

## PLANT RESOURCES OF WESTERN INDIA FOR THE PHARMACEUTICAL INDUSTRY

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The earliest record of medicinal utility of plants in India has been reported to be between 4,500 and 1,600 B. C. when the 'Rigveda' was written. Several other works of a little later period such as 'Susruta Samhita' and 'Charaka Samhita' describe a number of plants which were used in India in those days for medicinal purposes. With the spread of present civilization and development of mode of transport and communications, the knowledge of medicinal plants developed immensely. It is estimated that over fifteen hundred Indian plant species are put to some medicinal use or other. Most of these are, no doubt, of restricted occurrence and very restricted utility. A good number of them, however, are very widely distributed, very well known and very usefully utilized. About 90% of the ingredients of the prescriptions of Ayurvedic and Unani systems of medicines are based on plant products, the remaining 10% being minerals, or animal products.

In spite of this great usage of plants for medicinal purposes, researches on their authentic efficacy, dosage, and occurrence in India had been very restricted till the end of 19th century. In early years of the present century several research institutions and public bodies financed by Government or public grants engaged themselves in this study. In India, the contributions from the Tropical School of Indian Medicine, Calcutta, the Drug Research Laboratory, Jammu, and the various schemes financed by the Indian Council of Medical Research, Indian Council of Agricultural Research and the Council of Scientific and Industrial Research have been of fundamental importance. The establishment of several research institutions recently devoted chiefly or entirely to the indigenous drug plants is a significant step in mobilization of our efforts and resources in this direction. The Central Drug Research Institute, Lucknow, the Central Institute of Indigenous Systems of Medicine, Jamnagar and several new research schemes such as Central Indian Medicinal Plants Organisation, New Delhi, etc., will, in due course, enrich our knowledge of Indian medicinal plants.

Among the many very useful works on Indian medicinal plants, mention may be made here of

\*Now at the Central Botanical Laboratory, Allahabad, India.

only the following, which have been widely used as reference works on this subject :

Bal, 1932; Bose, 1902, 1932; Chopra, 1933; Dey, 1896; N. B., Dutt, 1928; U.C., Dutt, 1877; Dymock, et al. 1890—99; Kirtikar and Basu, 1935; Koman, 1920; Mukerjee, 1953; Nadkarni, 1927; Watts, 1889—96 and 1908. Several very useful papers have been published by Chopra, Mukerjee and their associates. Some work has been done on the medicinal plants of Western India also. For this a reference may be made to the works of Birdwood (1865), Indrajai Thakkar (1926) and recently Agharkar (1953) and Puri and Jain (1958).

In order to find out the more important medicinal plants in demand, a questionnaire was circulated by us to various Ayurvedic practitioners, drug dealers, rasayanshalas, directors of industry, drug manufacturers and cultivators in various states of Western India. The response to this questionnaire was quite satisfactory, and on the basis of the information obtained we have drawn the following list of species which are in more demand. Their approximate annual requirements in Western India has thus been estimated. This obviously is a very approximate estimate as information on total actual requirements would not have been communicated :—

TABLE 1.—LIST OF PLANTS WHOSE REQUIREMENT IS OVER 1000 LBS. PER YEAR.

<i>Acacia chundra</i>	<i>Cyperus rotundus</i>
<i>Adhatoda vasica</i>	<i>Desmodium gangeticum</i>
<i>Aegle marmelos</i>	<i>Eclipta prostrata</i>
<i>Aloe barbadensis</i>	<i>Eleitaria cardamomum</i>
<i>Asparagus racemosus</i>	<i>Embelia tsjarium-</i>
<i>Azadirachta indica</i>	<i>cottam</i>
<i>Bambusa arudinacea</i>	<i>Emblica officinalis</i>
<i>Berberis aristata</i>	<i>Fagonia cretica</i>
<i>Boerhaavia diffusa</i>	<i>Foeniculum vulgare</i>
<i>Cassia fistulsa</i>	<i>Garcinia indica</i>
<i>Cedrus deodara</i>	<i>Glycyrrhiza glabra</i>
<i>Centella asiatica</i>	<i>Gmelina arborea</i>
<i>Cinnamomum tamala</i>	<i>Hemidesmus indicus</i>
<i>Cinnamomum zeylanicum</i>	<i>Holarrhena antidysen-</i>
<i>Clerodendron phlomoidis</i>	<i>terica</i>
<i>Coriandrum sativum</i>	<i>Inula racemosa</i>
<i>Costus speciosus</i>	<i>Mesua ferrea</i>
<i>Curcuma longa</i>	<i>Operculina turpethum</i>

<i>Oroxylum indicum</i>	<i>Solanum xanthocarpum</i>
<i>Picrorhiza kurroo</i>	<i>Stereospermum</i>
<i>Piper longum</i>	<i>personatum</i>
<i>Piper nigrum</i>	<i>Swertia chirata</i>
<i>Plumbago zeylanica</i>	<i>Symplocos racemosa</i>
<i>Premna herbacea</i>	<i>Syzygium aromaticum</i>
<i>Petrocarpus santalinus</i>	<i>Terminalia arjuna</i>
<i>Punica granatum</i>	<i>Terminalia bellerica</i>
<i>Rhamnus wightii</i>	<i>Terminalia chebula</i>
<i>Ricinus communis</i>	<i>Tinospora cordifolia</i>
<i>Rosa centifolia</i>	<i>Tribulus terrestris</i>
<i>Rubia cordifolia</i>	<i>Uria lagopoides</i>
<i>Rumex vesicarius</i>	<i>Vanda roxburgii</i>
<i>Santalum album</i>	<i>Vetiveria zizanioides</i>
<i>Saraca indica</i>	<i>Withania somnifera</i>
<i>Solanum indicum</i>	<i>Woodfordia fruticosa</i>
	<i>Zingiber officinalis</i>

The problem of meeting this demand of drug plants could be approached from two ends—to collect the information on their occurrence in wild state in India and secondly to explore the possibilities of their large scale cultivation.

During the years 1956-1959 extensive survey tours were taken in all parts of Western India and information on wild occurrence of medicinal plants was obtained.

The Botanical Survey of India considered the utility of publishing a consolidated account of this survey of medicinal plants and a step in that line was taken when a list of important medicinal plants of Western India was drawn by Puri in 1957. This list was compiled from the available literature which is by no means exhaustive. The list has since been modified and expanded according to our field observations. The original list which gave the botanical name, local name and natural order, gives localities from where the species has been recently collected. Information in this list is now being amplified to include frequency of occurrence, flowering and fruiting time, important medicinal uses and references to important literature. This list is being published by the Botanical Survey of India in *Bull. Bot. Surv. India*.

Table 2 gives the above information on some more important medicinal plants of Western India.

As for the cultivation of medicinal plants, efforts were made to procure land for extension farms in a variety of habitats in the Western India, such as one in desert conditions, one on the Deccan plateau and one in high rainfall areas. The list of plants to be grown in these places can be finalized in consultation with the Central

Indigenous Medicinal Plant Organisation. Seed and propagating material for a number of medicinal plants have been procured already.

In the meantime about one hundred medicinal plant species had been raised in experimental beds in the garden of the Botanical Survey of India at Poona.

With a view to evaluate some exotic medicinal plant species in Indian cultivation conditions, experiments have been carried out by us on a number of American and Russian medicinal plants. Their seeds were procured either through the Chief Botanist, B.S.I., Calcutta or from some foreign botanical gardens.

In order to initiate active public interest and co-operation in exploitation of medicinal plant resources, a botanical museum was also organised at Poona. The museum has a section for the medicinal plants and crude drugs.

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## Appendix

TABLE 2

Name of the species and family	Locality & field number	Flowering time & frequency	Medicinal use
<i>Abrus precatoris</i> Linn. (Papilionaceae).	BOMBAY	Sept-Oct. Common	Purgative, emetic, tonic, alexiteric, aphrodisiac, used in cattle poisoning. Parts used: seeds & roots.
	Dewas 26616A		
	Bagh 23835		
	Katraj 5736		
	Sudasna 11412		
	Chopda 11267		
	"    11174		
Nandurbar 11124			
RAJASTHAN			
Banswara 29286			
<i>Aloe barbadensis</i> Mill. (Liliaceae)	BOMBAY	Common	Stomachic, purgative, anthelmintic, cathartic, given in fever, menstrual suppression. Parts used: pulp, root.
	Khed		
<i>Caesalpinia cristata</i> Linn. (Caesalpinaceae)	BOMBAY	July-Sept.	Antiperiodic, antipyretic, febrifuge, anthelmintic, tonic used in asthma, in snake bite, disorders of the liver. Parts used: leaves, seeds and bark, oil from the seed.
	Ankaleshwar 17468		
	Tanaswadi 6686 (Khandesh)		
<i>Cissus quadrangularis</i> Linn. (Vitaceae)	BOMBAY	July Rare	Alterative, stomachic, used for digestive troubles in irregular menstruation & for asthma, applied to the fractures of bones. Parts used: leaves, juice of stems.
	Ghodnadi 7744		
	Ankaleshwar 17462		
	Dahej 17679		
	MYSORE		
Sirsi 1416			
<i>Cleome viscosa</i> Linn. (Capparidaceae)	BOMBAY	Sept-June Common	Rubefacient, vesicant, sudorific, carminative, anthelmintic, used for ulcers & wounds. Parts used: leaves, seeds.
	Katraj 20654		
	Vithalwadi —		
	Padmalaya 6315		
	Laling 3924 & 3997		
	Jalgaon		
	MYSORE		
Yesle (N.K.) 1281			
Mattikeri 1300			
<i>Commiphora mukul</i> Engl. (Burseraceae)	CUTCH	Mar-Apr., Very common	Astringent, antiseptic, expectorant, enriches the blood, demulscent, carminative used in snakebite & scorpion stings. Parts used: gum, resin.
	Mevorakhal 11591		
<i>Elettaria cardamomum</i> Maton (Scitamineae)	MYSORE	Jan. Rar	Aromatic, stimulative, stomachic carminative, diuretic, Parts used: seeds.
	Agumbe 19593		
	KERALA		
Pambapara 15567			
<i>Ficus racemosa</i> L. (Urticaceae)	BOMBAY	Common	Astringent, stomachic, carminative, useful in rinderpest (cattle), dysentery, diabetes, bilious affections, piles, diarrhoea. Parts used: bark, root, root sap, leaves, fruits & milky juice.
	Bhimshankar 12604		
	Mahabaleshwar 24625		
	war		
	Matheran 10943		
	Haripur (Khandesh) 13485		
	Yawal 13350		
	MYSORE		
	Yesle 1805		
	Bisle forest 19853		
Arbail 16440			
Godalli 1158			

<i>Gloriosa superba</i> Linn. (Liliaceae)	BOMBAY	July-Oct.	Purgative, anthelmintic, used in leprosy, affection of skin, piles, colic, snakebite, scorpion stings and gonorrhoea. Parts used: root stock.
	Katraj 4757	Common	
	Manchar 6262		
	Vela 5785		
	Khandesh —		
	Chalisgaon 20378		
	Laling Kurans 6558		
	4215		
	Padmalaya 1617		
	Lake		
<i>Helicteres isora</i> Linn. (Sterculiaceae)	BOMBAY STATE	July-Dec.	Demulcent, expectorant, astringent, used in flatulence of children, dysentery, diarrhoea, stomach affections and snake bite, antigalactagogue, Parts used: fruit, bark, juice of root.
	Dimbha 18486	Common	
	Ghodbundur 14547		
	Haripur 20240		
	Sardi 23592		
	Chopda 11189		
	Junagadh 22188		
	Bagh 23847		
	22145		
	MYSORE		
	Chipgi forest 29071A		
	Belgaum 29761		
	KERALA		
Vettilapara 15730			
Jaman ghats 26473			
RAJASTHAN			
Kotashahabad 28818			
<i>Hiptage madablota</i> Gaertn. (Malpighiaceae)	MYSORE	Jan.-March	Insecticide, useful in chronic rheumatism, skin diseases and asthma, scabies. Parts used: leaves and juice of leaves.
	Sirsi 29084A	Rare	
<i>Hydnocarpus laurifolia</i> Sleumer (Bixaceae)	MYSORE	Common	Leprosy, skin diseases, also for fish poisoning. Parts used: seeds oils.
	Arabail (N.K.) 16426		
	Godalli 1135, 1147		
	Katgal 3886		
	KERALA STATE		
Adur 15233			
<i>Jatropha curcas</i> Linn. (Euphorbiaceae)	BOMBAY	Common	Purgative, useful in scabies, eczema and ringworm, fish poison. Parts used: seeds, juice of the plant.
	Thana 14969		
	Khedghat 2557		
	Madh island 9743		
	Dewas (M.P.) 26615A		
	MYSORE		
N. Kanara 1468			
Yekkambi 1045			
<i>Lawsonia inermis</i> Linn. Lamk. (Lythraceae)	BOMBAY	Apr.-July	In jaundice, skin diseases, head ache, in the bursting of feet, remedy for spermatorrhea. Parts used: leaves, leaf juice, oil and essence.
	Kawi 17724	Common	
	Cambay 17860		
	Dumas 17323		
	Mehasana 11300		
	Jalgaon 4673		
	KUTCH		
	Bhuj 11439		
	Dhinodhar 11698		
	<i>Lobelia micotinaefolia</i> Heyne. (Campanulaceae)	BOMBAY	
Bhimashankar 4873		Common	
Hirdoshi 2802			
Mahad Road 306			
229			
Ambegaon 30069			
KERALA			
Kallachickera 15025			
Ponnudi 15121			
MYSORE			
Coorg —			
Agumbe 34341			

<i>Mesua ferrea</i> Linn. (Guttiferae)	MYSORE Siddapur 1748 (Planted)	March Rare	Astringent, aromatic, sudorific, stomachic, used in cough, dysentery, snake bite & scorpion stings. Parts used: flowers, flower buds, unripe fruit, leaves.
<i>Mucuna prurita</i> Hk. (Papilionaceae)	MYSORE Katgal 1743 Jog (N.K.) 18199 BOMBAY Kolwan 9467 Haripur (Khandesh) 13412	Aug.-Dec. Common	Aphrodisiac, nervine tonic, anthelmintic, purgative, used in scorpion sting & cholera. Parts used: seeds, pods, root.
<i>Naregamia alata</i> Wt. & Am. (Meliaceae)	MYSORE Katgal 1586 Uppinpattan 1397	Rare	Emetic, cholagogue, expectorant, used in dysentery, rheumatism, itch, biliousness. Parts used: root, leave- & stem.
<i>Oldenlandia corymbosa</i> Linn. (Rubiaceae)	BOMBAY Bhimashankar 12636 Bhor 585 Dhond 9573 Chakan 1816 Kolwan 7700 Poona 3785 Sinhagad 10910 N. KANARA Mirjan 16499 Karwar-An- kola. 16498 Siddapur 1992	Sept.-Nov. Common	In remittent fever, with gastric irritation, in jaundice, diseases of liver and nervous depression, anthelmintic. Parts used: juice of plant.
<i>Oroxylum indicum</i> Vent. (Bignoniaceae)	KERALA Urakomban 15775 BOMBAY Ghodegaon 2214	May-July	Astringent, purgative, tonic, useful in diarrhoea, dysentery and in scorpion stings. Parts used: root barks, seeds stem.
<i>Plumbage zeylanica</i> Linn.	BOMBAY STATE Bawdhan Poona 8879 Dimbha 8485 Purandhar 773 Bheraghat (C.I.) 26576 Kapadurj 24453 Vasad 24282 Panala 26107 KUTCH Nakhatrana 11522	Aug-Sept. Common	Appetizer, powerful sudorific, antiperiodic, used in skin diseases, diarrhoea, dysentery, piles, useful in ophthalmia. Parts used: root, milky juice.
<i>Polygala chinensis</i> Linn. (Polygalaceae)	BOMBAY STATE Chakan 4821 Ahmednager 6716 Bawdhan 5068 Dhond 9566 Ankaleshwar 25767 Mhaswa 6488 Jalgaon 20518A Laling 4248 Phanda 26620A Bawdhan hill 7557	Oct.-March Common	Given in cases of fever and dizziness. Parts used: root.
<i>Rauwolfia serpentina</i> Benth. ex. Kurz (Apocynaceae)	MYSORE Katgal 2449A Sirsi 29084 Dandelli 16199 Sonda forest 1499 BOMBAY STATE Donja 4137	March-May Rare	Hypnotic, sedative, specific for insanity, reduces blood pressure, employed in labours to increase uterine contractions, used for removal of opacities of the cornea of the eye. Parts used: root and juice of leaves.
<i>Rubia cordifolia</i> Linn. (Rubiaceae)	BOMBAY Mahabalesh- ,, ,,war 24607 ,, ,, 24715	Oct.-Jan. Common	Tonic, alterative, astringent, used in cobra bite, scorpion stings. Parts used: root, stem.

	Mahabalesh- 27138		
	„ „ war 24794		
	„ „ 335		
	„ „ 16730		
	Paud 8828		
	Bhimshankar 9324		
	8688		
	Sinhagad 7831		
	Talegaon 8683		
	MYSORE		
	Siddapur(N.K)18392		
	Vandiperbar 15387		
	Coorg 31789		
<i>Salvia plebeia</i> R. Br. (Labiatae)	BOMBAY	Sept.-Feb.	Used in diarrhoea, gonorrhoea, menorrhagia, haemorrhoids. Parts used: seeds.
	Khandala 43 & 17141	Abundant	
	Poona river 1354		
	side		
	Rajur 12447		
	Kuruli 2518		
	Bhimashan- 12638		
	kar		
	Poona-Bombay		
	Road 11869		
	Vittalwadi —		
	Shivapur 83		
	Hirdoshi road 985		
	Dhond 9578		
	Bhor 564		
<i>Saraca indica</i> Linn. (Papilionaceae)	BOMBAY	Dec.-May	Astringent, used in uterine affections, monorrhagia, scorpion stings. Part used: bark.
	Surat 17394	Rare	
	Lonavala 30758		
	MYSORE		
	Menbile 19186		
	Dodnalli 1032		
	KERALA		
	Kilimanum 15215		
<i>Semercarpus anacardium</i> L.f. (Anacardiaceae)	BOMBAY	May-July.	Vermifuge, vesicant, used in rheumatism, leprous affections, snake bite and scorpion stings, brings about abortion. Parts used: nut, oil from the nut, bark's gum, ashes of th plant.
	Bhamburwadi 20444A		
	Katraj 424, 108 & 314		
	MYSORE		
	Hatuvjungi 13875		
	Siddapur 1990		
	Kolhapur- 13802		
	Belgaum		
	Jog falls 19216		
<i>Sterculia urens</i> Roxb. (Sterculiaceae)	BOMBAY	Dec.-Feb.	Gum is substitute for tragacanth in throat affections & in pleuropneumonia in cattle. Parts used: gum, leaves.
	Haripur 20243	Rare	
	13401		
	Chalisgaon 20411		
	Laling 3914 & 20501		
	Baghdara 29432		
	KUTCH		
	Bhuj 11545		
<i>Strychnos nuxvomica</i> Linn. (Loganiaceae)	MYSORE	Mar.-Apr.	Root bark with lime juice useful in cholera, in dysentery, fevers and dyspepsia, colic. Parts used: leaves, wood and seeds.
	Yellapur 3464B	Common	
	3475B		
	Katgal 1546 & 2495A		
	Sirsi road		
	Shurvati 19054		
	19048		
	„		
	Dandelli 16046		
	Ankola road 16480		
	Yekkambi 1062		

<i>Tinospora cordi folia</i> D.C. (Menispermaceae)	BOMBAY	April	Stomachic, diureatic, antiperiodic, anti-pyretic, alterative, aphrodisiac, nutrient, used in chronic diarrhoea and chronic dysentery. Parts used: stem, starch (roots), juice of plant.
	Poona, Law,		
	Coll. Hill 9780		
	Kolwan 9491		
	Umreth 25461		
	Ambevani 18254		
Khandala hill30737			
	KUTCH		
	Bhuj 11603		
<i>Withania somnifera</i> Dunal. (Solanaceae)	BOMBAY	Sept.	Alterative, diuretic, aphrodisiac, tonic, deobstruent, narcotic used in fever, applied to swellings, coagulates milk. Parts used: leaves, fruits, seeds.
	Bhavanagar 17921		
	Kawi 17798		
	Cambay 17812		
	Kaira 24222		
	Poona 27000		
Ahmedabad 23910			

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