extended to many other states in the country and at the end of 2011 there were 112 MPCAs established across different forest areas in the country.

The initiatives of FRLHT also resulted in shedding light on many grey areas associated with adulterants and substitutes of different medicinal plants such as Vidaari, Vidanga, Daaruharidra, Gokshura, Bhumyamalaki and others (FRLHT, 2010 a). The MPCA initiatives also offered a countrywide picture of the dynamics of demand, supply and trade of medicinal plants, documentation of traditional medical knowledge and diversity of folk healing traditions.

Besides, the interventions by FRLHT, also resulted in many significant conservation outcomes, and some of them are the below (Somashekhar, 2010):

- § Consolidated lists of state wise medicinal plants in the country
- § Demonstrated adoption of IUCN threat categories and CAMP methodology for threat assessment of Medicinal Plants
- § A countrywide list of Medicinal plants of conservation concern.
- § A nomenclature database that establishes botanical identity of medicinal plants by correlating the local names in 13 different languages with their accepted botanical names.
- § Multi subject databases on Medicinal plants of India that covers the botanical profile, medicinal uses, geographical distribution, ecology and reproductive biology, propagation, images of raw drug, herbarium and distribution maps.
- § Exclusive Herbarium of Medicinal plants of the Country, which subsequently got recognized as the National Herbarium of Medicinal plants by the MoEF.
- § Different Training module capsules on Conservation of Medicinal plants for the frontline forestry staff and NGOs, currently in use in different Forestry Training Institutes
- § Different kinds of Communication and Information Products on Medicinal plants and Medicinal uses.

### **Challenges ahead**

While it is quite commendable that the MPCA initiative resulted in many profound changes in the conservation perspectives among the resource managers and affected a shift in the conservation priorities, it is also true that, the rigor and the intensity with which the program was implemented could not be sustained beyond the project network, for various reasons. Often many stakeholder groups thought that the MPCAs were the brain child of FRLHT and needed only its care and support. However, these stakeholder groups failed to recognize that the MPCA model was a brilliant and powerful demonstration of a novel conservation model that needed to be embraced and properly accommodated in the mainstream conservation priorities for its continuation. Whatever are the dilemmas, given the novelty, innovativeness and the cost effective element in the MPCA model and the emerging expectations by the sector, the current need is to focus on the following on a priority basis, in order to deepen the understanding of medicinal plants and to address the emerging needs:

- § Expand the MPCA network so as to capture the other red listed species not brought under the conservation network.
- § Using the established MPCA sites as Open air Centre for Conservation education and Learning and establish links with the nearby Educational and research Institutes.
- § Take up Status surveys, reconnaissance surveys and Population studies of selected Red listed species to enrich the current data sets.
- § Take up small time market studies to examine the Harvesting and Collection-Produce flow-Market links of those species which are in High volume trade.
- § Conceive and develop small time field studies to generate additional field data on the Phenology, Reproductive biology, Seed biology of red listed species and to generate substantial examples and case studies for deepening the understanding of medicinal plants.
- § Take up studies to develop propagation methods for select red listed species and conceive species recovery initiatives.
- § Take up small time field studies to understand the cultural links of medicinal plants.

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