A BALANCED PERSPECTIVE FOR MANAGEMENT OF INDIAN MEDICINAL PLANTS

DARSHAN SHANKAR AND D.K. VED

Foundation for Revitalisation of Local Health Traditions (FRLHT), Bangalore (Karnataka).

What is a medicinal plant?

"Jagatyevam anoushadham na kinchit vidyate dravyam vasatnanartha yoga yoh"

Ancient Indian literature incorporates a remarkably broad definition of medicinal plants and considers 'all' plant entities to be potential sources of medicinal substances. While all plant entities are thus potentially medicinal, at a practical leval, only those plants are considered 'medicinal' whose medicinal use has already been discovered for human or veterinary application. Such an application could either be in the western bio-medical system or homeopathy or any of the traditional systems of medicine like Ayurveda, Unani, Siddha and Swa-Rigpa or the rich and diverse folk medical traditions which are eco-system and ethnic community specific.

The cultural roots of Medicinal Plants of India

India has one of the oldest, richest and most diverse cultural traditions associated with the use of medicinal plants. It represents a striking example of the intimate link between biodiversity and cultural diversity. The remarkable fact is that it is still a living tradition. This is borne out by the fact that there still exist around a million traditional, village-based carriers of herbal medicine traditions in the form of traditional birth attendants, bone-setters, herbal healers and wandering monks who use hundreds of ecosystem specific bio-resources. Apart from these specialized carriers, there are millions of households, women and elders who have traditional knowledge of herbal home remedies and of food and nutrition. There is enormous diversity in these local health cultures because they are ecosystem and ethnic community specific.

Complementing the village based carriers, there are around 5,00,000 licensed, registered medical practitioners of the codified systems of Indian Medicine like Ayurveda, Siddha, Unani and the Swa-rigpa (Tibetan) systems of medicine. The codified systems have sophisticated theoretical foundations and there are hundreds of medical texts and manuscripts in the form of *Samhitas*, *Nighantus* (lexicons) and regional commentaries including specialized texts on *Bhaisajya Kalpana* (pharmacy) that specifically deal with plants and plant products. There are over 25,000 herbal products documented in medical literature.

Traditionally medicinal plants have been used for human, veterinary and plant

health. There are medical texts that deal with the treatment of cows, horses, elephants and birds, there are also texts on subjects like *Vrksh Ayurveda* and *Krishi Sastra* that deal with use of plants for controlling pests, treating plant diseases and as biofertilizers.

In passing, it may be worth observing that the knowledge of the Indian people about plants and plant products is not based on the application of western categories of knowledge and approaches to studying natural products, like Chemistry and Pharmacology. It is based on a sophisticated indigenous knowledge category called *'Dravya Guna Shastra'*. Unfortunately due to lack of rigorous cross- cultural studies and in fact, in the absence of a well accepted methodology for such cross-cultural study, there exists no 'reliable bridge' to cross over from chemistry and pharmacology to *'Dravya Guna Shastra'* or vice-versa, although some preliminary functional links between the two knowledge systems have been explored.

The botanical profile of Indian medicinal plants

Several thousand species of plants are estimated to be used by 4,635 ethnic communities for human and veterinary health care, across the various ecosystems from Ladakh in the trans-Himalayas to the southern coastal tip of Kanyakumari and from the deserts of Rajasthan and Kachch to the hills of the North-East. In the codified medical texts of Ayurveda, a recent study enumerates around 1,800 species of plants that are fully documented in terms of their biological porperties, actions and drug formulations for a range of health conditions from a common cold to raising of the body's general immunity (Table 1).

There are however still big gaps in the work of completing an exhaustive inventory of the medicinal plants of India. While there exist several ethno-botanical and medical studies of scattered geographical pockets in the country which have documented ethnic uses of the locally available plants for medicine, there is at the moment no exhaustive and reliable inventory available of all the medicinal plants of India used by all the different ethnic communities in different ecosystems. From the codified literature of Ayurveda, Unani, Swarigpa and Siddha whereas check-lists of plants do exist and there have been efforts made to document the plants of Ayurveda and Siddha from 'primary sources', there have been less rigorous efforts made for the other codified systems of medicine. State-wise studies of the native medicinal plants that occur within the geographical boundaries of the various states and various agroclimatic zones of India have not yet been undertaken.

Medicinal plants as a group comprise approximately 7,500 species and account for around 50% of all the higher flowering plant species of India (Table 2).

Distribution of medicinal plants

The analysis of the distribution of medicinal plants shows that they are distributed across diverse habitats and landscapes. Around 70% of India's medicinal plants are found in the tropical areas mostly in the various forest types spread across the Western and Eastern Ghats, the Vindhyas, Chotanagpur

Table 1

Medicinal Plants species diversity and representative species of biogeographic zones of India

Sl. No.	Biogeographic region	Estimated no. of Medicinal Plants	Examples of some typical medicinal species
1.	Trans Himalayan	700	*Ephedra geradiana* Wall., *Hippophae rhamnoides* L., *Arnebia euchroma* (Royle) John
2.	Himalayan	2,500	*Aconitum heterophyllum* Wall. ex Royle, *Ferula jaeschkeana* Vatke and *Saussurea costus* (Balc). Lipsch. *Nardostachys grandiflora* DC., *Taxus wallichiana* Zucc., *Rhododendron anthopogon* D.Don and *Panax pseudoginseng* Wall.
3.	Desert	500	*Convolvulus microphyllus* Seib ex Spreng., *Tecomella undulata* (Sm), Seem., *Citrullus colocynthis* (L.), Schrader and *Cressa cretica* L.
4.	Semi-Arid	1,000	*Commiphora wightii* (Arn.) Bhandari, *Caesalpinia bonduc* (L)., Roxb., *Balanites aegyptiaca* (L.)., Delilie and *Tribulus rajasthanensis* Bhandari & Sharma
5.	Western Ghats	2,000	*Myristica malabarica* Lam., *Garcinia indica* (Thou.) Choisy, *Utleria salicifolia* Bedd. and *Vateria indica* L.
6.	Deccan Peninsula	3,000	*Pterocarpus santalinus* L.f., *Decalepis hamiltonii* Wight & Arn., *Terminalia pallida* Brandis and *Shorea tumbuggaia* Roxb.
7.	Gangetic Plain	1,000	*Holarrhena pubescens* (Buch-Ham.) Wall. ex DC., *Mallotus philippensis* (Lam.) Muell-Arg., *Pluchea lanceolata* C.B. Clarke and *Peganum harmala* L.
8.	North-East India	2,000	*Aquilaria malaccensis* Lam., *Smilax glabra* Roxb., *Ambroma augusts* (L.) L.f. and *Hydnocarpus kurzii* (King) Warb
9.	Islands	1,000	*Calophyllum inophyllum* L., *Adenanthera pavonina* L., *Barringtonia asiatica* (L.), Kurz and *Aisandra butyracea* (Roxb), Baehni
10.	Coasts	500	*Rhizophora mucronata* Lam., *Acanthus ilicifolius* L., *Avicennia marina* Vierth and *Sonneratia caseolaris* (L.) Engl.

plateau, Aravalis, the Tarai region in the foothills of Himalayas and the North-East. While less than 30% of the medicinal plants are found in the temperate and alpine areas of higher altitudes which include species of high medicinal value. A small number of medicinal plants are also found in aquatic habitats and mangroves.

Studies show that a large percentage of the known medicinal plants occur in the dry and moist deciduous vegetation as

Table 2

Medicinal Plants enlisted across different Systems of Medicine

	Ayurveda	Folk	Homeo	Modern	Siddha	Tibetan	Unani
Ayurveda	**2351**	900	189	80	1028	341	879
Folk	900	**5150**	164	86	972	235	572
Homeo	189	164	**508**	100	167	77	173
Modern	80	86	100	**204**	65	25	75
Siddha	1028	972	167	65	**1786**	277	641
Tibetan	341	235	77	25	277	**350**	275
Unani	879	572	173	75	641	275	**978**

Total record in Bot_Mast: 7334

compared to the evergreen or temperate habitats.

Analysis of habit-wise distribution of medicinal plants indicates that a little more than one-third are trees. Herbs form around one-third of the population. Shrubs and climbers form a little more than one-third of the total.

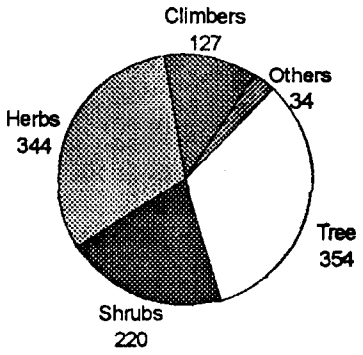
Medicinal species are found in groups like algae, fungi, lichens, bryophytes, pteridophytes, gymnosperms and angiosperms.

Of the 386 families and 2,200 genera in which medicinal plants are recorded, the families Asteraceae, Euphorbiaceae, Lamiaceae, Fabaceae, Rubiaceae, Poaceae, Acanthaceae, Rosaceae and Apiaceae share the larger proportion of medicinal plant species, with the highest number of species (419) falling under Asteraceae (Figs. 1-3).

Conservation status of Indian Medicinal Plants

While the demand for medicinal plants is increasing, their survival in their

Fig. 1

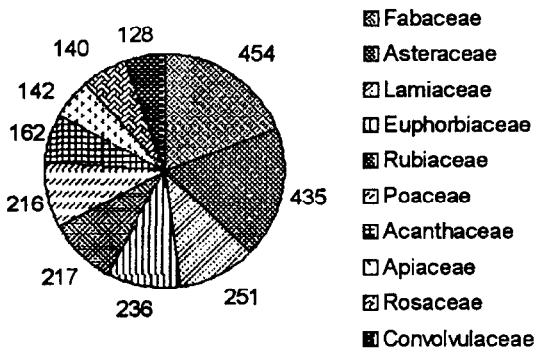


Diversity of medicinal plants in South India
(Habitat-wise analysis of 1079 species)

Source : FRLHT data base

natural habitats is under growing threat. This is due to rapid degradation and loss of natural habitats and in certain instances due to over-harvesting of species. Species like *Coscinium fenestratum, Janakia arayalpathra, Dactylorhiza hatagirea, Saussurea costus* are critically endangered in the wild. It is estimated that today around a 1,000 species of medicinal plants are facing threat to their existence in the wild, and some of them like *Plectranthus*

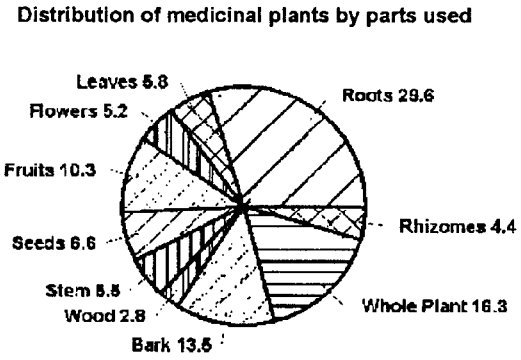
Fig. 2



Top ten families with larger share of medicinal plants of India

Source : FRLHT data base

Fig. 3



Pie chart showing destructive harvest

Source : FRLHT data base

vettiveroides have become extinct in the wild.

Trade studies indicate that there are around 880 species of medicinal plants in all India trade, out of which 100 species are from cultivated sources, 14 are imported and exotic to India and the remaining are collected from the wild from both forest and other land scapes. Thus around 90% of the medicinal plants used by the Indian industry today are collected from the wild. Over 70% of the plant collections involve destructive harvesting because of the use of parts like roots, bark, wood, stem and the whole plant (in case of herbs).

This pattern of use poses a definite threat to the genetic stocks and to the diversity of medicinal plants. Threat assessment exercises as per latest IUCN guidelines, for southern and northern India have already listed around 200 species (Table 3) of medicinal plants that are rare, endangered and threatened.

Outline of conservation and cultivation strategies.

If Indian and global consumers of India's herbs and herbal products are to continue to benefit from the richness and diversity of India's medicinal plant heritage, it is essential to urgently develop and implement cost effective plans firstly for their *in-situ* conservation and next to create suitable policy and price environment, so that industry and farmers have an incentive to engage in large scale organic cultivation.

A network of around 300 *in-situ* forest reserves of medicinal plants across the different biogeographic zones and linked to hundreds of decentralised nurseries and State-level seed centres is probably the most cost effective way for India to conserve, manage and supply the inter and intra specific diversity of medicinal plants to users. This 'network of *in-situ* gene banks' with attached nurseries and seed centers can serve as

Table 3

Medicinal plant species assessed as threatened in CAMP workshops in India*

S.No.	Species	Scale	AP	KL	KT	MH	TN	JK	HP
1	2	3	4	5	6	7	8	9	10
1.	*Aconitum chasmanthum*							CR	DD
2.	*Aconitum dinorrhizum*							EN	EN
3.	*Aconitum heterophyllum*							EN	EN
4.	*Aconitum violaceum*							VU	VU
5.	*Acorus calamus*		EN	EN	DD		VU		
6.	*Adenia hondala*			VU	VU		NT		
7.	*Adhatoda beddomei*	G		CR	CR		CR		
8.	*Aegle marmelos*		VU	NE	VU	VU	VU		
9.	*Aerva wightii*	G		EX	EX		EX		
10.	*Alangium salvifolium*					LC			
11.	*Allium stracheyi*							VU	VU
12.	*Amorphophallus commutatus*	G		VU	VU		VU		
13.	*Amorphophallus paeoniifolius*			NT	DD		VU		
14.	*Amorphophallus sylvaticus*		VU						
15.	*Ampelocissus araneosa*	G		VU	VU		VU		
16.	*Ampelocissus indica*			EN	EN		EN		
17.	*Andrographis paniculata*					LC			
18	*Angelica glauca*							EN	EN
19.	*Angiopteris evecta*		EN						
20.	*Anodendron paniculatum*		EN						
21.	*Aphanamixis polystachya*			VU	VU		DD		
22.	*Aristolochia bracteolata*					LC			
23.	*Aristolochia tagala*			LC	VU		DD		
24.	*Arnebia benthamii*							CR	CR
25.	*Arnebia euchroma*							EN	EN
26.	*Artemisia maritima*							EN	VU
27.	*Artocarpus hirsutus*	G		VU	VU		VU		
28.	*Asparagus rottleri*	G		EX	EX		EX		
29.	*Baliospermum montanum*			VU	VU	LC	DD		
30.	*Bergenia stracheyi*							VU	VU
31.	*Betula utilis*							EN	EN
32.	*Boswellia ovalifoliolata*	G	EN						

Contd...

1	2	3	4	5	6	7	8	9	10
33.	*Butea monosperma*	G	EN						
34.	*Cadaba fruticosa*					NT			
35.	*Calophyllum apetalum*	G		VU	VU		VU		
36.	*Canarium strictum*	G		VU	VU		VU		
37.	*Capparis mooni*					NT			
38.	*Cayratia pedata*	G		EN	EN		EN		
39.	*Celastrus paniculatus*		NT	VU	NT	LC	NT		
40.	*Chlorophytum arundinaceaum*		LC			EN			
41.	*Chlorophytum borivilanum*	G				EN			
42.	*Chonemorpha fragrans*			VU	EN		DD		
43.	*Cinnamomum macrocarpum*	G		VU	VU		VU		
44.	*Cinnamomum sulphuratum*	G		VU	VU		VU		
45.	*Cinnamomum wightii*	G		EN	EN		EN		
46.	*Commiphora wightii*			NE	NE		NE		
47.	*Coscinium fenestratum*			CR	CR		CR		
48.	*Costus speciosus*		VU						
49.	*Curcuma pseudomontana*	G		VU	VU		VU		
50.	*Cycas circinalis*			VU	CR		CR		
51.	*Cycus beddomei*	G	CR						
52.	*Dactylorhiza hatagirea*							CR	CR
53.	*Decalepis hamiltonii*	G	EN	EN	EN		EN		
54.	*Diospyros candolleana*	G		VU	VU		VU		
55.	*Diospyros paniculata*	G		VU	VU		VU		
56.	*Dipcadi ursale*	G				EN			
57.	*Dipterocarpus indicus*	G		EN	EN		EN		
58.	*Drimeria indica*					LC			
59.	*Drosera indica*			LC	EN	LC	LC		
60.	*Drosera peltata*			VU	EN		EN		
61.	*Dysoxylum malabaricum*	G		EN	EN		EN		
62.	*Embelia ribes*		CR	NT	VU	DD	VU		
63.	*Embelia tsjeriam-cottam*			VU	VU	VU	VU		
64.	*Entada pursaetha*		EN						
65.	*Ephedra geradiana*							EN	VU
66.	*Eulophia cullenii*	G		CR	CR		CR		
67.	*Eulophia nuda*					EN			
68.	*Eulophia ramentacea*	G		DD	DD	EN	DD		

Contd...

1	2	3	4	5	6	7	8	9	10
69.	*Euphorbia fusiformis*		VU						
70.	*Fagonia cretica*					VU			
71.	*Ferula jaschkeana*							VU	VU
72.	*Ferula narthex*							DD	NE
73.	*Fritillaria roylei*							CR	EN
74.	*Fumaria indica*					EN			
75.	*Garcinia gummi-gutta*	G		NT	NT		NT		
76.	*Garcinia indica*	G		VU	VU	NT	VU		
77.	*Garcinia morella*			NT	VU		VU		
78.	*Garcinia travancorica*	G		EN	EN		EN		
79.	*Gardenia gummifera*	G		VU	VU		VU		
80.	*Gardenia resinifera*					NT			
81.	*Gentiana kuroo*							CR	EN
82.	*Gloriosa superba*		VU	VU	VU	VU	LC		
83.	*Glycosmis macrocarpa*	G		VU	VU		VU		
84.	*Gymnema khandalense*	G		EN	EN		EN		
85.	*Gymnema montanum*	G		EN	EN		EN		
86.	*Gymnema sylvestre*		VU			NT			
87.	*Hedychium coronarium*			NT	NT		LC		
88.	*Helicteris isora*					LC			
89.	*Heliotropium keralense*	G		CR	CR		CR		
90.	*Helminthostachys zeylanicus*	G		VU	DD		CR		
91.	*Heracleum candolleanum*	G		VU	VU		VU		
92.	*Heracleum lanatum*							VU	VU
93.	*Hildegardia populifolia*	G	VU						
94.	*Hippophea rhamnoides*							NT	NT
95.	*Holarrhena pubescence*					LC			
96.	*Holostemma ada-kodien*		NT	EN	VU	CR	NT		
97.	*Humboldtia vahliana*	G		EN	EN		EN		
98.	*Hydnocarpus alpina*	G		VU	VU		VU		
99.	*Hydnocarpus macrocarpa*	G		EN	EN		EN		
100.	*Hydnocarpus pentandra*	G		VU	VU		VU		
101.	*Hyoscyamus niger*							NT	NT
102.	*Inula racemosa*							NE	NE
103.	*Iphigenia stellata*			EN	EN	EN	EN		
104.	*Janakia arayalpathra*	G		CR	CR		CR		

Contd...

1	2	3	4	5	6	7	8	9	10
105.	*Jurinea dolomiaea*							EN	VU
106.	*Kaempferia galanga*			NE	NE	NE	NE		
107.	*Kingiodendron pinnatum*	G		VU	VU		VU		
108.	*Knema attenuata*	G		NT	NT		NT		
109.	*Lamprachaenium microcephalum*	G		DD	DD	EN	DD		
110.	*Lasia spinosa*		EN						
111.	*Litsea glutinosa*		CR						
112.	*Lobelia nicotianefolia*	G				LC			
113.	*Madhuca diplostemon*	G		DD	DD		DD		
114.	*Madhuca insignis*	G		EX	EX		EX		
115.	*Madhuca longifolia*			NE	VU		LC		
116.	*Madhuca neriifolia*			LC	VU		LC		
117.	*Malaxis muscifera*							VU	VU
118.	*Mecanopsis aculeata*							EN	VU
119.	*Merremia turpethum*		LC	EN	VU	EN	NT		
120.	*Mesua ferrea*		NE						
121.	*Michelia champaca*			NT	EN		VU		
122.	*Michelia nilagirica*	G		VU	VU		VU		
123.	*Moringa concanensis*			NE	NE	VU	LC		
124.	*Mucuna monosperma*					VU			
125.	*Myristica dactyloides*			VU	VU		LC		
126.	*Myristica malabarica*	G		VU	VU		VU		
127.	*Nardostachys grandiflora*							NE	CR
128.	*Nervilia aragoana*		EN	VU	NT	NT	EN		
129.	*Nervilia prainiana*					NT			
130.	*Nilgirianthus ciliatus*	G		EN	EN		EN		
131.	*Nothapodytes nimmoniana*			VU	EN	EN	VU		
132.	*Ochreinauclea missionis*	G		VU	VU		VU		
133.	*Oroxylum indicum*		VU	EN	VU	EN	DD		
134.	*Paederia scandens*		NT						
135.	*Paphiopedilium druryi*	G		CR			CR		
136.	*Persea macrantha*			VU	EN		EN		
137.	*Phyllanthus indofischeri*	G	VU						
138.	*Physochaena prealta*							VU	VU
139.	*Picrorhiza kurrooa*							EN	EN
140.	*Pimpinella tirupatensis*	G	EN						

Contd...

1	2	3	4	5	6	7	8	9	10
141.	*Piper barberi*	G		CR	CR		CR		
142.	*Piper longum*			NT	NE		EN		
143.	*Piper mullesua*			NT	VU		VU		
144.	*Piper nigrum*		EN	LC	NT		NT		
145.	*Plectranthus barbatus*		EN						
146.	*Plectranthus nilgherricus*	G		EN	EN		EN		
147.	*Plectranthus vettiveroides*			NE	NE		CR		
148.	*Plumbago indica*		EN						
149.	*Podophyllum hexandrum*							EN	EN
150.	*Polygonatum multiflorum*							VU	VU
151.	*Polygonatum verticillatum*							VU	VU
152.	*Pseudarthria viscida*			VU	VU	LC	NT		
153.	*Pterocarpus marsupium*					VU			
154.	*Pterocarpus santalinus*	G	EN		CR		CR		
155.	*Pueraria tuberosa*		NT	VU	CR	NT	VU		
156.	*Raphidophora decursiva*		EN						
157.	*Rauvolfia serpentina*		CR	EN	EN	CR	EN		
158.	*Rhaphidophora pertusa*			LC	VU		NT-lc		
159.	*Rheum australe*							VU	VU
160.	*Rheum moocrofrianum*							VU	VU
161.	*Rheum spiciforme*							VU	VU
162.	*Rheum webbianum*							VU	VU
163.	*Rhododendron anthopogon*							VU	VU
164.	*Rhododendron campanulatum*							VU	VU
165.	*Rhododendron lepidotum*							VU	VU
166.	*Rubia cordifolia*		VU			VU			
167.	*Salacia oblonga*			EN	EN	DD	EN		
168.	*Salacia reticulata*			DD	CR		NE		
169.	*Santalum album*		EN	EN	VU	EN	EN		
170.	*Saraca asoca*		EN	DD	EN	EN	DD		
171.	*Saussurea costus*							CR	NE
172.	*Saussurea obvallata*							VU	VU
173.	*Sausurea gossypiphora*							VU	EN
174.	*Schrebera swietenioides*			NE	VU		DD		
175.	*Selinum tenuifolium*							LC	LC
176.	*Selinum vaginatum*							LC	LC

Contd...

1	2	3	4	5	6	7	8	9	10
177.	*Semecarpus travancorica*	G		EN	EN		EN		
178.	*Shorea robusta*		NT						
179.	*Shorea tumbuggaia*	G	EN	CR	CR		CR		
180.	*Smilax zeylanica*			VU	NT		LC		
181.	*Stemona tuberosa*		VU						
182.	*Sterculia urens*		VU						
183.	*Strychnos aenea*	G		EN	EN		EN		
184.	*Strychnos colubrina*		EN						
185.	*Swertia corymbosa*	G		VU	VU		VU		
186.	*Swertia lawii*	G		EN	EN		EN		
187.	*Symplocos cochinchinensis*			LC	NT	LC	LC		
188.	*Symplocos racemosa*			DD	VU	VU	NT		
189.	*Syzygium altenifolium*	G	EN						
190.	*Syzygium travancoricum*	G		EN	EN		EN		
191.	*Tacca leontopetoloides*		NT						
192.	*Terminalia arjuna*			NT	NT	NT	LC		
193.	*Terminalia pallida*	G	EN						
194.	*Thalictrum dalzellii*					EN			
195.	*Tinospora sinensis*			NT	VU	NT	NE		
196.	*Tragia bicolor*	G		VU	VU		VU		
197.	*Trichopus zeylanicus*	G		EN	EN		EN		
198.	*Trichosanthus cucumerina*		NT						
199.	*Uraria picta*					LC			
200.	*Urgenia nagarjunae*	G	EN						
201.	*Utleria salicifolia*	G		CR	CR		CR		
202.	*Valeriana leschenaultii*	G		CR	CR		CR		
203.	*Vateria indica*	G		VU	VU		VU		
204.	*Vateria macrocarpa*	G		CR	CR		CR		
205.	*Zanthoxylum rhetsa*		EN						
206.	*Zingiber roseum*		EN						

IUCN Red list status – CR : Critically endangered, EN : endangered, NE : Near endangered, VU : Vulnerable, NT : Near threatened, LC : Least concern.

States : AP- Andhra Pradesh, JK - Jammu & Kashmir, HP - Himachal Pradesh, KL - Kerala, KT- Karnataka, MH - Maharashtra, TN- Tamil Nadu. (JK & HP are in northern India while the rest constitute the Indian Peninsula).

G - indicates globally threatened species as these are endemic to India and deserve higher conservation priority.

the backbone for a sustainable cultivation programme.

Cultivation - The Area Approach

While designing cultivation strategies, one should promote 'area projects' wherein in a compact area, suitable species are promoted via low risk cultivation, involving thousands of farmers, and although the farmers involved in cultivation would only earn a supplementary income, the risk they incur will also be very low. In such strategies, there will be an income spread and this kind of cultivation strategy will provide benefits to a large number of small and marginal farmers.

Cultivation cannot prevent extinction

It is necessary to bear in mind that even if a particular variety of a plant is put under several million hectares of active cultivatrion, the species can still go extinct in the wild, if its wild populations with all their inherent intra-specific diversity are not conserved. It is an established fact that the evolution of species depends on diversity.

Need to Regulate Wild Harvest

Regulations with regard to sustainable of wild collection will also need to be put in place and collections of species known to be critically enlarged will need to be banned.

As a first step intervention, a provision could be including in the Drugs and Cosmetic Act, 1940 (provisions relating Ayurvedic, Unani and Siddha Drugs) making it mandatory for the manufacturer/ storage provider/exporter to declare, on a periodic basis, the quantity of herbal raw material obtained from the wild and to pay some fixed percentage as 'Conservation cess' on the estimated value of the raw material. Such a provision is expected to make the manufacturing sector contribute to conservation and also help to encourage cultivation of selected medicinal plants.

A holistic perspective for medicinal plants development

If India's medicinal plants diversity is to be conserved comprehensively and on a longterm basis, one needs to conserve under *in-situ* conditions the plant populations which represent the inter and intra specific diveristy across and within the species.

Four important parallel measures are necessary to achieve this kind of conservation, namely:

(a) *In-situ* conservation of wild populations in forests and other *in-situ* habitats like sacred groves and community forests. Here the key institutional actor is Government and to a smaller extent, the owners of private forests.

(b) Establishment of Taluka-level herbal gardens to conserve representative populations of medicinal plants known to local health cultures. Here the key players are NGOs, CBOs, schools, colleges, municipalities/panchayats and to a lesser extent other institutions (industry).

(c) Establishment of thousands of home gardens to conserve intra-specific diveristy of plants useful for human and livestock health.

(d) Large scale organic cultivation of selected cultivars of medicinal plants. Here the key actors are farmers.

It is also important to establish linkages between the four kinds of measures because they need the support of one another. For example, cultivation, home gardens and community gardens cannot be sustained without *in-situ* conservation of inter and intra-specific diversity. *In-situ* conservation measures on their own, however, will not be fruitful if the germplasm being conserved *in-situ* is not utilized by community gardens, home gardens and cultivation programs.

Because of the large geographical scale on which these four measures are to be implemented in order to be effective, they will not succeed or sustain without active public support. These measures cannot be sustained by government action alone.

Conclusions and recommendations

It is important for policy makers to view planning for the development of the herbal sector in a holistic manner. It should be borne in mind that conservation strategies for medicinal plants are as important as cultivation strategies. Policies to regulate prices and wild harvest of plants from wild are as important as cultivation initiatives. Low risk area approaches for cultication is an important strategy for benefiting thousands of small and medium farmers are as important, as encouragement to specialized high-tech and large plantation programmes. Development of community enterprises can create large scale employment and this strategy is as important as the promotion of large scale private enterprises and export promotion.

SUMMARY

Indigenous Systems of Medicine like Ayurveda, Siddha, Unani and Swarigpa have their separate codes of medicine and their practitioners use medicinal plants in their own way. Besides, there are traditional women, elders who also possess knowledge of medicinal plants and use them as remedies and health aids in areas from high Himalayas in the North to Kanyakumari in the South. Regional studies and checklists are available but these have not been, in all cases, correlated to modern systems based on chemistry and pharmacology. It has been estimated that about 1,800 species are fully documented for biological properties, which are mainly obtained from tropical and various types of forests. Of the 386 families and 2,200 genera, 10 families provide the larger share and the highest number of species falls under Asteraceae. About one-third of these are trees, shrubs, and herbs, respectively. Threat assessment has indicated that about 200 species are rare, endangered or threatened. Conservation and cultivation strategies have been suggested and a holistic approach recommended because cultivation alone cannot prevent extinction. *In-situ* conservation of wild population, establishment of taluka-level herbal gardens, thousands of home gardens and large scale cultivation of selected cultivators are the four important measures, which are likely to effect conservation and reduce threat, at present facing them due to over-exploitation as well as their destructive utilization, as roots barks, whole plants etc. in these systems.

भारतीय औषध–पादपों के प्रबन्ध के लिए संतुलित परिदृष्टि

दर्शन शंकर व डी०के० वेद

सारांश

औषधियों की देशी प्रणालियों जैसे आयुर्वेद, सिद्ध, यूनानी और स्वञ्ज्ञग्या की अपनी-अपनी पृथक संहिताएं हैं और उनके व्यवहारकर्ता अपने-अपने ढंग से औषधियां उपयोग में लाते हैं । उनके अतिरिक्त पारम्परिक व्यवसाय करने वाली स्त्रियां और बड़े-बूढे हैं जिन्हें औषध-पादपों का ज्ञान है और वे उच्च हिमालयी प्रदेश से लगाकर दक्षिण में कन्याकुमारी तक फैले भूभाग में रोगोपचार और स्वास्थ्य साधन के लिए उनका उपयोग करते हैं । क्षेत्रीय अध्ययन और औषध सूचियां मिलती हैं किन्तु, सभी जगह इन्हें रसायन शास्त्र और भैषज्य निर्माण पर आधारित आधुनिक चिकित्सा-प्रणाली से सहसम्बद्ध किया हुआ नहीं है । अनुमान लगाया गया है कि लगभग 1800 पादप-जातियां पूरी तरह उनकी जैविकीय विशेषताएं बताते हुए प्रलेखित की हुई हैं जिन्हें प्रधान्तः उष्णदेशीय और अन्य वन प्ररूपों से प्राप्त किया जाता है । 386 कुलों और 2200 प्रजातियों में आने वाली औषधियों का बड़ा भाग दस कुलो से ही प्राप्त होता है और उनमें भी सर्वाधिक संख्या तारक या एस्टरेसी कुल के अन्तर्गत आती है । इन औषधियों में लगभग एक तिहाई वृक्ष, एक तिहाई क्षुप और एक तिहाई शाक हैं । विलुप्ति खतरे के आकलन से पता लगा कि करीबन 200 पादप जातियां दुर्लभ, संकटापन्न या संकट में पड़ने के कगार पर आ चुकी हैं । इनके संरक्षण और कृषि की समरनीतियां सुझाई गई है और ऐसा करने में समग्र दृष्टि अपनाना अभिस्तावित किया गया है । जंगली पेड़ पौधों का उनके स्वभावतः मिलने वाले क्षेत्रों में संरक्षण तालुका स्तर पर औषध शाक उद्यानों की स्थापना, हजारों की संख्या में घरेलू बगानों की स्थापना और कुछ चुने हुए कृषिकृत विभेदों को बड़े परिमाण पर खेती कराना ऐसे चार प्रकार के महत्वपूर्ण उपाय बताए गए है जिनसे यह संभावना दिखाई पड़ती है कि औषध पादपों का संरक्षण होगा और विलुप्ति खतरा घटेगा जो इस समय उनके सिर पर टंगा है जिसका कारण उनका अति-समुपयोजन और उसके साथ-साथ उनका विनाशी उपयोग, जो जड़ों, छालों, पूरे के पूरे पादपों के रूप में, इन चिकित्सा प्रणालियों में किया जाता है, दोनों ही हैं ।