

HARNESSING THAR BIODIVERSITY FOR MEDICINAL USES

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Introduction

About one-fifth of the land surface of the world is desert. From the rock surface of the American Sonoran to the vast dunes of the African Sahara, deserts are not all the same. Most deserts are found in bands along 30 degrees latitude North and 30 degrees latitude South. The arid Thar Desert is the world's seventh largest desert and is without doubt the most inhospitable eco-region in the Indo-Pacific region. The origin of the Thar Desert is a controversial subject in terms of evolution. Some consider it to be only 4,000 to 10,000 years old, whereas others state that aridity started in this region much earlier. It is spread over four states in India, namely Punjab, Haryana, Rajasthan and Gujarat, also in two states in Pakistan and covers an area of about 2,38,700 square kilometres. 12% area of India is desertic and 26% area is semi-arid, 0.32 million km² is hot desert and 0.07 million km² is cold desert. Sixty one per cent of India's hot desert is in Rajasthan having 17.44 million human and 23.33 million livestock population (Census 2001). The average annual rainfall of the region varies from 100 to 500 mm; it is distributed very erratically, occurring mostly between July and September. The mean average temperature varies from a

minimum of 24°C to 26°C in summer to 4 °C to 10 °C in winter. Majority of desert is covered by sand dunes; the rest is covered by gravel plains. The region is characterized by low and erratic rain fall, high evaporation, high temperature regime, scanty vegetation, soil with high pH values, rodent infestation, absence of perennial rivers, subsistence on agriculture, sparse nomadic population and dependence of man on animal rearing. Biotic influences have adversely impacted on the biological diversity. The forest cover in this region is less than 3 % which is depleting fast due to increase in human and livestock population.

Deserts are the home to many life forms and interdependent elements. They are second only to tropical rainforests in the variety of plant and animal species that live there. Indeed, desert plants often look different than plants in any other biome or ecosystem. Forty-five plant species are considered to be rare and/or endangered (Khan *et al.*, 2003). The desert has a large number of plants of economic importance and medicinal use. The human population subsisting on this unique exerts pressure on the biological resources of the Thar Desert causing a lack of sustainability and necessitate conservation of biodiversity actions.

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The importance of retrieving information on medicinal flora of the state of Rajasthan is to initiate the proper scientific management and exploitation for economic development of the area. The contributions of ethnobotanical interest are reported in the works of King (1870), Nathawat and Deshpande (1960), Chopra and Abrol (1964), Singh (1964), Bhandari (1974, 1978), Gupta and Saxena (1977), Srivastava (1977), Singh and Shetty (1977), Tewari (1979) and Tripathi *et al.* (1996). This paper describes the medicinal flora of Indian Thar Desert.

Species Diversity and Enumeration on Medicinal Flora

The information presented here about the plants and their medicinal uses and values are based upon the retrieval of published accounts. The plants are indexed in a uniform system of latin name, trade/local name, families, parts used, cultivation practices and their medicinal uses. Indexing of medicinal flora of Indian Thar has been done with a viewpoint of consolidation of scattered information on the subject and to provide as ready reference for developing database comprehensively.

Synopsis on the Medicinal Flora of Thar

Table 1 indicates the indexing of medicinal plants on the basis of their Latin and trade names, families, habit, parts used and medicinal uses. In all 157 plant species belonging to 124 genera and 62 families are documented. Fabaceae with 8 genera was highly represented followed by Asclepiadaceae with 7, and Asteraceae

(Compositae) with 6 genera each. However, Solanaceae with only 4 genera and 9 species is the highest represented family (Table 2). Top 10 families from Fabaceae to Convolvulaceae represent total 47 genera, approximately 37%. Sixty two families represent approximately 40.7% of the total medicinal flora of Indian Thar. Most of the families were represented very poorly.

It is found that most of the families represent plants with medicinal value. Most of the families (27) were represented only by a single genus and species. Eleven families were documented having two genera and two species. Eight families were indexed by single genus and two species. Single family, namely Solanaceae is indexed having 4 genera and 9 (highest) species. 27 families represented singly were indexed on the basis of their cultivation practices (Table 3). Out of 27 plant species, 9 were found under cultivation while 18 were wild. The prominent cultivated species were *Bacopa monnieri* (Linn.) Pennell, *Boerhavia diffusa* Linn., *Plantago ovata* Forsk. and *Plumbago zeylanica* Linn. However, in total 157 plant species, 42 were cultivated, 115 were wild and 110 were harvested destructively while 47 were harvested non-destructively (Fig. 1).

Table 4 shows habit-wise distribution of medicinal plants. As indicated most of them are herbs (79) followed by shrubs (51) and trees (21). Generally under such harsh climate, herbs and shrub type of vegetation is prominent. There was only one perennial sedge and a climber and annual grass. Three perennial grasses were reported to have medicinal potential.

Table 1

List of medicinal plants, their trade names, family, habit, parts used and medicinal uses found in arid areas.

Sl. No.	Latin name	Trade name	Family	Habit/ Part(s) used	Medicinal Uses
1	2	3	4	5	6
1.	<i>Abrus precatorius</i> L.	Ratti, Chirmi	Fabaceae	Shrub/seed	Sore throat, cough, chronic inflammation of mucus membrane of eyeball & eyelid.
2.	<i>Abutilon indicum</i> (Linn.) Sweet	Kanghi, Tara-kanchi	Malvaceae	Shrub/whole plant	Astringent, anthelmintic, diuretic, alexiteric, toothache, demulcent tonic, rheumatism, piles, laxative, gonorrhoea.
3.	<i>Abutilon indicum guineense</i> (Sch.) Borr.	Kanghi,	Malvaceae	Shrub/seed	Tonic, gonorrhoea, bladder stone.
4.	<i>Acacia nilotica</i> Linn. ssp. <i>indica</i> (Benth) Brenner	Babool	Mimosaceae	Tree/leaves, bark, gum	Eye sores in children, sexual impotency, diseases of urino-genital system, Astringent, demulcent, asthma, diarrhoea.
5.	<i>Acacia senegal</i> Willd.	Kumatia	Mimosaceae	Tree/gum	Emollient, demulcent, burns, sore nipples, haemorrhage, intestinal mucous, food for diabetics.
6.	<i>Achyranthes aspera</i> Linn.	Andhi-jaro, Apamarg	Amaranthaceae	Herb/whole plant	Asthma, cough, cholera, renal dropsy, gonorrhoea, eye dis. piles, laxative, purgative, anthelmintic, anti-periodic in malaria, insect bite, pneumonia, hydrophobia.
7.	<i>Adhatoda zeylanica</i> Medic.	Adua	Acanthaceae	Shrub/whole plants	Diuretic bronchitis, gonorrhoea, jaundice, anti-spasmodic, ophthalmic, heart trouble, loss of memory, leucoderma.
8.	<i>Aegle marmelos</i> (Linn.) Correa	Bel	Rutaceae	Tree/root, leaves, fruit	Abdominal pain, heart palpitation, urinary troubles, laxative, febrifuge, ophthalmic, deafness, dysentery.
9.	<i>Aerva persica</i> (Burm. f.) Merrill	Bui	Amaranthaceae	Shrub/flower	Inflammation, swelling, demulcent, diuretic.
10.	<i>Ageratum conyzoides</i> Linn.	Doachuntry, Uachauty	Asteraceae	Herb/leaves, root	Styptic, sores, cuts; Root: antilithic.

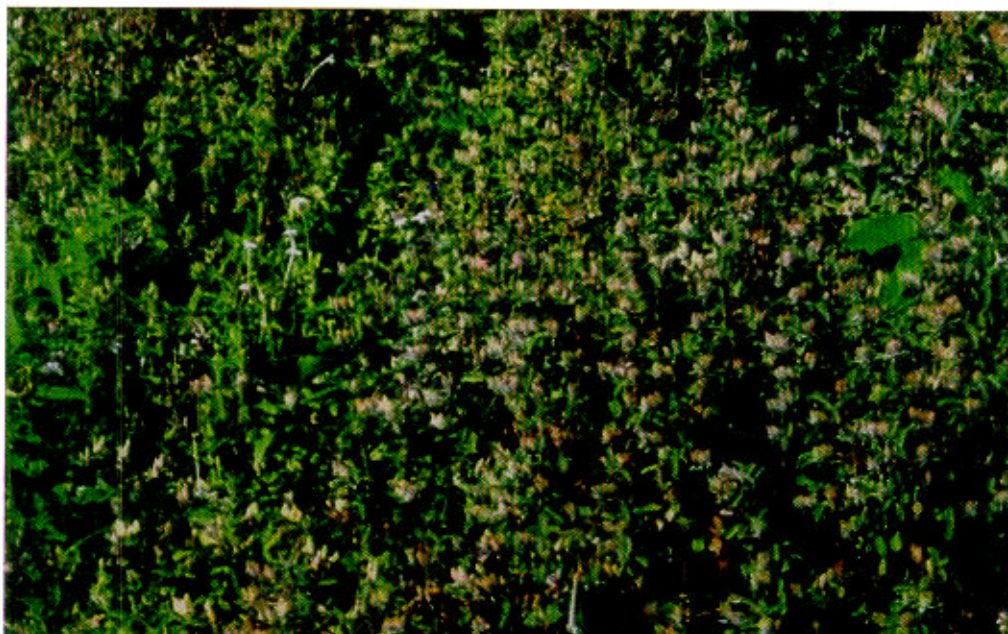
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Plate 1



Aloe vera

Plate 2



Barleria acanthoides

Plate 3



Catharanthus roseus

Plate 4



Citrullus colocynthis

1	2	3	4	5	6
11.	<i>Ailanthus excelsa</i> Roxb. (Bieb.) Desv.	Ardu	Simaroubaceae	Tree/bark	Appetizer, anthelmintic, dysentery, chronic bronchitis.
12.	<i>Alhagi pseucalhari</i> (Bieb.) Desv.	Jawasa	Fabaceae	Shrub/whole plant	Laxative, diuretic, expectorant; piles, rheumatism.
13.	<i>Alternanthera sessilis</i> (Linn.) DC	Bhaji	Amaranthaceae	Herb/whole plant	Lactagogue, febrifuge, eye wash, galactagogue.
14.	<i>Amaranthus viridis</i> Linn.	Jangli chauli	Amaranthaceae	Herb/leaves	Emollient, laxative.
15.	<i>Anagallis arvensis</i> Linn.	Neel	Primulaceae	Herb/whole plant	Inflammation, diseases of kidney, epilepsy, ophthalmia, cerebral problems.
16.	<i>Argemone mexicana</i> Linn.	Satyanashi	Papaveraceae	Herb/whole plant	Eczema, skin disorders, blood purifier, laxative, emetic, expectorant, demulcent, jaundice, asthma, diuretic, leucoderma, liniment of head, aphrodisiac, whooping cough.
17.	<i>Aristolochia bracteolata</i> Lamk.	Kiramar, Hukka-bel	Aristolociaceae	Herb/whole plant	Anthelmintic, emmenagogue purgative, fever, joint pain, ulcer, eczema.
18.	<i>Asparagus racemosus</i> Willd.	Satawari	Liliaceae	Shrub/root	Aphrodisiac, laxative, expectorant, galactagogue, tuberculosis, leprosy, epilepsy, night blindness, diseases of kidney, liver, blood, eye & throat.
19.	<i>Azadirachta indica</i> A. Juss.	Neem	Meliaceae	Tree/whole plant	Anthelmintic, diuretic, blood & skin diseases, leprosy, insecticidal, ophthalmia, biliousness.
20.	<i>Bacopa monnieri</i> (Linn.) Pennel.	Brahmi	Araceae	Herb/whole plant	Nerve tonic, memory promoter, epilepsy, insanity.
21.	<i>Balanites aegyptiaca</i> Del.	Hingotio, Hingoto	Balanieaceae	Tree/whole plant	Purgative, anthelmintic, alexipharmic, anti-dysenteric, analgesic, leucoderma, ulcers, skin diseases, whooping cough, boils, leucoderma, skin diseases.
22.	<i>Barleria cristata</i> (L.)	Raktajhinti	Acanthaceae	Shrub/whole plant	Inflammation, fever, bronchitis, biliousness, tympanitis.

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1	2	3	4	5	6
23.	<i>Barleria prionitis</i> (Linn.)	Bajra-danti, Kala-bans, Chapri	Acanthaceae	Shrub/whole plant	Alexiteric, bronchitis, blood complaints, leucoderma, laceration, cracking of feet, fever, catarrhal affections, cough, diarrhoea, toothache, boils, glandular swellings, dropsy. Sores, broken bones.
24.	<i>Bergia suffruticosa</i> (Delile) Fenzl	Kankaio, Karbuji	Elatinaceae	Shrub/leaves	
25.	<i>Blepharis linariaefolia</i> Pers.	Bhangri, Bili-Khoja	Acanthaceae	Herb/seed	Earache, tonic, increase milk production.
26.	<i>Boerhavia diffusa</i> Linn.	Punarnava	Nyctaginaceae	Herb/whole plant	Astringent, biliousness, anaemia, night blindness, leucoderma, inflammation, blood purifier, diuretic, laxative, expectorant, intestinal inflammation, fever.
27.	<i>Boswellia serrata</i> Roxb.	Salar, Salaran	Burseraceae	Tree/bark, fruit, gum	Biliousness, dysentery skin diseases, ulcer, blood purifier, leucoderma, piles, antipyretic, astringent, emmenagogue, rheumatism, vaginal discharge, diabetes, bronchitis.
28.	<i>Butea monosperma</i> (Lam.) Taub	Palas, Dhak	Fabaceae	Tree/root, bark, leaves flower, gum	Night blindness, elephantiasis, aphrodisiac, laxative, dysentery, stomach worms, piles, astringent, tonic, eye diseases, diuretic, chronic diarrhoea, round worm.
29.	<i>Cadaba fruticosa</i> Druce.	Dabi, Kodhab	Capparaceae	Shrub/root, leaves	Anthelmintic, emmenagogue, antiseptic, purgative, urinary obstruction.
30.	<i>Calligonum polygonoides</i> Phog, Linn.	Phogda	Polygonaceae	Shrub/root, leaves	Washing eyes, sore gum.
31.	<i>Calotropis procera</i> R.Br.	Madar	Asclepiadaceae	Shrub/whole plant	Toothache, stomachic, appetiser, piles, asthma, tonic.
32.	<i>Capparis decidua</i> (Forsk.) Edgew.	Ker	Capparaceae	Shrub/whole plant	Carminative, aphrodisiac, appetiser, emme- nagogue, alexipharmic, lumbago, rheuma- tism, hiccups, analgesic, diaphoretic, laxative, anthelmintic, ulcer, cough, asthma, piles, cardiac troubles, inflammation.
33.	<i>Caraluma edulis</i> Benth.	Pimpa	Asclepiadaceae	Herb/whole plant	Anthelmintic, leprosy, blood diseases.

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34.	<i>Cardiospermum halicacabum</i> Linn.	Chirphuta	Sapindaceae	Climber/root, leaves	Diaphoretic, diuretic, gonorrhoea, rheumatism, lumbago, emmenagogue. Digestive tonic.
35.	<i>Caropegia bulbosa</i> Roxb.	Khapparkada	Asclepiadaceae	Herb/tubers	Skin diseases, astringent, anthelmintic, diabetes, urinary disorders, conjunctivitis.
36.	<i>Cassia auriculata</i> Linn.	Anwal, Tarawar	Caesalpiniaceae	Shrub/whole plant	Skin diseases, astringent, anthelmintic.
37.	<i>Cassia occidentalis</i> Linn.	Anwal	Caesalpiniaceae	Climber/whole plant	Diuretic, dysentery, ulcer, tonic, gonorrhoea, rickets, leucorrhoea.
38.	<i>Cassytha filiformis</i> Linn.	Amebel	Lauraceae	Herb/whole plant	Antipyretic, aphrodisiac, liver tonic, gonorrhoea.
39.	<i>Celosia argentea</i> Linn.	Surli Garke	Amaranthaceae	Herb/leaves, seed	Appetizer, anthelmintic, diuretic, laxative, aphrodisiac, abdominal pain, eye disease, piles, tonic, disease of blood, heart & spleen.
40.	<i>Chenopodium album</i> Linn.	Bathua	Chenopodiaceae	Herb/whole plant	Carminative, emmenagogue, pectoral complaints, amenorrhoea, nervous affections.
41.	<i>Chenopodium ambrosioides</i> Linn.		Chenopodiaceae	Herb/whole plant	Emetic, corrosive.
42.	<i>Chrozophora rottileri</i> A. Juss.	Shadevi	Euphorbiaceae	Herb/whole plant	Purgative, jaundice, rheumatism, urinary disease
43.	<i>Citrullus colocynthis</i> Schrad.	Tumba, Indrayan	Cucurbitaceae	Herb/root, fruit	Anthelmintic cough sores, rubefacient, intermittent fever, muscular pain, rheumatism, headache, intestinal wounds.
44.	<i>Cleome gynandra</i> Linn.	Safed bagro, Karalia	Cleomaceae	Shrub/seed, leaves	Carminative, anthelmintic, rubefacient, vesicant, piles, round worms leucoderma, skin diseases, earache, fever, dysentery, paratyphoid, bronchitis, gonorrhoea.
45.	<i>Cleome vahlana</i> Fresen.	Madhio, Khiramar, Noli, Nodi	Cleomaceae	Herb/seed, leaves	Laxative, anthelmintic, diuretic, ulcer, leprosy, malaria, piles, lumbago.
46.	<i>Cleome viscosa</i> Linn.	Handi-bagro, Pili-hulhul	Cleomaceae	Herb/whole plant	Laxative, alexipharmic, anaemia, diabetes, chyluria, bronchitis, dyspepsia, inflammation, piles.
47.	<i>Clerodendron phlomidis</i> Linn.	Arni	Verbinaceae	Tree/root, leaves	

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1	2	3	4	5	6
48.	<i>Clitoria ternatea</i> Linn.	Gokari	Fabaceae	Shrub/root, seed	Laxative, diuretic, alexiteric, anthelmintic, brain tonic, corneal ulcer, elephantiasis, leucoderma.
49.	<i>Cocculus hirsutus</i> Diels.	Chhireta	Menispermaceae	Shrub/root, leaves	Alexipharmic, antipyretic, laxative, soporific, venereal pain.
50.	<i>Cocculus pendulus</i> (Forst.) Diels	Pilawan	Menispermaceae	Shrub/leaves	Skin diseases.
51.	<i>Commelina benghalensis</i> Bukana (Forst.) Diels		Commelinaceae	Herb/whole	Emollient, leprosy.
52.	<i>Commelina obiqua</i> Buch. Ham.	Kanjuna	Commelinaceae	Herb/root	Vertigo, laxative, biliousness, fever.
53.	<i>Commiphora wightii</i> Buch. Ham.	Guggal	Burseraceae	Tree/gum	Laxative, aphrodisiac, alternative, anthelmintic, biliousness, ulcers, fistula, piles, pyorrhoea, chronic tonsillitis, pharyngitis, chronic bronchitis, chronic nasal catarrh, laryngitis, phthisis, urinary troubles, asthma, cough & cold, tumours, leucoderma, lowering blood cholesterol.
54.	<i>Convolvulus microphyllus</i> Santari Sieb. ex Sprang.		Convolvulaceae	Herb/whole plant	Laxative, brain tonic.
55.	<i>Corchorus depressus</i> Linn.	Chamkas, bahuphali	Tiliaceae	Shrub/whole plant	Sexual impotency, weakness, fever; demulcent, dysentery, laxative, appetizer, anthelmintic, antiperiodic, carminative, dyspepsia, catarrh, liver disorder.
56.	<i>Corchorus olitorius</i> Linn.	Chamghas	Tiliaceae	Herb/seed, leaves	Alternative, alexiteric, diuretic, tumours, gonorrhoea, cystitis, dysuria.
57.	<i>Corchorus tridens</i> Linn.	Kag-nasha	Tiliaceae	Herb/whole plant	Gonorrhoea, tonic.
58.	<i>Cordia gharaf</i> Hook.	Godela	Ehretiaceae	Tree/bark, fruit	Astringent, headache, constipation, stomach worms, piles, toothache.
59.	<i>Cressa cretica</i> Linn.	Lana	Convolvulaceae	Herb/whole plant	Aphrodisiac, stomachic, asthma, diuretic, leprosy, biliousness, appetizer, tonic.

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60.	<i>Crotalaria burhia</i> Buch. Ham.	Shinyo	Fabaceae	Shrub/whole plant	Hydrophobia, swelling.
61.	<i>Cucumis prophetarum</i> Linn.	Khat-Kachrio	Cucurbitaceae	Herb/root, fruit	Indigestion, fever; purgative, emetic.
62.	<i>Cuscuta hyalina</i> Heyne ex. Roth.	Amar bel, Akash bel	Cuscutaceae	Shrub/whole plant	Purgative, itch, protracted fevers, sores, chest pain.
63.	<i>Cuscuta reflexa</i> Roxb.	Akash-bel	Cuscutaceae	Shrub/whole plant	Aphrodisiac, diuretic, paralysis, heart & spleen disease, lumbago, emmenagogue, sedative, biliousness.
64.	<i>Cynodon dactylon</i> Pers. Linn.	Dub	Poaceae	Perennial grass/whole plant	Astringent, diuretic, dropsy, cut, wound, genital-urinary disorder.
65.	<i>Cyperus rotundus</i> Linn.	Motha, Mothee	Cyperaceae	Perennial sedge/root-tuber	Diuretic, emmenagogue, anthelmintic, diaphoretic, astringent, stimulant, stomach disorder, bowel irritation.
66.	<i>Dactyloctenium aegyptium</i> (Linn.) P. Beauv.	Malra, Manchi, Kuri	Poaceae	Annual grass/seed	Bellyache after childbirth, kidney pain.
67.	<i>Datura innoxia</i> Mill.	Dhatura	Solanaceae	Shrub/root, leaves, seed	Toothache, insanity, catarrhal, cerebral complaints, skin diseases, lumbago, fever, asthma, hydrophobia, malarial fever.
68.	<i>Datura metel</i> Linn.	Dhatura, Kalo-dhaturo	Solanaceae	Herb/root, leaves, seed	Toothache, insanity, catarrhal, cerebral complaints, skin diseases, lumbago, diarrhoea, asthma, hydrophobia, malarial fever.
69.	<i>Datura stramonium</i> Linn.	Dhatura	Solanaceae	Herb/leaves, seed, fruit	Antispasmodic, narcotic, anodyne, sedative, intoxicant, carbuncles.
70.	<i>Dicoma tomentosa</i> Cass.	Vajradanti, Cholaharnacharo	Asteraceae	Shrub/whole plant	Pyorrhoea, febrifuge, febrile attacks.
71.	<i>Digera muricata</i> Forsk	Khanjuru	Amaranthaceae	Herb/whole plant	Astringent, laxative, biliousness, urinary discharge.

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72.	<i>Echinops echinatus</i> Roxb.	Unt-Kanta, Unt-Katalo	Asteraceae	Herb/whole plant	Alterative, diuretic, nerve tonic, hysteria, dyspepsia, ophthalmia, cough, scrofula, seminal debility.
73.	<i>Eclipta alba</i> Linn.	Bhangro	Asteraceae	Herb/whole plant	Emetic, purgative, antiseptic, tonic, hepatic & spleen enlargement, jaundice, catarrh, skin diseases, hair dye.
74.	<i>Ehretia aspera</i> Willd.	Tombolan	Ehretiaceae	Shrub/fruit	Veneral diseases.
75.	<i>Enicostema hyssopi- folium</i> Willd.	Chota-chirayata	Gentianaceae	Herb/whole plant	Blood purifier, dropsy, rheumatism, abdominal ulcer, hernia, swellings, itches, malaria.
76.	<i>Eruca sativa</i> Mill.	Taramira	Brassicaceae	Herb/leaves, seed	Stimulant, stomachic, diuretic, antiscarbutic, aphrodisiac.
77.	<i>Euphorbia caducifolia</i> Linn.	Thor	Euphorbiaceae	Shrub/whole plant	Carminative, purgative, laxative, appetizer, alexipharmic, rubefacient, expectorant, cutaneous eruptions, cough, earache, bronchitis, tumour, delirium, leucoderma, piles, spleen enlargement, anaemia, ulcers, fever.
78.	<i>Euphorbia hirta</i> Linn.	Dudhali	Euphorbiaceae	Herb/leaves	Dysentery, worms, colic, bowel complaints, cough, asthma, vermifuge, diseases of urino- genital tract, diarrhoea, leucorrhoea, menorrhagia.
79.	<i>Evolvulus alsinoides</i> Linn.	Shankhpushpi, Phooli	Convolvulaceae	Herb/leaves	Bronchitis, asthma, fever, diarrhoea, tonic, vermifuge, dysentery.
80.	<i>Fagonia cretica</i> Linn.	Jawasiao, Dhamaso	Zygophyllaceae	Shrub/whole plant	Astringent, febrifuge, tonic, small pox, dropsy, delirium, asthma, cough, fever, dysentery, skin diseases, abortion.
81.	<i>Farsesia hamiltonii</i> Royle.	Hiran-chanbba	Brassicaceae	Herb/whole plant	Rheumatism, cooling.
82.	<i>Feronia limonia</i> (Linn.) Swingle	Kaitha	Rutaceae	Tree/leaves, seed, fruit	Cough, dysentery, alexiteric, heart diseases, aphrodisiac, leucorrhoea, ophthalmia, biliousness.

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1	2	3	4	5	6
83.	<i>Ficus benghalensis</i> Linn.	Bargad	Moraceae	Tree/whole plant	Biliousness, ulcer, erysipelas, vaginal complaints, fevers, liver troubles, diabetes, cooling tonic.
84.	<i>Ficus religiosa</i> Linn.	Peepal	Moraceae	Tree/whole plant	Leucorrhoea, biliousness, ulcer, diseases of vagina and uterus, alexipharmic.
85.	<i>Fumaria indica</i> Pugsley	Pithpaparo	Fumariaceae	Herb/whole plant	Diuretic, diaphoretic, aperients, anti-spasmodic, CNS depressant.
86.	<i>Glinus lotoides</i> Linn.	Hata, Badka, Matter, Gandhi-butti	Molluginaceae	Herb/whole plant	Diuretic, purgative, boils, wounds, indigestion, bilious attacks.
87.	<i>Grewia tenax</i> (Forsk.) Fiori	Gangeran, Gangar, Gabgi	Tiliaceae	Shrub/wood, root	Cough, pain, diarrhoea.
88.	<i>Haloxylon recurvum</i> Bunge ex Boiss.	Khar	Chenopodiaceae	Shrub/whole plant	Ulcer.
89.	<i>Heliotropium ellipticum</i> Ledebour	Kalibui, Tindaru, Nilkattei	Boraginaceae	Herb/leaves	Ulcers, earache, emetic.
90.	<i>Heliotropium strigosum</i> Willd.	Arkali	Boraginaceae	Herb/whole plant	Laxative, diuretic.
91.	<i>Hopaea dichotoma</i> Willd.	Ramjetta	Gentianaceae	Herb/root	Piles, snake bite.
92.	<i>Indigofera argentea</i> Burm.	Neel, Surmaineel	Fabaceae	Herb/leaves, root, seed	Anthelmintic.
93.	<i>Indigofera linifolia</i> Retz.	Sidio bakario	Fabaceae	Herb/flower	Febrile eruptions, amenorrhoea.
94.	<i>Indigofera oblongifolia</i> Forsk.	Khuara	Fabaceae	Shrub/whole plant	Root: Appetizer, rheumatism; Whole plant: spleen and liver problems.
95.	<i>Indigofera tinctoria</i> Linn.	Neel	Fabaceae	Shrub/whole plant	Laxative, expectorant, alexipharmic, anthelmintic, leucoderma, abdominal complaints, heart disease.
96.	<i>Ipomea hederacea</i> Jacq.	Kirpan-beli	Convolvulaceae	Herb/seed	Laxative, carminative, fever, abdominal & liver troubles, leucoderma.
97.	<i>Justica procumbens</i> Linn.	Kagner	Acanthaceae	Herb/whole plant	Biliousness, intoxication, fever, diuretic, enriches blood, leprosy, mental and blood diseases.

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1	2	3	4	5	6
98.	<i>Lepidagathis trinervis</i> Nees	Unt-Katalio	Acanthaceae	Shrub/seed	Cooling drink, tonic.
99.	<i>Leucas aspera</i> Spreng.	Chota-halkusar	Lamiaceae	Herb/leaves	Chronic rheumatism, psoriasis, skin diseases, swellings.
100.	<i>Leucas caphalotes</i> Spreng.	Vdapata	Lamiaceae	Herb/whole plant	Diaphoretic, stimulant, laxative, bronchitis, jaundice, dyspepsia, paralysis, leucoderma, urinary discharge, fever, scorpion sting.
101.	<i>Malva parviflora</i> Linn.	Khumbasi	Malvaceae	Herb/leaves, seed	Nerve tonic, profuse menstruation, wounds & swellings; Seed: demulcent in cough, bladder ulcer.
102.	<i>Merremia tridentata</i> (Linn.) Hallier	Parasarini	Convolvulaceae	Shrub/whole plant	Laxative, tonic, rheumatism, piles, urinary disorders.
103.	<i>Mimosa himata</i> Willd.	Shiah-Kanta, Jinjanio	Mimosaceae	Shrub/seed	Stimulant, weakness.
104.	<i>Moringa oleifera</i> Lam.	Sanjna	Moringaceae	Tree/whole plant	Aphrodisiac, alexiteric, analgesic, anthelmintic, ulcers, heart troubles, ophthalmia, muscular and spleen diseases.
105.	<i>Ocimum americanum</i> Linn.	Ban-tulsi	Lamiaceae	Herb/whole plant	Fever, parasitical skin diseases, cold, cough.
106.	<i>Ocimum canum</i> Sims.	Bapchi	Lamiaceae	Herb/leaves, seed	Fever, parasitic diseases, expectorant, anti-catarthal, nasal haemorrhage, anti-rheumatism.
107.	<i>Oxalis corniculata</i> Linn.	Khatari, Khatti-buti	Oxalidaceae	Herb/whole plant	Appetizer, dysentery, diarrhoea, refrigerant, stomachic, anti-scorbutic, piles, skin diseases.
108.	<i>Oxystelma esculentum</i> (Linn.) Schult.	Dudhialak	Asclepiadaceae	Herb/whole plant	Diuretic, laxative, aphrodisiac, leucoderma, bronchitis, expectorant, anthelmintic, gonorrhoea.
109.	<i>Panicum antidotale</i> Retz.	Gramma, Garmano	Poaceae	Perennial grass/whole plant	Small pox, wound.

Contd...

1	2	3	4	5	6
110.	<i>Pedaliium murex</i> Linn.	Baragokhru	Pedaliaceae	Herb/root, leaves, fruit	Anti-biliousness, gonorrhoea, dysuria, anti-spasmodic, aphrodisiac, diuretic, demulcent, emmenagogue.
111.	<i>Peganum harmal</i> Linn.	Harmal, Isband, Gandhio	Zygophyllaceae	Herb/whole plant	Emmenagogue, galactagogue, aphrodisiac, abortifacient, toothache; Seed: expectorant, anthelmintic, lumbago, colic, urinary troubles, ophthalmia, rheumatism, bronchitis.
112.	<i>Pentratropis spiralis</i> (Forsk.) Dence	Kauathodi	Asclepiadaceae	Shrub/whole plant	Whole plant: leucoderma, biliousness, piles, cough, inflammation; Root: astringent, gonorrhoea.
113.	<i>Pergularia daemia</i> (Forsk.) Chior	Ganderio-ki-bel, Utran, Manda-singi	Asclepiadaceae	Shrub/whole plant	Anthelmintic, expectorant, catarrhal affections, infantile diarrhoea, asthma, rheumatism, carbuncle, purgative, raises blood pressure.
114.	<i>Periploca aphylla</i> Decne. Barri		Periplocaceae	Shrub/whole plant	Tumours, swellings, purgative.
115.	<i>Phaseolus trilobus</i> Ait.	Jangli-Moth, Arak-Mungani	Fabaceae	Herb/leaves	Sedative, intermittent fever.
116.	<i>Phyllanthus fraternus</i> Webs.	Kanocha, Gugaria	Euphorbiaceae	Herb/whole plant	Diuretic, dropsical affections, gonorrhoea, genito-urinary diseases, sores, stomachic, dysentery.
117.	<i>Phyllanthus maderas-patensis</i> Linn.	Hazarmani	Euphorbiaceae	Herb/leaves, seed	Expectorant, diaphoretic, carminative, laxative, diuretic, bronchitis, earache, ophthalmia, liver tonic.
118.	<i>Phyllanthus niruri</i> Linn.	Bhonyaabali	Euphorbiaceae	Herb/whole plant	Stomachic, dysentery, dropsy, ulcer, wounds, ringworm.
119.	<i>Physalis peruviana</i> Linn.	Baripopatan	Solanaceae	Shrub/whole plant	Diuretic.
120.	<i>Plantago ovata</i> Forsk.	Isabgol	Plantaginaceae	Herb/seed	Astringent, tonic, biliousness, cough, dysentery, leprosy.
121.	<i>Ploycarpea corymbosa</i> (Linn.) Lam.	Dholphuli	Caryophyllaceae	Herb/whole plant	Strangury, urinary calculi, ulcer.

Contd...

1	2	3	4	5	6
122.	<i>Plumbago zeylanica</i> Linn.	Chitrak	Plumbaginaceae	Shrub/root bark	Dysentery, leucoderma, piles, inflammation, rheumatism, bronchitis, anaemia, liver & intestinal complaints.
123.	<i>Portulaca oleracea</i> Linn.	Lunkha	Portulacaceae	Herb/leaves, stem	Alexipharmic, laxative, diarrhoea, asthma, ulcer, blisters, boils, dysentery, leprosy, piles, kidney & spleen diseases, burning sensation.
124.	<i>Portulaca quadrifida</i> Linn.	Lunki	Portulacaceae	Herb/whole plant	Alternative, laxative, asthma, cough, urinary discharge, ulcers, eye & skin diseases.
125.	<i>Prosopis cineraria</i> (Linn.) Macbr.	Khejri	Mimosaceae	Tree/bark, pods	Rheumatism, astringent.
126.	<i>Pulicaria crispa</i> (Cass.) Benth. & Hook. f.	Buhrna, Dhola- lizru	Asteraceae	Herb/whole plant	Headache, bruises.
127.	<i>Salvadora oleoides</i> Dence.	Mitho-jal	Salvadoraceae	Tree/whole plant	Vesicant, purgative, cough, aphrodisiac, laxative, carminative, bronchitis, spleen enlargement, piles.
128.	<i>Salvadora persica</i> Dence.	Kharo-jal	Salvadoraceae	Tree/leaves, fruits	Rheumatism, scurvy, astringent, anthel- mintic, diuretic, analgesic, liver tonic, carminative, deobstruent, aphrodisiac.
129.	<i>Salvia aegyptiaca</i> Linn.	Tukham malanga	Labiatae	Shrub/whole plant	Diseases of eye, diarrhoea, gonorrhoea, haemorrhage.
130.	<i>Sarcostemma acidium</i> (Roxb.) Voigt.	Khiri-Khimp, Somlata	Asclepiadaceae	Shrub/stem, root	Emetic, dog-bite, snake-bite.
131.	<i>Schweinfurthia</i> <i>papilionacea</i> (L.) Merr.	Sanipat	Scrophu- lariaceae	Herb/leaves, fruits	Typhoid, bleeding nose
132.	<i>Scoparia dulcis</i> Linn.		Scrophu- lariaceae	Herb/whole plant	Emollient, astringent, emetic, menorrhagia, excessive menstruation.
133.	<i>Sesamum indicum</i> Linn.	Til	Pedaliaceae	Herb/root, seed, seed oil	Aphrodisiac, spleen troubles, piles bleeding, menorrhoea, diuretic diaphoretic, cooling, hair growth, diarrhoea, lungs diseases, small- pox, syphilis.
134.	<i>Sida acuta</i> Burm.	Bal	Malvaceae	Shrub/root, leaves	Aphrodisiac, demulcent in gonorrhoea, astringent, nervous and urinary trouble.

Contd...

1	2	3	4	5	6
135.	<i>Sida cordifolia</i> Linn.	Bariar	Malvaceae	Shrub/whole plant	Astringent, cooling, tonic, emollient, aphrodisiac, urinary troubles, blood disease, bleeding piles.
136.	<i>Sida ovata</i> Forsk.	Bal, Dhab	Malvaceae	Shrub/seed, root	Lumbago, tonic, cooling effect.
137.	<i>Sida rhombifolia</i> Linn.	Bariara	Malvaceae	Shrub/root, leaves	Aphrodisiac, tonic, febrifuge, nervous and urinary troubles, strangury, heart diseases, piles, rheumatism.
138.	<i>Sisymbrium irio</i> Linn.	Asalio, Khub Khala	Brassicaceae	Herb/leaf, seed	Cooling and refreshing drink.
139.	<i>Solanum indicum</i> Linn.	Nar-kanta	Solanaceae	Shrub/root, fruit	Astringent, anthelmintic, digestive, cardiac troubles, bronchitis, leucoderma, fever.
140.	<i>Solanum nigrum</i> Linn.	Makoi, Chirpoti	Solanaceae	Herb/whole plant	Diseases of eye, ear, nose, ulcer on the neck, laxative, boils, headache, aphrodisiac, alternative, diuretic, inflammation, asthma, bronchitis, fever, diarrhoea, hydrophobia, leucoderma, cathartic, liver enlargement, piles, dysentery.
141.	<i>Solanum surattense</i> Burm.f.	Ringni, Kateli, Bhorangi	Solanaceae	Herb/whole plant	Expectorant, cough, asthma, chest pain, catarrhal fever, vomiting, rheumatism, cough, toothache, burning feet.
142.	<i>Sporobolus helvolus</i> (Trin.) Dur. et Schinz	Kharia	Poaceae	Perennial grass/whole plant.	Malaria.
143.	<i>Tamarix aphylla</i> (Linn.) Karst.	Lal-jhau, Farash	Tamaricaceae	Tree/bark	Astringent, aphrodisiac, eczema.
144.	<i>Tecomella undulata</i> Seem.	Rohiro, Rugtrora	Bignoniaceae	Tree/bark, seed, young branches	Eczema, abdominal & liver complaints, laxative, anthelmintic, abscess, ulcers, blood & eye diseases
145.	<i>Tephrosia purpurea</i> Pears.	Sarphoka, Biyani, Fabaceae Dhamasia		Herb/whole plant	Dyspepsia, chronic diarrhoea, enlarged liver, colic, stomach troubles, alexipharmic, ulcers, wounds, spleen complaints, anthelmintic, antipyretic, leprosy, asthma, bronchitis, gonorrhoea, lung troubles.

Contd...

1	2	3	4	5	6
146.	<i>Tinospora cordifolia</i> Miers.	Amrita gulbel	Minispermaceae	Perennial climber/root, fruit	Emetic, visceral obstruction, rheumatism, jaundice.
147.	<i>Tribulus terrestris</i> Linn.	Gokhru, Kanti	Zygophyllaceae	Herb/whole plant	Aphrodisiac, alternative, diuretic, appetiser, strangury, leprosy, piles, heart diseases, gout, kidney diseases, impotency.
148.	<i>Urgenia indica</i> (Roxb.) Kunth.	Jangli-piaz	Liliaceae	Herb/tuber	Anthelmintic, alexiteric, diuretic, emmena- gogue, purgative, bronchitis, asthma, dropsy, rheumatism, skin diseases, leprosy.
149.	<i>Vallisneria spiralis</i> Linn.	Sawala, Syala	Hydrochari- taceae	Herb/whole plant	Diuretic, anthelmintic, nephritic troubles, haemorrhage in kidney & uterus, jaundice.
150.	<i>Vernonia cinerea</i> Linn.	Sandri, Sahadevi	Asteraceae	Herb/whole plant	Diaphoretic, strangury, promotes perspira- tion, spasm of bladder, conjunctivitis, anthelmintic, alexipharmic.
151.	<i>Viola cinerea</i> Boiss. var. <i>stocksii</i> (Boiss.) Beck.	Banafsha	Violaceae	Herb/whole plant	Fever.
152.	<i>Withania coagulans</i> Dunal	Paneer-bandh	Solanaceae	Shrub/fruit, seed	Asthma, biliousness, strangury, emmena- gogue, diuretic, ophthalmia, lumbago, liver troubles, piles.
153.	<i>Withania somnifera</i> Dunal.	Asgandh, Chirpotan	Solanaceae	Shrub/root, tuber, seed, leaves	Alternative, aphrodisiac, abortifacient, tonic, narcotic, bronchitis, psoriasis, ulcers, senile debility, rheumatism.
154.	<i>Wrightia tinctoria</i> R.Br.	Kerni	Apocynaceae	Tree/whole plant	Aphrodisiac, biliousness, piles, skin diseases, dropsy, aphrodisiac, anthelmintic, amoebic dysentery.
155.	<i>Ziziphus mauritiana</i> Lamk.	Bor, Bordi	Rhamnaceae	Shrub/root, bark, fruit	Ulcer, wounds, fever, diarrhoea, digestive, blood purifier.
156.	<i>Ziziphus nummularia</i> (Burm. f.) W & A.	Jari-bor	Rhamnaceae	Shrub/leaves, fruit	Cough, cold, skin diseases, astringent, cooling, biliousness, sores, ulcerated gums.
157.	<i>Zygophyllum simplex</i> Linn.	Lunwo, Alathi	Zygophyllaceae	Herb/leaves,	Ophthalmia, leucoderma, anthelmintic.

Table 2

Family, genera and species of medicinal plants of Thar Desert.

Sl. No.	Family	No. of genera	No. of species
1	2	3	4
1.	Fabaceae	8	11
2.	Solanaceae	4	9
3.	Asclepiadaceae	7	7
4.	Malvaceae	3	7
5.	Acanthaceae	5	6
6.	Amaranthaceae	6	6
7.	Asteraceae	6	6
8.	Euphorbiaceae	3	6
9.	Convolvulaceae	5	5
10.	Lamiaceae	3	5
11.	Mimosaceae	3	4
12.	Poaceae	4	4
13.	Tiliaceae	2	4
14.	Zygophyllaceae	4	4
15.	Brassicaceae	3	3
16.	Chenopodiaceae	2	3
17.	Cleomaceae	1	3
18.	Menispermaceae	2	3
19.	Boraginaceae	1	2
20.	Burseraceae	2	2
21.	Caesalpinaceae	1	2
22.	Capparaceae	2	2
23.	Commelinaceae	1	2
24.	Cucurbitaceae	2	2
25.	Cuscutaceae	1	2
26.	Ehretiaceae	2	2
27.	Gentianaceae	2	2
28.	Liliaceae	2	2

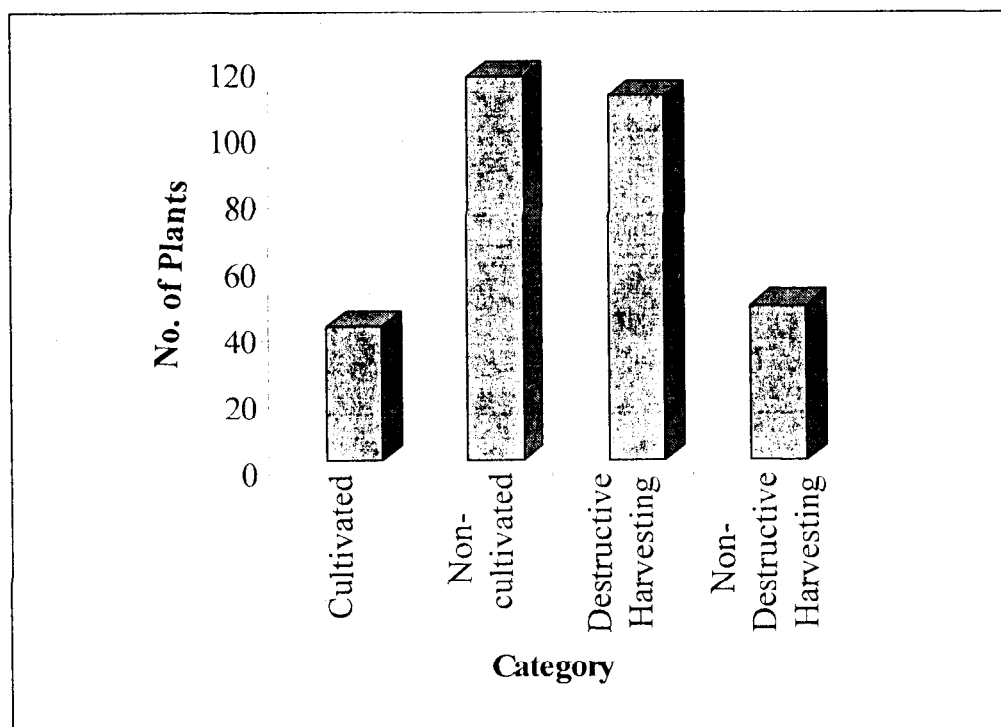
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1	2	3	4
29.	Moraceae	1	2
30.	Pedaliaceae	2	2
31.	Portulacaceae	1	2
32.	Rhamnaceae	1	2
33.	Rutaceae	2	2
34.	Salvadoraceae	1	2
35.	Scrophulariaceae	2	2
36.	Apocynaceae	1	1
37.	Araceae	1	1
38.	Aristolociaceae	1	1
39.	Balanitaceae	1	1
40.	Bignoniaceae	1	1
41.	Caryophyllaceae	1	1
42.	Cyperaceae	1	1
43.	Elatinaceae	1	1
44.	Fumariaceae	1	1
45.	Hydrocharitaceae	1	1
46.	Lauraceae	1	1
47.	Meliaceae	1	1
48.	Molluginaceae	1	1
49.	Moringaceae	1	1
50.	Nyctaginaceae	1	1
51.	Oxalidaceae	1	1
52.	Papaveraceae	1	1
53.	Periplocaceae	1	1
54.	Plantaginaceae	1	1
55.	Plumbaginaceae	1	1
56.	Polygonaceae	1	1
57.	Primulaceae	1	1
58.	Sapindaceae	1	1
59.	Simaroubaceae	1	1
60.	Tamaricaceae	1	1
61.	Verbinaceae	1	1
62.	Violaceae	1	1
Total		124	157

During the past decade, demand for medicinal plants and their products as well as health systems have attracted worldwide interest. India, being the Botanical Garden and treasure house of biodiversity with its diverse ecological conditions, rich ethnic diversity and a strong traditional knowledge base, accounts for 45,000 plant species and out of these 8,000 species are used medicinally (Tewari, 2000). Ninety per cent of the herbal industrys' requirement is met from the forests, resulting into the destruction. There is no reliable assessment of the volume or value of the herb related trade in India, but, the

conservatives put the quantity of dry raw material collected at 0.5 million tonnes each year. Thar biodiversity is a very fragile eco-system and any practice of over exploitation of monotypic and monogeneric families may lead to the extinction of taxa. As stated above, 27 families of medicinal importance of Thar Desert are monogeneric while 8 are represented by only two species out of total 64 families represented. Thus there is an urgent need to formulate strategies for proper sustainable utilization of medicinal flora of Thar Desert especially monogeneric families which need greater attention in this regard.

Fig. 1



Distribution of medicinal plants on the basis of cultivation and harvesting

Table 3

Distribution of mono-generic families on the basis of cultivation practices on the species.

Sl. No.	Latin Name	Local Name	Family	Status (Cultivated/ Non-cultivated)
1.	<i>Bacopa monnieri</i> (Linn.) Pennell	Brahmi	Araceae	Cultivated
2.	<i>Tecomella undulata</i> (Sm.) Seem.	Rohida	Bignoniaceae	Cultivated
3.	<i>Azadirachta indica</i> A. Juss.	Neem	Meliaceae	Cultivated
4.	<i>Moringa oleifera</i> Lam.	Sanjna	Moringaceae	Cultivated
5.	<i>Boerhavia diffusa</i> Linn.	Punarnava	Nyctaginaceae	Cultivated
6.	<i>Plantago ovata</i> Forsk.	Isabgol	Plantaginaceae	Cultivated
7.	<i>Plumbago zeylanica</i> Linn.	Chitrak	Plumbaginaceae	Cultivated
8.	<i>Ailanthus excelsa</i> Roxb.	Ardu, Maharukh	Simaroubaceae	Cultivated
9.	<i>Tamarix aphylla</i> Linn. Karst.	Lal-jhau, Farash	Tamaricaceae	Cultivated
10.	<i>Wrightia tinctoria</i> R. Br.	Kerni	Apocynaceae	Non-cultivated
11.	<i>Aristolochia bracteolata</i> Lamk.	Kiramar	Aristolociaceae	Non-cultivated
12.	<i>Balanites aegyptiaca</i> Del.	Hingota	Balanitaceae	Non-cultivated
13.	<i>Ploycorpea corymbosa</i> (Linn.) Lam.	Dholphuli	Caryophyllaceae	Non-cultivated
14.	<i>Cyperus rotundus</i> Linn.	Motha, Mothee	Cyperaceae	Non-cultivated
15.	<i>Bergia suffruticosa</i> (Delile) Fenzl	Kankaio, Karbuji	Elatinaceae	Non-cultivated
16.	<i>Fumaria indica</i> Pugsley	Pithpaparo	Fumariaceae	Non-cultivated
17.	<i>Vallisneria spiralis</i> Linn.	Sawala, Syala	Hydrocharitaceae	Non-cultivated
18.	<i>Cassytha filiformis</i> Linn.	Amebel	Lauraceae	Non-cultivated
19.	<i>Glinus lotoides</i> Linn.	Hata, Badka	Molluginaceae	Non-cultivated
20.	<i>Oxalis corniculata</i> Linn.	Khatti-buti	Oxalidaceae	Non-cultivated
21.	<i>Argemone mexicana</i> Linn.	Satyanashi	Papaveraceae	Non-cultivated
22.	<i>Periploca aphylla</i> Decne.	Barri	Periplocaceae	Non-cultivated
23.	<i>Calligonum polygonoides</i>	Phog, Phogda Linn.	Polygonaceae	Non-cultivated
24.	<i>Anagallis arvensis</i> Linn.	Neel	Primulaceae	Non-cultivated
25.	<i>Cardiospermum halicacabum</i>	Chirphuta Linn.	Sapindaceae	Non-cultivated
26.	<i>Clerodendron phlomidis</i> Linn.	Arni	Verbenaceae	Non-cultivated
27.	<i>Viola cinerea</i> Boiss. var. <i>stocksii</i> (Boiss.) Beck.	Banafsha	Violaceae	Non-cultivated

Table 4

Habit wise distribution of medicinal plants of Thar Desert.

Sl. No.	Habit	No. of species
1.	Herb	80
2.	Perennial climber	1
3.	Perennial grass	3
4.	Perennial sedge	1
5.	Shrub	51
6.	Tree	21
Total		157

Conclusions

The analysis of the plant diversity indicates that 73 % of the total families represent 39 % of the total genera and 23 % of the total plant species have one or other medicinal uses. The lesser number of plant species is of indication that most of the families are monogeneric. Extra care is needed for the commercial exploitation of such monogeneric elements of potential value.

Acknowledgement

The authors are thankful to National Medicinal Plants Board, New Delhi for financial help.

SUMMARY

The Thar Desert is the world's seventh largest desert and is most inhospitable eco-region in the Indo-Pacific region. It is spread over in the four states of India, and in Pakistan and covering an area of about 2,38,700 km². There are as many as 157 species of plants with medicinal value. Medicinal value and usefulness of several species is yet to be studied and established. The diversity of the medicinal flora typical of desert ecosystem has immense future prospects. The prominent families to which the majority of the medicinal plants of the arid zone belong are : Fabaceae, Asclepiadaceae, Malvaceae, Acanthaceae, Amaranthaceae, Convolvulaceae., Lamiaceae (Labiateae). The present study is aimed at indexing of all medicinal flora occurring in the Western Rajasthan of Indian desert and their uses for the benefit of the researchers to undertake studies on the prospects and potential of commercial exploitation.

थार की जैवविविधता को औषधियों के लिए काम में लाना

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सारांश

थार मरुभूमि विश्व की सबसे बड़ी मरुभूमियों में सातवें क्रम पर आती है तथा भारत-प्रशांत महासागर प्रदेश की वह सबसे विकटतम परिस्थिति-क्षेत्र है। यह भारत के चार राज्यों में फैली हुई है और पाकिस्तान में भी लगभग 2,38,700 वर्ग किमी. क्षेत्र पड़ता है। इसमें 157 जितनी ज्यादा जातियां औषध महत्व वाली हैं। परन्तु इनमें से कुछ जातियों की औषधीय मूल्यवत्ता और उपयोगिता का अध्ययन करके उन्हें स्थापित किया जाना बाकी है। मरुभूमि परिस्थिति संहति के विशिष्ट प्रकार के पेड़पौधों की विविधता की भविष्य में भारी संभावनाएं हैं। जिन मुख्य कुलों में इस शुष्क प्रदेश के अधिकांश औषधीय पेड़पौधे आते हैं वे इस प्रकार हैं - पृथुशिम्बि कुल, अर्क कुल, भेण्डी कुल, वासम कुल, खरमंजरी कुल,

हरिणपदी और तुलसीकुल कुल । प्रस्तुत अध्ययन का उद्देश्य अनुसन्धानकर्ताओं के लाभार्थ इस भारतीय मरुभूमि के पश्चिमी राजस्थान वाले भाग में मिलने वाले सभी औषधीय पेड़पौधों और उनके उपयोगों की अनुक्रमणिका तैयार करना है ताकि वे उनकी संभावनाओं और क्षमताओं के बारे में व्यापारिक समुपयोजन विषयक अपने अध्ययन शुरू कर सकें ।

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