

## ***Ex-situ* Conservation of Indigenous, Threatened and Ethno-Medicinal Diversity of Forest Species**

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### **Abstract**

*Madhya Pradesh is rich in plant wealth and endemic flora. As a part of conservation programme, institute has established an arboretum-cum-botanic garden in 1976, covering an area of 7.34 ha. The garden complex includes various sections situated in the campus and nursery. The main forest botanic garden is situated in 4.25 ha area and houses a wide array of forest flora including trees, shrubs, climbers and herbal plant species in various sections. Of the total species planted, over 50% were threatened and ascribed with conservation value. The garden was of scientific and educational utility. The institute provides diploma and degree courses in collaboration with Universities and colleges. The institute forest botanic garden has been registered under the network of Indian Botanic Gardens in 2005. It was one among the 140 Botanic gardens of India registered by Botanic Garden Conservation International under BGCI-Investing in Nature-India programme. Detailed online information was available on the IBGN website (<http://www.ibgn.org>). SFRI-BG is unique in terms of its scientific arrangement of plants. The species wise conservation status and uses pertaining to ethnic, medicinal and economic importance were described here.*

**Keywords:** Plant diversity, ethno-medicinal plants, conservation, threatened plants.

### **1. Introduction**

The definition of botanic garden as presented in the international agenda for botanic garden conservation is an institution “holding documented collection of plants for the purposes of scientific research, conservation, display and education”.

Convention on Biological Diversity (CBD), particularly the target on *ex-situ* conservation and National Plant Programme, has given impetus on conservation of threatened plants in forest botanic gardens. The National level programmes also emphasized on (I) promoting conservation activities at local and regional levels, (II) setting conservation priorities, (III) deciding conservation targets and appropriate strategies and, (IV) facilitating effective collaboration and co-ordination through Botanic Garden Network.

Madhya Pradesh is rich in plant wealth and Botanical Survey of India has documented about 2500 species of angiosperms in the Flora of state of Madhya Pradesh in India. A number of endemic, rare and indigenous species of angiosperms and their habitats were under various degrees of threat and there was a need to conserve and multiply in special habitats, particularly in forest botanic gardens.

As State Forest Research Institute, Jabalpur (M.P.) India, established an arboretum in 1976 covering an area of 7.34 ha. It harbors 225 species including endangered trees, many herbs, shrubs and climbers of medicinal and ethno-botanical importance. Conservation of RET plants of M.P is in progress in a phased manner. Attempts were made to forest herbarium of the institute that has holdings of more than 30,000 plant specimens arranged according to the Bentham & Hooker classification system. The institute has been engaged

in inventorization, identification and conservation of plant diversity of forests of Madhya Pradesh. The present communication enumerates the plant wealth of Madhya Pradesh conserved in the forest botanic garden of the institute for education, conservation and authentic identification of species.

## 2. Materials and Methods

The total area of the botanical complex includes various sections. The break-up was as under:

1. The main forest botanic garden section-It is spread in 4.25 ha area with different sections such as (a) Arboratum, (b) Shrubbery section, (c) Exotic section, (d) Experimental area (e) Tissue culture plantation and (f) Pinetum.
2. Eucalyptorium - 2.0 ha situated in the campus.
3. Medicinal plant section - 0.19 ha.
4. Bamboosetum - 0.05 ha situated in the nursery.
5. Climbetorium - 0.04 ha situated in the nursery
6. Fruit Orchards- 0.81 ha, situated in the campus

The garden has the following infrastructure:

The main forest botanic garden of the institute has barbed wire-cum-wire mesh fencing of 2 m height; newly constructed paver road covering a length of 1000 running meter; a tube well, one overhead syntax tank of 5000 litres capacity with network of micro-irrigation; a green house erected in an area of 560 sq m; a display room in the garden; two entry gates; three water ponds having aquatic plants.

Each tree species has four individuals of plants planted at a spacing of 4x4 m. It, thus, serves the purpose of education and conservation. Besides the arboretum, the garden has tissue culture raised plantations of *Shorea robusta*, *Acacia catechu*, *Tectona grandis*, *Azadirachta indica* and *Dalbergia sissoo*. The ethno-medicinal plants of herbaceous and shrubby nature were planted in the under canopy of tree species. This would be very purposeful for ground floor management of degraded natural ecosystem and valuable for livelihood security. The present paper deals with the enrichment of garden with forest flora of Madhya Pradesh including: Rare, endangered, threatened, ethno-medicinal and endemic plants, mass production of threatened plants species under species recovery programme, and educational program for biodiversity conservation.

## 3. Results

The inventory of plants conserved in different sections, along with their habit, family and conservation value was given in table 1.

**Table 1. List of Forestry Species Including Indigenous and Threatened Wild Plants Conserved in Forest Botanic Garden**

S. No.	Botanical Name	Local Name	Habit	Family	Conservation Value
1.	* <i>Abroma augusta</i> L.	Ulatkambal	S/ST	Sterculiaceae	VU regionally
2.	<i>Alectra chitrakutensis</i> (Rau) Prasad & Dixit	Midaki	Root parasite	Scrophulariaceae	Critically endangered
3.	<i>Acacia auriculiformis</i> A. Cunn.ex. Benth.	Wattle Tree	MT	Mimosaceae	-
4.	<i>A. catechu</i> (L.f.) Willd.	Khair	ST	Mimosaceae	-
5.	* <i>A. concinna</i> (Willd.) DC.	Shikakai	C	Mimosaceae	VU regionally
6.	<i>A. leucophloea</i> (Roxb.) Willd.	Safed Kiker	MT	Mimosaceae	-

S. No.	Botanical Name	Local Name	Habit	Family	Conservation Value
7.	<i>A. nilotica</i> (L.) Willd. ex Del.	Babool	MT	Mimosaceae	-
8.	<i>Acalypha marginata</i> Spreng	Cheeku	S	Euphorbiaceae	-
9.	<i>Acrocarpus fraxinifolius</i> Wight & Arn.	Manadari	MT	Moraceae	-
10.	* <i>Adansonia digitata</i> L.	Gorakh Imli, Khursani Imli	T	Bombacaceae	Rare and Endangered regionally
11.	* <i>Aegle marmelos</i> (L.) Correa	Bel	ST	Rutaceae	NMPB Priority List, Threatened regionally
12.	<i>Ailanthus excelsa</i> Roxb.	Maharukh	T	Simaroubaceae	-
13.	* <i>Alangium salvifolium</i> (Linn.f.) Wang	Akol	S/ST	Alangiaceae	VU regionally
14.	<i>Albizia procera</i> (Roxb.) Benth.	Safed Siras	T	Mimosaceae	-
15.	<i>A. lebbeck</i> (L.) Benth.	Kala Siras	T	Mimosaceae	-
16.	<i>A. amara</i> (Roxb.) Boiv	Seljhari	T	Mimosaceae	-
17.	<i>Alstonia scholaris</i> R.Br.	Champa/Chatwan	T	Apocynaceae	-
18.	* <i>Anacardium occidentale</i> L.	Kaju	ST	Anacardiaceae	Narrow distribution
19.	* <i>Anogeissus latifolia</i> (Roxb. ex DC.) Wall.	Dhawa	MT	Combretaceae	VU regionally
20.	* <i>A. pendula</i> Edgew.	Kardhai	MT	Combretaceae	Lesser known tree species for Central plateau and hill regions, Upper Gangatic plains, Trans-Gangatic plains (CAMP)
21.	* <i>Annona reticulata</i> L.	Ramphal	ST	Annonaceae	Narrow distribution in natural forests
22.	* <i>A. squamosa</i> L.	Sitaphal	ST	Annonaceae	Narrow distribution in natural forests
23.	<i>Anthocephalus chinensis</i> (Lamk.) A. Rich. ex. Wale	Kadamba	T	Rubiaceae	-
24.	<i>Argyrea nervosa</i> (Burm.f.) Boj.	Vidhara	C	Convolvulaceae	-
25.	<i>Artocarpus heterophyllus</i> Lam.	Kathal	T	Moraceae	-
26.	<i>Azadirachta indica</i> A. Juss.	Neem	T	Meliaceae	-
27.	<i>Bambusa arundinacea</i> Willd.	Katang bans	B	Poaceae	-
28.	<i>B. multiplex</i>	Pani bans	B	Poaceae	-
29.	<i>B. nutans</i> Wall. ex Munro	Nutan bans	B	Poaceae	-

S. No.	Botanical Name	Local Name	Habit	Family	Conservation Value
30.	<i>B. tulda</i> Roxb.	Yellow bamboos, Sar bans	B	Poaceae	Sporadic
31.	<i>B. vulgaris</i> Schrader.	Green Bans (Sunder kanya)	B	Poaceae	Sporadic
32.	<i>Bauhinia racemosa</i> Lamk.	Asta	ST	Caesalpiniaceae	-
33.	<i>Bauhinia variegata</i> L.	Kachnar	ST	Caesalpiniaceae	-
34.	<i>Bixa orellana</i> L.	Sinduri	ST	Bixiaceae	-
35.	<i>Bombax ceiba</i> L.	Semal	T	Bombacaceae	-
36.	* <i>Boswellia serrata</i> Roxb. ex Colebr.	Salai	T	Burseraceae	VU regionally
37.	<i>Bridelia retusa</i> (L.) Spreng.	Kasai	T	Euphorbiaceae	-
38.	* <i>Buchanania lanzan</i> Spreng.	Achar	ST	Anacardiaceae	VU regionally
39.	<i>Butea monosperma</i> (Lam.) Taub. var. <i>butea</i> (Witt) Maheshwari	Red Palas	MT	Papilionaceae	-
40.	* <i>B. monosperma</i> (Lam) Kuntz. var. <i>lutea</i>	Yellow Palas	MT	Papilionaceae	Rare
41.	<i>B. superba</i> Roxb.	Palas Bel	C	Papilionaceae	-
42.	<i>Callistemon citrinus</i> (Curt.) Skeels	Bottle Brush	ST	Myrtaceae	-
43.	* <i>Careya arborea</i> Roxb.	Kumbhi	MT	Myrtaceae	VU regionally
44.	<i>Cassia fistula</i> L.	Amaltas	ST	Caesalpiniaceae	-
45.	<i>C. siamea</i> Lam.	Kassondan	MT	Caesalpiniaceae	-
46.	* <i>Cedrela toona</i> Roxb. ex Rottl.	Toona	T	Meliaceae	Narrow distribution
47.	<i>Cephalostachyum pergracile</i> Munro	Pani Bans, Mal bans, Pitha Bans	B	Poaceae	-
48.	<i>Ceropegia bulbosa</i> Roxb.	Mirchi dhudde	Herbaceous climber	Asclepiadaceae	Rare
49.	<i>C. macrantha</i> Wight.	-	Herbaceous climber	Asclepiadaceae	Rare
50.	<i>Chloroxylon swietenia</i> DC.	Bhirra	ST	Meliaceae	VU (IUCN, ver. 2.3, 1994)
51.	<i>Citrus limon</i> (L.) Burm.f.	Neebu	S/STT	Rutaceae	-
52.	<i>Cleistanthus collinus</i> (Roxb.) Benth. ex Hook.	Garari	MT	Euphorbiaceae	VU (IUCN Red List ver. 2.3, 1994)
53.	<i>Commiphora wightii</i> (Arn.) Bhandari	Guggal	S	Burseraceae	Endangered
54.	* <i>Cordia dichotoma</i> G. Forster	Lasora	ST	Boraginaceae	LKTS (4,5,7,10,12,13 agro climatic zones** of India)
55.	<i>Crateva magna</i> (Lour.) DC.	Varun		Capparidaceae	Rare
56.	<i>Dalbergia sissoo</i> Roxb.	Sisoo	MT	Fabaceae	-

S. No.	Botanical Name	Local Name	Habit	Family	Conservation Value
57.	<i>*D. latifolia</i> Roxb.	Sisham	MT	Fabaceae	E (IUCN Red List ver. 2.3, 1994)
58.	<i>Delonix regia</i> (Bojer ex. Hook.) Raf.	Gulmohar	ST	Caesalpiniaceae	-
59.	<i>D. giganteus</i> Wallich ex Munro	Giant bamboo	B	Poaceae	-
60.	<i>D. longispathus</i> (Kurz) Kurz.	Bander bans	B	Poaceae	-
61.	<i>D. membranaceus</i> Munro.	Timi Bans	B	Poaceae	-
62.	<i>D. strictus</i> (Roxb.) Nees	Bans	B	Poaceae	-
63.	<i>*Dillenia indica</i> L.	Elephant apple	ST	Dilleniaceae	Narrow distribution and small population
64.	<i>*D. pentagyna</i> Roxb.	Kalla	MT	Dilleniaceae	LKTS (2,3,7,9,10,12 agro climatic zones of India)
65.	<i>Dioscorea alata</i> L.	Yam	Tubers	Dioscoriaceae	Rare
66.	<i>D. tomentosa</i> Koenig ex. Spreng	Pindi	Tubers	Dioscoriaceae	Rare
67.	<i>D. wallichii</i> Hook.f.	Yam	Tubers	Dioscoriaceae	Rare
68.	<i>Diospyros melanoxylon</i> Roxb.	Tendu	ST	Ebenaceae	-
69.	<i>*Drypetes roxburghii</i> (Wallich) Hurusawa	Putranjiva	ST	Euphorbiaceae	LKTS
70.	<i>*Emblica officinalis</i> Gaertn.	Aonla	ST/MT	Euphorbiaceae	NMPB Priority List
71.	<i>*Feronia limonia</i> (L.) Swingle	Kaitha	T	Rutaceae	DD
72.	<i>Ficus benghalensis</i> L.	Bad	T	Moraceae	-
73.	<i>*F. benjamina</i> auct. non L.	Paras pipal	ST/MT	Moraceae	Rare
74.	<i>F. cupulata</i> Haines	Chhota Bar	T	Moraceae	Endemic & rare
75.	<i>*F. glomerata</i> Roxb.	Gular	MT/T	Moraceae	Rare
76.	<i>*Ficus benghalensis</i> L. var. <i>krishnae</i> C. DC.	Makhan Katori	MT	Moraceae	Rare
77.	<i>*F. microcarpa</i> L. f.	-	ST/MT	Moraceae	Rare
78.	<i>*F. religiosa</i> L.	Pipal	T	Moraceae	VU regionally
79.	<i>*Flacourtia indica</i> (Burm. f.) Merr.	Kakai	ST	Flacourtiaceae	LKTS (1,2,3,9,7,10,12 agro climatic zones of India)
80.	<i>Flemingia paniculata</i> Wall. ex. Benth.	-	Shrub	Fabaceae	Rare
81.	<i>F. stricta</i> subsp. <i>pteropus</i> Roxb.	-	Shrub	Fabaceae	Rare
82.	<i>*Gardenia latifolia</i> Ait.	Papda	ST	Rubiaceae	VU regionally
83.	<i>*Gardenia resinifera</i> Roth.	Dikamali	S/ST	Rubiaceae	DD
84.	<i>*Garuga pinnata</i> Roxb.	Kekad	MT	Burseraceae	DD
85.	<i>Gigantochloa rostrata</i> Wong	Pani Bans	B	Poaceae	Sporadic

S. No.	Botanical Name	Local Name	Habit	Family	Conservation Value
86.	<i>Gliricidia sepium</i> (Jacq.) Kunth ex Walp.	Spotted Gliricidia	ST	Fabaceae	-
87.	<i>Gmelina arborea</i> Roxb.	Khamer	MT/T	Verbenaceae	-
88.	<i>Grevillea robusta</i> A. Cunn. ex R.Br.	Silver Oak	T	Proteaceae	-
89.	* <i>Grewia tiliaefolia</i> Vahl.	Daman	MT	Tiliaceae	LKTS (1,3,7,9,10,12 agro climatic zones of India)
90.	* <i>Haldina cordifolia</i> (Roxb.) Ridsdale Syn. <i>Adina cordifolia</i> (Roxb.) Benth. & Hk. f.ex. Brandis	Haldu	T	Rubiaceae	VU regionally
91.	* <i>Hardwickia binata</i> Roxb.	Anjan	T	Caesalpiniaceae	VU regionally
92.	* <i>Holarrhena pubescens</i> (buch-Ham.) Wall. ex. G. Don Syn. <i>Holarrhena</i> <i>antidysenterica</i> Wall. ex A.DC.	Kutaja, Dudhi	ST	Apocynaceae	VU regionally
93.	* <i>Holoptelea integrifolia</i> (Roxb.) Planch.	Chirol	T	Ulmaceae	LKTS (6,7,8,12 agro climatic zones of India)
94.	<i>Kydia calycina</i> Roxb.	Baranga		Malvaceae	-
95.	<i>Lagerstroemia parviflora</i> Roxb.	Landia	ST/MT	Lythraceae	-
96.	<i>L. speciosa</i> Auct.	Jharul	T	Lythraceae	-
97.	<i>Lannea coromandelica</i> (Houtt.) Merr.	Moyen	MT	Anacardiaceae	-
98.	* <i>Litsea glutinosa</i> (Lour.) Robinson	Maida lakari	ST/MT	Lauraceae	Endangered regionally
99.	* <i>Madhuca indica</i> J.F. Gmel. Syn. <i>M.latifolia</i> (Roxb.) Macbride	Mahua	T	Sapotaceae	DD
100.	<i>Mallotus philippensis</i> (Lam.) Muell. Arg.	Sinduri	ST	Euphorbiaceae	-
101.	* <i>Mangifera indica</i> L.	Aam	T	Anacardiaceae	DD ((IUCN,Red List ver. 2.3, 1994)
102.	<i>Manilkara hexandra</i> (Roxb.) Dub.	Khirni	ST	Sapotaceae	-
103.	<i>Melia azedarach</i> L.	Bakain	T	Meliaceae	-
104.	<i>Miliusa tomentosa</i> (Roxb) J. Sinclair	Kari	T	Annonaceae	-
105.	<i>Mimusops elengi</i> L.	Moulshree	ST	Sapotaceae	-
106.	<i>Morus alba</i> L.	Shahtoot	ST	Moraceae	-
107.	<i>Murraya koenigii</i> (L.) Spreng.	Meethi Neem	ST	Rutaceae	-
108.	<i>Nyctanthes arbor-tristis</i> L.	Harshingar	S	Oleaceae	-

S. No.	Botanical Name	Local Name	Habit	Family	Conservation Value
109.	<i>*Oroxylum indicum</i> (L.) Vent.	Shivnak, Jaimangal	ST	Bignoniaceae	Rare
110.	<i>Parkia biglandulosa</i> Wight & Arn.	Bobbed drumstick tree	T	Mimosaceae	-
111.	<i>Peltophorum pterocarpum</i> (DC.) Backer ex K. Heyne	Copper pod	T	Caesalpiniaceae	-
112.	<i>Pithecellobium dulce</i> (Roxb.) Benth.	Jungle Jalebi	ST	Mimosaceae	-
113.	<i>Plumeria alba</i> L.	Champa	ST	Apocynaceae	-
114.	<i>Polyalthia longifolia</i> (Sonn.) Thw	Ashok	MT	Annonaceae	-
115.	<i>Pongamia pinnata</i> (L.) Pierre	Karanj	MT	Papilionaceae	-
116.	<i>*Pterocarpus marsupium</i> Roxb.	Bija	T	Fabaceae	E (VU) (IUCN Red List ver. 2.3, 1994)
117.	<i>Pterospermum acerifolium</i> (L.) Willd.	Machkund	T	Sterculiaceae	-
118.	<i>Randia dumetorum</i> (Retz. ) Poir.	Manhar	ST	Rubiaceae	-
119.	<i>Radermachera xylocarpa</i> (Roxb.) K. Schum.	-	-	Sterculiaceae	-
120.	<i>*Santalum album</i> L.	Chandan	ST	Santalaceae	VU (IUCN Red List ver. 2.3, 1994)
121.	<i>Sapindus trifoliatus</i> L.	Ritha	T	Sapindaceae	-
122.	<i>Saraca asoca</i> (Roxb.) de Wilde Syn. <i>S. indica</i> auct. non L.	Sita Ashok	T	Caselpiniaceae	VU (IUCN Red List ver. 2.3, 1994)
123.	<i>*Schleichera oleosa</i> (Lour.) Oken.	Kosum	MT	Sapindaceae	VU regionally
124.	<i>*Semecarpus anacardium</i> Hassk.	Bhilwa	MT	Anacardiaceae	VU regionally
125.	<i>*Soyimida febrifuga</i> (Roxb.) A. Juss.	Rohan	MT	Meliaceae	VU regionally
126.	<i>Sterculia foetida</i> L.	JangliBadam	T	Sterculiaceae	-
127.	<i>*S. urens</i> Roxb.	Kullu	T	Sterculiaceae	VU regionally
128.	<i>*Stereospermum chelonoides</i> (Linn. f.) DC.; <i>Stereospermum suaveolens</i> (Roxb.) DC.	Padar, Padari	MT	Bignoniaceae	Rare
129.	<i>*Strychnos nuxvomica</i> L.	Kuchla	MT/T	Loganiaceae	Rare
130.	<i>Syzygium cumini</i> (L.) Skeels.	Jamun	T	Myrtaceae	-
131.	<i>Tamarindus indica</i> L.	Imli	T	Caesalpiniaceae	-
132.	<i>Tectona grandis</i> L.f.	Sagon	T	Verbenaceae	-
133.	<i>T. hamiltoniana</i> Wall.	Sagon	T	Verbenaceae	Rare
134.	<i>*Terminalia arjuna</i> Bedd. (Roxb. ex DC.) Wight & Arn.	Koha	T	Combretaceae	LKTS CAMP)

S. No.	Botanical Name	Local Name	Habit	Family	Conservation Value
135.	* <i>Terminalia bellirica</i> (Gaertn.) Roxb.	Baheda	T	Combretaceae	VU regionally
136.	* <i>T. chebula</i> Retz.	Harra	ST/MT	Combretaceae	VU regionally
137.	* <i>T. tomentosa</i> (Roxb. ex DC.) Wight & Arn.	Saja	T	Combretaceae	VU regionally
138.	* <i>Thespesia populnea</i> (L.) Soland. ex Correa	Paras Pipal	ST	Malvaceae	Rare
139.	* <i>Wrightia tinctoria</i> R.Br.	Dhudhi	ST	Apocynaceae	VU regionally
140.	<i>Ziziphus mauritiana</i> Lam. Syn. <i>Zizyphus jujuba</i> Lamk. non Mill.	Ber	S/ST	Rhamnaceae	-
141.	<i>Z. nummularia</i> (Burm.f.) Wight & Arn.	Jhar Beri	S/ST	Rhamnaceae	-
142.	<i>Z. xylopyra</i> Willd.	Ghont	ST	Rhamnaceae	-

**Note:** 1. Abbreviations used: S: Shrub, T: Tree, ST: Small Tree, MT: Middle Tree, B: Bamboo, C: Climber, VU: Vulnerable, E: Endangered, DD: Data Deficient, LKTS: Lesser Known Tree Species, CAMP: Conservation Assessment and Management Plan; and 2. \* Regionally threatened wild species in Madhya Pradesh based on one or other criterion such as population reduction of mature individuals, extent of occurrence (EOO), poor regeneration, unscientific and destructive collection of forest produce.

A model of ethno-medicinal garden was created at State Forest Research Institute, Jabalpur (M.P.) India. Different thematic sections for different ailments were created in the garden. Documentation of ethno-medicinal knowledge from different areas of Madhya Pradesh (India) was done. The creation of thematic garden of ethno-medicinal value was of great importance to promote conservation activities under the thematic programme of Convention of Biological Diversity (CBD) particularly target 8 (i) of the convention. Plants of ethno-medicinal, economic and aromatic importance were conserved in 19 ethno-pharmacological sections. Annual herbs conserved in containers, while perennials and shrubs introduced in beds of size 4x4 m. Shrubs planted at 1m intervals in beds, while perennial herbs planted at a distance of 50x50 cm. In all, about 103 species of different ethno-medicinal, economic and aromatic value were conserved in different sections as detailed below in table-2:

**Table 2. Ethno-medicinal Plants Conserved in Different Thematic Sections of Forest Botanic Garden**

S.N.	Species	Part used
<b>1. Anti hepatotoxic section</b>		
1.	<i>Clerodendrum indicum</i> (L.) Kuntze	Decoction of leaves/roots
2.	<i>Aloe vera</i> L.	Leaf pulp
3.	<i>Acorus calamus</i> Linn	Root
4.	<i>Clitoria ternatea</i> L.	Leaves, roots
5.	<i>Cordia dichotoma</i> G.Forster	Fruit
6.	<i>Glycyrrhiza glabra</i> Linn.	Root powder
7.	<i>Plumbago zeylanica</i> Linn.	Root ,whole plant
8.	<i>Bryophyllum pinnatum</i> K.	Leaf
9.	<i>Ocimum americanum</i> L.	Whole plant
10.	<i>Coleus forskohlii</i> Briq.	Root
11.	<i>Bixa orellana</i> L.	Decoction of leaf , root
12.	<i>Zingiber officinale</i> L.	Rhizome
13.	<i>Argyreia nervosa</i> (Burm. f.) Boj.	Leaf, root



S.N.	Species	Part used
14.	<i>Mimosa pudica</i> L.	Leaf extract
15.	<i>Acacia concinna</i> (Willd.) DC.	Root, seed
16.	<i>Piper longum</i> L.	Seed, fruit
<b>2. Dental and mouth diseases</b>		
17.	<i>Adhatoda vasica</i> Nees.	Leaf
18.	<i>Spilanthes acmella</i> DC.	Fruits
19.	<i>Barleria prionites</i> L.	Leaves , stem, flower
20.	<i>Achyranthes aspera</i> L.	Leaf
21.	<i>Eclipta alba</i> Hassk.	Leaf
22.	<i>Cinnamomum zeylanicum</i> Blume	Oil
23.	<i>Woodfordia fruticosa</i> (L.) Kurz	Leaves and flowers
24.	<i>Terminalia bellirica</i> (Gaertner) Roxb.	Fruit
25.	<i>Vitex negundo</i> L.	Oil
26.	<i>Piper longum</i> L.	Fruit powder
27.	<i>Boerhavia diffusa</i> L.	Root paste
28.	<i>Anacyclus pyrethrum</i> (L.) Link	Root
29.	<i>Azadirachta indica</i> A. juss	Root, stem
30.	<i>Glycyrrhiza glabra</i> L.	Fruit
<b>3. Anti diabetic section</b>		
31.	<i>Gymnema sylvestre</i> (Retz.) R. Br. ex Schult.	Whole plant
32.	<i>Acorus calamus</i> L.	Root
33.	<i>Murraya koenigii</i> (L.) Sprengel	Leaves
34.	<i>Alangium salvifolium</i> Linn.	Root
35.	<i>Tinospora cordifolia</i> (Willd.) Miers.	Root
36.	<i>Mimosa pudica</i> L.	Root
37.	<i>Woodfordia fruticosa</i> (L.) Kurz	Flower, leaf
38.	<i>Phyllanthus amarus</i> Schumach. & Thonn.	Whole plant
39.	<i>Caesalpinia bonduc</i> (Linn.) Roxb.	Root
40.	<i>Azadirachta indica</i> A. juss	Leaves bark
41.	<i>Pterocarpus marsupium</i> Roxb.	Wood
42.	<i>Syzygium cumini</i> (L.) Skeels	Fruit
<b>4. Anti dysenteric section</b>		
43.	<i>Holarrhena pubescens</i> Wall. ex Don	Seed
44.	<i>Wrightia tinctoria</i> R. Br.	Seed, gum
45.	<i>Helicteres isora</i> Linn.	Fruit
46.	<i>Abrus precatorius</i> Linn.	Whole plant
47.	<i>Spilanthes acmella</i> Murr.	Fruit, seed
48.	<i>Tephrosia purpurea</i> (L.) Pers.	Whole plant
49.	<i>Punica granatum</i> L.	Fruit
50.	<i>Syzygium cumini</i> (L.) Skeels	Fruit
51.	<i>Mimosa pudica</i> L.	Root
52.	<i>Oroxylum indicum</i> (L.) Vent.	Root bark
53.	<i>Grewia hirsuta</i> Vahl. A	Root
54.	<i>Strychnos potatorum</i> Linn	Seed
55.	<i>Litsea glutinosa</i> (Lour.) C.B.	Stem bark
56.	<i>Celastrus paniculatus</i> Willd. subsp.	Seed oil
<b>5. Anti rheumatic section</b>		
57.	<i>Plumbago Zeylanica</i> L.	Whole plant
58.	<i>Withania somnifera</i> (L.) Dunal.	Leaf, tuber
59.	<i>Nyctanthes arbor-tristis</i> Linn.	Leaf decoction
60.	<i>Datura metel</i> L.	Seed, root
61.	<i>Commiphora wightii</i> (Arnott) Bhandari.	latex
62.	<i>Costus speciosus</i> (Koenig) Sm.	Rhizome
63.	<i>Curcuma angustifolia</i> Roxb.	Rhizome
64.	<i>Embelia ribes</i> Burm. f.	Seeds

S.N.	Species	Part used
65.	<i>Dioscorea hispida</i> Dennst.	Rhizome
66.	<i>Curcuma longa</i> L.	Rhizome
67.	<i>Oroxylum indicum</i> (L.) Benth. ex Kurz	Stem bark
68.	<i>Pueraria tuberosa</i> (Roxb.ex.Willd.) DC	Tuber
69.	<i>Tinospora cordifolia</i> (Willd.) Miers	Whole plant
70.	<i>Rauvolfia serpentina</i> (L.) Benth. ex Kurz	Whole plant
71.	<i>Vitex negundo</i> Linn.	Leaves
72.	<i>Grewia subinaequalis</i> DC.	Root bark
<b>6. Emmenagogue section</b>		
73.	<i>Barleria prionitis</i> L.	Whole plant
74.	<i>Datura metel</i> L.	Whole plant
75.	<i>Withania somnifera</i> (L.) Dunal.	Whole plant
76.	<i>Boerhavia diffusa</i> L.	Root
77.	<i>Abrus precatorius</i> Linn.	Whole plant
78.	<i>Tinospora cordifolia</i> (Willd.) Miers.	Whole plant
<b>7. Diuretic section</b>		
79.	<i>Bacopa monnieri</i> (L.) Wettst.	Whole plant
80.	<i>Moringa oleifera</i> Lam.	Pod, leaves
81.	<i>Cissampelos pareira</i> Linn.	Whole plant
82.	<i>Embelia ribes</i> Burm.f.	Seed
83.	<i>Stevia rebaudiana</i> (Bertoni) Bertoni	Leaves
84.	<i>Achyranthes aspera</i> L. var.	Whole plant
<b>8. Febrifuge section</b>		
85.	<i>Caesalpinia bonduc</i> (Linn.) Roxb.	Whole plant
86.	<i>Andrographis paniculata</i> (Burn.f.) Wallich ex Nees	Whole plant
87.	<i>Gymnema sylvestre</i> R. Br. Gymnema	Whole plant
88.	<i>Cissampelos pareira</i> Linn.	Whole plant
89.	<i>Uraria picta</i> (Jacq.) DC.	Root
90.	<i>Holarrhena pubescens</i> Wall. ex G.Don	Bark
<b>9. Expectorant section</b>		
91.	<i>Adhatoda vasica</i> Nees	Leaves, root, flower
92.	<i>Eclipta alba</i> Hassk.	Whole plant
93.	<i>Hemidesmus indicus</i> R.Br.	Root
94.	<i>Bryophyllum pinnatum</i> (Lam.) Oken	Leaves
95.	<i>Crocus sativus</i> L	Flower
96.	<i>Operculina turpethum</i> (L.) S. Manso	Whole plant
<b>10. Skin section</b>		
98.	<i>Psoralea corylifolia</i> L.	Oil
99.	<i>Plumbago zeylanica</i> L.	Root
100.	<i>Aloe vera</i> L.	Pulp
101.	<i>Embelia ribes</i> Burm.f.	Whole plant
102.	<i>Vetiveria zizanooides</i> L. Nash,	Oil
103.	<i>Acacia catechu</i> (L. f.) Willd.	Heart wood
104.	<i>Elaeocarpus ganitrus</i> Roxb	Seed flesh
<b>11. Eye section</b>		
105.	<i>Hedychium coronarium</i> J. Koenig	Flower
106.	<i>Strychnos potatorum</i> Linn.	Seed
<b>12. Heart section</b>		
107.	<i>Terminalia arjuna</i> (Roxb.) Wight & Arn.	Stem bark
108.	<i>Rauvolfia serpentina</i> (L.) Benth. ex Kurz	Whole plant
109.	<i>Ocimum sanctum</i> Linn	Whole plant
<b>13. Cancer section</b>		
110.	<i>Cissampelos pareira</i> Linn.	Whole plant
111.	<i>Gloriosa superba</i> L.	Rhizome

S.N.	Species	Part used
112.	<i>Aristolochia indica</i> L. var. <i>indica</i>	Root
113.	<i>Tinospora cordifolia</i> (Willd.) Miers.	Plant extract
<b>14. Anti stress section</b>		
114.	<i>Centella asiatica</i> (L.) Urb.	Whole plant
115.	<i>Bacopa monnieri</i> (L.) Wettst.	Whole plant
<b>15. Immunostimulants section</b>		
116.	<i>Marsdenia tenacissima</i> (ROXB.) WIGHT	Whole plant
117.	<i>Dioscorea hispida</i> Dennst.	Whole plant
118.	<i>Costus speciosus</i> (J. Koenig) Sm.	Whole plant
119.	<i>Withania somnifera</i> (L.) Dunal.	Root
<b>16. Aphrodisiac section</b>		
120.	<i>Withania somnifera</i> (L.) Dunal.	Whole plant
121.	<i>Chlorophytum tuberosum</i> (Roxb.) Bak.	Tuber
122.	<i>Crocus sativus</i> L.	Flower
123.	<i>Sida cordifolia</i> L.	Whole plant
124.	<i>Curculigo orchioides</i> Gaertn.	Tuber
125.	<i>Bombax ceiba</i> L.	Root
126.	<i>Protasparagus racemosus</i> (Willd.) Oberm.	Tuber
127.	<i>Nerium indicum</i> Mill.	Root, flower
128.	<i>Chrysanthemum indicum</i> L.	Flower
<b>17. Aromatic section</b>		
129.	<i>Lavandula bipinnata</i> (Roth) Kuntze	Whole plant
130.	<i>Cymbopogon flexuosus</i> (Nees ex Steud.) Wats.	Whole plant
131.	<i>Cymbopogon martinii</i> var. <i>motia</i>	Whole plant
132.	<i>Vetiveria zizanioides</i> (L.)	Root
133.	<i>Pandanus odoratissimus</i> Linn.	Root
134.	<i>Piper longum</i> L.	Fruit
135.	<i>Artemisia vulgaris</i> (LINN.)	Leaf root
136.	<i>Geranium arboreum</i> A. Gray	Whole plant
137.	<i>Mentha piperita</i> L.	Whole plant
<b>18. Palm section</b>		
138.	<i>Areca paretis</i> Becc.	Fruit
139.	<i>Trachycarpus fortunei</i> (Hook.) H. Wendl.	Fruit
140.	<i>Caryota mitis</i> Lour.	Latex
<b>19. Gymnosperm section</b>		
141.	<i>Cycas circinalis</i> L.	Starch
142.	<i>Juniperus communis</i> L.	Whole plant

Scientific communities, trainees from forest department, universities / colleges and other stake holders visited the garden throughout the year as the garden was meant for scientific and educational purposes. A number of university students completed their dissertation work for various degree courses. Besides, monographs of 14 threatened species and one technical illustrated bulletin on some ethnic plants in cure of various human diseases (Chaubey, 2011, 2012) were published to create conservation awareness and promote education for planting these species. Regular training programs on cultivation of medicinal plants were conducted in the institute to various stakeholders.

#### 4. Discussions

The forest botanic garden of State Forest Research Institute, Jabalpur (M.P.) India, was a representative of indigenous, rare, endangered and threatened flora, particularly of forest species of tropical zone of Madhya Pradesh, for better understanding of conservation status of wild forestry plants. This was important to promote research and education along

with a valuable asset for identification of plants of the state and to promote conservation awareness of the CBD among scientific community and other stakeholders. Some of the threatened and prioritized species conserved as per the standard of IUCN, National Red List, FRLHT, BSI, NMPB and ICFRE were listed below: *Abroma augusta* L., *Alectra chitrakutensis* (Rau) Prasad & Dixit, *Acacia concinna* (Willd.) DC., *Adensonia digitata* L., *Aegle marmelos* (L.) Correa, *Alangium salvifolium* (Linn.f.) Wang syn. *A. lamarkii* Thw., *Anacardium occidentale* L., *Anogeissus latifolia* (Roxb. ex DC.) Wall., *A.pendula* Edgew., *Anona reticulata* L., *A.squamosa* L., *Boswellia serrata* Roxb. ex Colebr., *Buchanania lanzan* Spreng., *Butea monosperma* (Lam.) Kuntz. var. *lutea*, *Careya arborea* Roxb., *Cedrela toona* Roxb. ex Rottl., *Ceropegia bulbosa* Roxb., *C.macrantha* Wight., *Chloroxylon swietenia* DC., *Cleistanthus collinus* (Roxb.) Benth. ex Hook., *Commiphora wightii* (Arn.) Bhandari, *Cordia dichotoma* G. Forster, *Crateva magna* (Lour.) DC, *Dalbergia latifolia* Roxb., *Dillenia indica* L., *D.pentagyna* Roxb., *Dioscorea alata* L., *D.tomentosa* Koenig ex Spreng, *D.wallichii* Hook.f., *Dryptetes roxburghii* (Wall.) Hurusawa Syn. *Putranjiva roxburghii* Wall., *Emblica officinalis* Gaertn., *Feronia limonia* (L.) Swingle, *Ficus benjamina* auct. non L., *F.cupulata* Haines, *F.glomerata* Roxb., *F.krishnae* C.DC., *F.microcarpa* L.f. Syn. *F. retusa* auct. non L., *Ficus religiosa* L., *Flacourtia indica* (Burm. f.) Merr., *Flemingia paniculata* Wall. ex Benth., *F.stricta* sub. *pteropus* Roxb., *Gardenia latifolia* Ait., *G.resinifera* Roth., *Garuga pinnata* Roxb., *Grewia tiliaefolia* Vahl., *Haldina cordifolia* (Roxb.) Ridsdde Syn. *Adina cordifolia* (Roxb.) Benth. & Hook. f. ex Brandis, *Hardwickia binata* Roxb., *Holarrhena pubescens* (Buch-Ham.) Wall. ex. G. Don Syn. *H.antidysenterica* Wall. ex A.DC., *Holoptelea integrifolia* (Roxb.) Planch., *Litsea glutinosa* (Lour.) Robinson, *Madhuca indica* J.F.Gmel. Syn. *M. latifolia* (Roxb.) Macbride, *Mangifera indica* L., *Oroxylum indicum* (L.) Vent., *Pterocarpus marsupium* Roxb., *Santalum album* L., *Saraca asoca* (Roxb.) de Wilde syn. *S. indica* auct. non L., *Schleichera oleosa* (Lour.) Oken., *Semecarpus anacardium* Hassk., *Soymida febrifuga* (Roxb.) A. Juss., *Sterculia urens* Roxb., *Stereospermum chelonoides* (L.f.)DC., *Stereospermum suaveolens* (Roxb.) DC., *Strychnos nux-vomica* L., *Tectona hamiltoniana* Wall., *Terminalia arjuna* Bedd. (Roxb. ex DC.) Wight & Arn., *T.belerica* (Gaertn.) Roxb., *T.chebula* Retz., *T.tomentosa* (Roxb. ex. DC. ) Wight & Arn. *Thespesia populnea* (L.) Soland. ex Correa, *Wrightia tinctoria* R.Br. Most of the species were also of medicinal and economic importance.

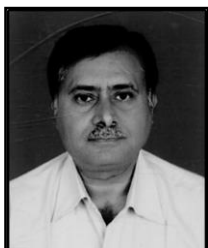
## 5. Conclusions

Herbaceous plants of ethno-medicinal, economic and aromatic importance were also planted in under canopy of tree species in the garden. The technology of ethno medicinal plants conserved in the under-canopy of tree species would be of practical importance for ground floor management of degraded forest ecosystems. The collection and conservation of forest flora particularly indigenous and RET species as found in forest botanic garden of the institute, was not appeared anywhere in the state.

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