

PHYTODIVERSITY OF THE NARAYAN SAROVAR WILDLIFE SANCTUARY, KACHCHH, GUJARAT, INDIA

R. P. PANDEY, V. SINGH AND P. J. PARMAR

**Botanical Survey of India, Arid Zone Regional Centre, Jodhpur 342 008*

ABSTRACT

The present paper deals with an account of vegetation, floral composition and analysis, forest types and its associations. It comprises 455 species of vascular plants, under to 247 genera and 74 families. Besides this, important economic plants of bioperspective nature, a list of 13 cultivated/ crop plants and their 14 wild relatives, 39 rare, threatened and endemic taxa which need effective conservation measures for maintenance of germplasm.

Keywords : Gujarat, Kachchh, Narayan Sarovar Wildlife Sanctuary, Phytodiversity, Rare, Threatened.

INTRODUCTION

Narayan Sarovar Wildlife Sanctuary, located in the western most part of the country, is locally known as 'Naransar'. It is a place of pilgrimage and is about 2 km from Koteswar. Koteswar is one of the 12th Jyoti Linga of Lord Shiva in India. The temple of Lord Shiva constructed during 18th century is the main attraction of the place. Narayan Sarovar is considered to be one of the five holy lakes in India whose importance is narrated in the Hindu scriptures *Shrimad Bhagwat*, *Vayu Purana*, *Vishnu Purana*, etc.

The practice of conservation of natural resources in the Kachchh goes way back to the princely times when certain resource rich areas were given legal protection by declaring them as "Rakhals" (reserve forests). The objective behind this was to ensure the availability of big game as well as fodder to the livestock during scarcity.

Period of 1970-1990 may be considered to be a period of serious attempts made by the government for the preservation of wild living resources, when a number of areas were notified as Sanctuaries and National Parks. Out of 21 Sanctuaries in Gujarat State, 4 are situated in Kachchh which shows the importance of the area.

Recognizing its unique phyto-geographical position, uncommon ecosystem and its unique biodiversity, in April 1981, State Government notified 765.79 sq km area of 4 rakhals, viz. Gagariana, Ratipal, Kaniyara & Mindhiari as wildlife sanctuary in Lakhpat taluka of Kachchh district, popularly known as Narayan Sarovar Wildlife Sanctuary.

In 1993, an area of 94.87 sq km of Narayan Sarovar WLS, spread over 16 villages was denotified as "Chinkara Wildlife Sanctuary", as Chinkara is the key species of this region; this notification was quashed by hon'ble Highcourt. In 1995, the areas in and around the boundary of the Narayan Sarovar WLS, bounded with rich mineral deposits, forced the State Government to denotify about 321 sq km area and, thus, reduced the Sanctuary to present extent of 444.23 sq km (including village Pakho). Narayan Sarovar is the first Sanctuary, which was denotified by the Government. The settlement work in the Sanctuary is still going on and final notification of the Sanctuary is yet to be issued (Annon., 2001).

The percentage geographical area in the State under the wildlife-protection areas is above the national average of 4.3%. Rodgers & Panwar (1988) have classified India into 10 Biogeographic zones and 25 biotic provinces. Accordingly, Gujarat has four Biogeographic zones and five biotic provinces. Narayan Sarovar Wildlife Sanctuary comes under Biogeographic zone-3 Indian Desert, Biotic province- 3- A Kachchh. This Biogeographic zone comprises four sanctuaries, covering approximately 74% of the total area under protected areas network in the State (*Table 1*).

Table 1: Distribution of wildlife protected areas in Biogeographic Zone - 3 Indian Desert, Biotic Province - 3 A Kachchh.

Biogeographic Sub-Div	Area (sq km)	Sanctuary	Area (sq km)
Little Rann	5000	1.Wild Ass Sanctuary	4953.70
Great Rann	10000	2.Desert Wildlife Sanctuary	7506.20
Southern hills	33000	3.Narayan Sarovar WLS	444.23
		4.Kachchh Bustard Sanctuary	12906.10

AREA AND TOPOGRAPHY

Narayan Sarovar Wildlife Sanctuary (WLS), lies between 23° 27' - 23° 42' N latitude and 68° 30' - 68° 57' E longitude in Lakhpat taluka of Kachchh district, having a total area of 436.77 sq km. Total forest area is 152.95 sq km, with 119.74 sq km reserved forest and 33.21 sq km unclassified forest. There are 31 villages in the Sanctuary. The tract of the Sanctuary is mainly hilly lying in eastern, north- eastern, south- eastern and with undulating areas interspersed with small hill range extending east- west. Western coastal region have sand dunes and the hummocky plains, interspread with rocky- gravelly plains and gentle slopes towards the sea- coast. Few water bodies like dams; ponds and puddles are also present in the Sanctuary area. The entire western area is an ecotone of intertidal mangrove. The Kori creek surrounds the Sanctuary in the north- west and the mangrove forest on the west. The altitude ranges from 2.7 meter above msl near coastal Tahera village and 157 meter above msl in Manijal hill at Kaniyaro Rakhal.

GEOLOGY AND SOIL

The geological formations of Kachchh range is in age from middle Jurassic to late Tertiary periods with unconformities breaking the succession between the middle cretaceous, supra- trappean, middle Kirthar, and finally Miocene & Pliocene. Therefore, the entire Kachchh district may have an effect in epitome of Jurassic and post Jurassic geology of India. Thus, Kachchh is considered to be an eastern extension of the mobile belt then a part of the unfolded and stable peninsular foreland of India.

Geologically Narayan Sarovar WLS area exposes the following rock formations of Jurassic and Cretaceous periods:

- Deccan trap is a basaltic rock, confined to Pandhro in the west and extended to east of Anjar. The lava flows vary from medium grained to aphanites type at times being periphyritic.
- Tertiary formation is exposed in the central part of the Sanctuary and lying as a continuous horizon all along the western, southern and south- eastern coast of Kachchh from Lakhpat in the west to as far as Vandh on the eastern side. The numulitic limestone and shale are exposed bordering the balastic rocks in south and go upto Lakapat.
- Pleistocene formations support coarse sandy limestone, which are massive with forameniferal shells, sand grains and other rock fragments.
- Recent alluvium is recorded as a belt of 5 to 15 km along the coast. Few coastal sand dunes are also present along the western boundary (Anon., 1971).

The Narayan Sarovar WLS represents three major types of soil, viz. sandy- alluvium, clay and black-loam. Alluvium sandy type of soil is restricted to the western coastal bank areas, the clay deposition is present on both northern and southern parts of the sanctuary. Bentonite clay is present in the southern part; it has poor moisture retention capacity and very less permeability. As a result of this, vegetation is very poor in such type of soil. Black loamy soil is found mainly in the central part of the sanctuary. Comparatively, this soil is fertile due to better moisture retention capacity and thus supports better vegetation.

CLIMATE

Narayan Sarovar WLS has a semi- arid climate, May and June are the hottest months with dusty storms, and day temperature reaches upto 43°C, while December and January are the coldest months. The mean maximum day temperature during winter is about 15°C. The mean annual rainfall is extremely erratic in the region and there are only 8-9 rainy days in a year. The average annual precipitation is 200 to 350 mm. More than 90% of total rain is received during south- west monsoon, which normally set over an area between last week of June and remains active till September. There are considerable variations and fluctuations in the temperature in different months and seasons. The humidity is also quite considerable in the Sanctuary area.

PREVIOUS WORK AND PRESENT STUDY

The earliest recorded information on plants of Kachchh, provided by Plain (1880). At the time of publication of “Flora of Bombay Presidency” by Cooke (1901 – 08), Gujarat was a part of presidency, and was the least explored part of the presidency, especially North Gujarat and Kachchh, which have been touched only by few visits.

After Cooke, phytodiversity of Kachchh was explored by many workers *viz.* Blatter (1908 - 09), Thakar (1926), Kapadia (1954a,b), Puri & al. (1959 - 1960), Jain & Deshpande (1960a,b), Jain & Kanodia (1960), Chavan & Sabnis (1962), Bhandari (1965), Kanodia & Nanda (1966), Jain (1968), Rao (1970), Guha Bakshi (1971), Rao & Sabnis (1977), Rao (1981 - 81a), Parmar & Singh (2003) etc, but, there is no published account on phytodiversity of Narayan Sarovar, except an account on ecological status of Narayan Sarovar WLS (Annon., 2001) which provides a list of 255 species of flowering plants. Shah (1978) published a comprehensive account on the phytodiversity of Gujarat. Raghavan & al. (1981) updated this work in form of check list. Recently, Pandey & Singh, (1999), Pilo & al. (1996), Singh & Prabia (2003) and Meena & Pandey (2004) studied the floristic diversity of Gujarat as a whole.

Considering the importance of floral, faunal and its unique ecosystem value of this fragile arid region, Botanical Survey of India, Jodhpur takes initiative to explore the phytodiversity of Kachchh region, with special reference to Narayan Sarovar WLS. During the years 2000 to 2005, five exhaustive and intensive botanical exploration tours of 15 days each, in different seasons have been undertaken. During these visits a total numbers of about 10,000 plant specimens were collected, out of this about 3,500 specimens were only from Narayan Sarovar Wildlife Sanctuary. In the present study a total number of 454 species of flowering plants belonging to 246 genera and 73 families have been enumerated. The specimens have been deposited in the herbarium of Arid Zone Circle of Botanical Survey of India, Jodhpur (BSJO) and Central National Herbarium, Howrah (CAL). Species marked with an asterisk (*) are included on the authority of Anon., 2001.

VEGETATION

The Narayan Sarovar WLS represents a unique floral and faunal assemblage of arid ecosystem, and the representative habitat of mixed thorn forest and grasslands / savannas which are well distributed mainly in two zones, *viz.* Pipar and Mindhiari and partially in Ratipal. The vegetation near hills and the valleys appears more dense and luxuriant during monsoon period; the herbaceous ground cover also flourishes well during the rainy season. During summers and winters, only woody perennial species survive. A huge portion of the area of the Sanctuary exhibits the edaphic climax of the Tropical thorn forest with average tree height 3 to 5 m, except in the areas where anthropogenic pressure or factors have decimated them. Thus, major portion of the Narayan Sarovar WLS comes under thorny scrub jungles and interspersed with grasslands / savannas.

According to classification of forest types of India (Champion & Seth, 1968), the following forest types may be recognised in Narayan Sarovar Wildlife Sanctuary.

Northern tropical dry deciduous scrub type (5B)

1. 5B/DS1 - Dry deciduous scrub forest.
2. 5B/DS2 - Dry Savannah type forest.
3. 5B/DSE3 - Babul forest (*Acacia nilotica* ssp. *subalata* type).

Northern tropical thorn forest (6B)

1. 6B/C1 - Desert thorn forest.
2. 6B/DS2 - Tropical *Euphorbia* scrub type.
3. 6B/E2 - *Acacia senegal* type forest.
4. 6B/ DS2 - *Euphorbia* thorn forest.
5. 6B/ E2 - *Acacia senegal* forest.
6. 6B/C1 - Desert thorn forest.
7. 6B/DS1 - *Ziziphus* scrub forest.
8. 6B/E4 - *Salvadora* scrub forest.
9. 6B/1S1 - Desert dune scrub forest.

On the basis of edaphic factors, the vegetation of the Sanctuary may be classified in to following habitats:

1. Hills and valleys
2. Rocky gravelly undulating plains
3. Sandy hummocky plains with low sand -dunes
4. Western coastal mangroves and saline habitat
5. Marshy / aquatic habitat
6. Weeds

1. Hills and valleys: Narayan Sarovar WLS is surrounded from all four sides by hills and valleys with some interspersing areas of hummocky sandy and gravelly rocky plains. A chain of considerable high hills is situated at Mindhiari, Kaniyaro, Chamro, Daulatpar, Subhashpar, Khadak, Bitiyari and Dayapar etc in the eastern side of the Sanctuary. Similarly, in western side, some hills and rock out -crops are also present at Pipar, Ratipal, Nareda, Khirsara and Laxmirani etc. Northern side comprises hills at Narayan Sarovar, from Verma Nagar to Pandhro and up to Dayapar. The southern side also has a continuous chain of hills ranging from Dayapar to Mata-na- Madh and further east up to Nakhtarana.

The most dominating tree species on hills and valleys are: *Acacia senegal* and *Acacia nilotica* ssp. *subalata*, which predominate in the western side having lime stone formation in the gravelly- rocky plains or at the base of hills. The lime stone formations were also recorded at Guhar nani, Guhar moti, Lakki, Gugariyana, Kerwandh, Pipar, Bhutau, Khirsa, and Medi etc. In the hilly region and rocky- gravelly plateau of eastern region, *Acacia senegal* is dominant species and it covers major parts of the reserve forest at Haman Khudi, Halapar, Mudia, Chamro, Mindhiari, Kaniyaro, Subhashpar, Daulatpar, Nareda, Bhudha etc. The common associations observed in this habitat are:

- (i) *Acacia nilotica* ssp. *subalata* with *Salvadora oleoides*, *S. persica*
- (ii) *Capparis decidua* with *Salvadora oleoides*, *Ziziphus nummularia*
- (iii) *Ziziphus nummularia* with *Prosopis juliflora*, *Acacia senegal*
- (iv) *Acacia senegal* with *Capparis decidua*, *Ziziphus nummularia*, *Salvadora oleoides*
- (v) *Ziziphus nummularia* & *Capparis decidua*
- (vi) *Acacia senegal* with *Euphorbia caducifolia*, *Salvadora oleoides* and
- (vii) *Ziziphus nummularia* and *Salvadora oleoides*.

The other common trees and shrubs in these *Rakhals* are: *Acacia leucophloea*, *A. eburnea*, *Balanites aegyptiaca*, *Capparis decidua*, *C. grandis*, *Commiphora wightii*, *Cordia perrottetii*, *Euphorbia caducifolia*,

Grewia tenax, *G. villosa*, *Lycium barbarum*, *Premna resinosa*, *Prosopis juliflora*, *P. cineraria*, *Salvadora oleoides*, *S. persica*, *Ziziphus nummularia* etc. At few places *Acacia senegal* and *A. nilotica* ssp. *subalata* are noted at the base of hills. The other associates of these are *Acacia eburnea*, *A. nilotica* ssp. *indica*, *A. tortilis*, *Calotropis procera*, *Senna auriculata*, *Salvadora* spp., *Prosopis* spp. and *Ziziphus nummularia*. In some of the areas of the Sanctuary, *Prosopis juliflora* spreads widely leading to declination of the grass cover and herbaceous ground cover.

The common climber and twiners recorded from hills and valleys are: *Asparagus dumosus*, *A. racemosus*, *Cadaba fruticosa*, *Dalechampia scandens* var. *codofana*, *Ipomoea* spp., *Rhynchosia minima*, *Rivea hypocrateriformis* etc. The ground cover, which is quite luxuriant during monsoon, comprises herbaceous annuals and ephemerals like *Digera muricata*, *Dipteracanthus patulus* var. *alba*, *Indigofera cordifolia*, *Pupalia lappacea*, *Tephrosia purpurea*, *Tribulus terrestris*, *Vernonia cinerea*, together with species of *Amaranthus*, *Boerhavia*, *Cassia*, *Cleome*, *Corchorus*, *Sida* etc. The common grasses which sometimes cover a large area are: *Apluda mutica*, *Aristida adscensionis*, *Brachiaria ramosa*, *Chrysopogon fulvus*, *Cymbopogon martinii*, *Desmostachya bipinnata*, *Dichanthium annulatum*, *Echinochloa colona*, *Heteropogon contortus*, *Melanocenchris jacquemontii*, *Tetrapogon tenellus*, *Tragus roxburghii*, and species of *Cenchrus*, *Chloris*, *Eragrostis*, etc.

2. Rocky- gravelly undulating plains: Rocky- gravelly and undulating plains are quit common and are spread from Narayan Sarovar to Haman Khudi, Guhar, Kanoj, Sheh, Tahera, Halapar, Nareda, Vanyor and Baranda etc. The common trees and shrubs recorded here are almost the same as recorded on the hills, but they are very sparsely distributed. The thorny scrub type vegetation of these regions face a high biotic pressure, particularly the ground flora (after monsoon) as most of the livestock is grazing on these plains. A peculiar feature of this habitat was noted after 10 km of Narayan Sarovar along Haman Khudi, Nareda, Halapar via Baranda and Vanyor, where the entire area of rocky gravelly plains are covered with a homogeneous population of *Helichrysum cutchicum* which gives a terpentine like smell in the environment. A large purplish pink- flowered rare species of *Senneria incana* was also recorded here. The common associations recorded in this habitat are:

- (i) *Acacia* with *Salvadora oleoides*, *S. persica*
- (ii) *Capparis decidua* with *Salvadora oleoides*, *Ziziphus nummularia*
- (iii) *Ziziphus nummularia* with *Prosopis juliflora*, *Acacia senegal*
- (iv) *Acacia senegal* with *Premna resinosa*, *Capparis decidua*, *Ziziphus nummularia*, *Salvadora oleoides*.

The common trees and shrubs of this habitat are: *Acacia senegal*, *A. eburnea*, *A. leucophloea*, *A. nilotica* ssp. *subalata*, *Capparis decidua*, *Cordia perrottetii*, *Commiphora wightii*, *Euphorbia caducifolia*, *Grewia tenax*, *Lycium barbarum*, *Premna resinosa*, *Prosopis juliflora*, *P. cineraria*, *Salvadora oleoides*, *S. persica*, *Ziziphus nummularia* etc. The ground flora is similar to hills.

The common climbers of this habitat are: *Asparagus racemosus*, *A. dumosus*, *Cadaba fruticosa*, *Dalechampia scandens* var. *cordofana*, *Ipomoea* spp., *Maerua oblongifolia*, *Mukia maderaspatana*, *Rivea hypocrateriformis*, *Rhynchosia minima* etc.

The undulating plains are very rich in grass species called as "Savannah" (grasslands). The common grasses are *Aristida* spp., *Cenchrus* spp., *Chloris* spp., *Dichanthium annulatum*, *Eragrostis* spp., *Panicum* spp., *Sporobolus* spp., *Melanocenchris jacquemontii*, *Tragus roxburghii*, *Tetrapogon tenellus* etc. Physiognomically, Sanctuary predominantly supports mixed scrub thorn forest (58%) and grasslands (savannah) (25%) types.

3. Sandy hummocky plains with low sand dunes: The western part of the Sanctuary, particularly from Narayan Sarovar to Haman Khudi, Lakki, Medi, Gangariana and in the east upto Lakhpat, is covered with sandy hummocky plains with low dunes. This habitat is also intermixed with rocky / gravelly plains and ends in mangrove forest.

The common trees and shrubs are: *Calotropis procera*, *Capparis decidua*, *Cordia perrottetii*, *Commiphora wightii*, *Lycium barbarum*, *Acacia leucophloea*, *Prosopis cineraria*, *Salvadora oleoides*, *S. persica*, *Ziziphus nummularia* etc. The common ephemerals and undershrubs forming a green carpet during moonson season are: *Aerva javanica*, *Borreria articularis*, *Boerhavia diffusa*, *Citrullus colocynthis*, *Corchorus depressus*, *Crotalaria burhia*, *Cucumis callosus*, *C. prophetarum*, *Enicostema axillare*, *Fagonia schweinfurthii*, *Gisekia pharnaceoides*, *Heliotropium zeylanicum*, *Hibiscus micranthus*, *Indigofera cordifolia*, *I. linnaei*, *Leptadenia pyrotechnica*, *Mollugo cerviana*, *Polygala erioptera*, *Pulicaria angustifolia*, *P. crispa*, *Seriscostoma pauciflora*, *Sida cordata*, *S. ovata*, *Solanum nigrum*, *Tribulus terrestris*, *Trichodesma amplexicaule* var. *indica*, *Vernonia cinerea*, *Withania somnifera* etc.

The common grasses and sedges recorded are: *Aristida* spp., *Cenchrus* spp., *Chloris* spp., *Dactyloctenium aegyptium*, *D. scindicum*, *Dichanthium annulatum*, *Ochthochloa compressa*, *Panicum antidotale*, *P. typheron*, *Sporobolus* spp., *Tetrapogon tenellus* etc. *Bolboschoenus maritimus*, *Cyperus conglomerates*, *Cyperus difformis*, *C. iria*, *C. rotundus*, *Eleocharis geniculata*, *Fimbristylis bisumbellata*, *Schoenoplectus roylei* etc are the common sedges recorded here. Lactiferous *Periploca aphylla* climbs on the clumps of bushes in association with *Rhynchosia minima*.

The common associations recorded in this psammophytic habitat are:

- (i) *Capparis decidua* with *Salvadora oleoides* and *Ziziphus nummularia*
- (ii) *Aerva javanica* with *Crotalaria burhia* and *Leptadenia pyrotechnica*
- (iii) *Ziziphus nummularia* with *Prosopis juliflora* and *Acacia leucophloea*
- (iv) *Cenchrus ciliaris* with *C. biflorus*, *C. setigerus*, *Aristida* spp. and *Eragrostis tremula*.

4. Western Coastal Mangrove and saline habitat: The sandy hummocky and saline plains, which ultimately end in mangrove and muddy rann are common from Lakki to Medi. The common species recorded from saline habitat are: *Ammannia baccifera*, *Artiplex stocksii*, *Bergia ammannioides*, *Cressa cretica*, *Glinus lotoides*, *Heliotropium curassavicum*, *H. ovalifolium*, *Eclipta prostrata*, *Blumea obliqua*, *Polygonum plebium*, *Suaeda fruticosa*, *Tamarix* spp., *Trianthema portulacastrum* and *Zygophyllum simplex* etc. Sedges and grasses are poorly represented in these habitats, like *Scirpus tuberosus*, *Aeluropus lagopoides*, *Sporobolus* spp., *Urochondra setulosa* etc in association with *Ochthochloa compressa*.

The coastal area of Kachchh is surrounded on the south by the Gulf of Kachchh and on the west by the Arabian Sea. The coastal region in the west of Narayan Sarovar WLS rises gently and is fringed with mangrove swamps from Lakki to Kori Creek. Xerophytic and salt tolerant species are the characteristic feature of this mangrove forest, and dominating species having climatic climax is *Avicennia marina*, which reaches upto Pakistan border (Kori Creek). *Heliotropium ovalifolium*, *Peganum harmala* var. *stenophylla*, *Scaveola taccada* and *Tamarix* spp., are the other common elements of the permanent vegetation of mangrove forest. At tidal creeks, *Avicennia marina* associated with a grass species of *Urochondra setulosa* forms a dense association.

5. Marshy / Aquatic habitat: There is no perennial river in the Sanctuary; Guhar dam is the only permanent water source used for irrigation as well as drinking purposes. Though, the Sanctuary has eight water bodies located at Haman Khudi, Pipar, Halapar, Mindhiari, Narayan Sarovar, Godhatal and Suvar, but excepting Guhar dam all are ephemeral and have water only for few months after the rains. In relation to the substratum, water and air, the hydrophytes of the Sanctuary may be grouped into following life forms.

- i. Rooted with floating leaves: *Potamogeton nodosus*.
- ii. Attached submerged: *Vallisneria spiralis* var. *denseserrulata*.
- iii. Suspended submerged: *Najas minor*.
- iv. Amphibious emerged: *Typha domingensis*, *Bolboschoenus maritimus*.

v. Marshy: The common plants of marshy habitat are: *Alternanthera sessilis*, *Ammannia baccifera*, *Bacopa monnieri*, *Bergia ammannioides*, *Blumea* spp., *Coldenia procumbens*, *Eclipta prostrata*, *Grangea*

maderaspatana, *Heliotropium ovalifolium*, *Phyla nodiflora*, *Polygonum plebeium*, *Vernonia cinerea* etc. The sedges like *Bolboschoenus maritimus*, *Cyperus pygmaeus*, *C. rotundus*, *Schoenoplectus roylei* etc. and grasses like *Echinochloa colona*, *Eragrostis ciliaris* var. *brachystachya* etc.

6. Weeds: Several characteristic weedy species forms a considerable part of the Sanctuary in association with seasonal crops, fallow fields and in wastelands. Maximum weeds are noted in rainy season in comparison to winter or summer season. The common winter season weeds with 'Rabi' crop are: *Celosia argentea*, *Chenopodium album*, *C. murale*, *Euphorbia hirta*, *Fagonia schweinfurthii*, *Polycarpaea corymbosa* etc. The common grass species associated with these are: *Dactyloctenium aegyptium*, *Eragrostis tremula* etc.

The weed species associated with summer crops are *Alhagi maurorum*, *Crotalaria burhia*, *Solanum nigrum*, *Tribulus terrestris*, *Withania somnifera* and *Ziziphus nummularia* etc.

Due to more humus and moisture contents during rainy season, maximum weed species are recorded, sometimes forming a pure population and lush green carpet in fallow fields and wastelands. The common rainy season weeds associated with 'Kharif' crop are: *Achyranthes aspera*, *Alternanthera sessilis*, *Aristolochia bracteolata*, *Boerhavia diffusa*, *Catharanthus pusillus*, *Celosia argentea*, *Cleome gynandra*, *C. viscosa*, *Commelina benghalensis*, *Corchorus trilocularis*, *Digera muricata*, *Euphorbia clarkeana*, *E. hirta*, *Gisekia pharanaceoides*, *Heliotropium maurifolium* var. *wallichii*, *H. strigosum*, *Indigofera hochstetteri*, *I. linnaei*, *Kohautia aspera*, *Launaea procumbens*, *Mollugo cerviana*, *Nothosaerva brachiata*, *Hedyotis corymbosa* var. *linearis*, *Pulicaria angustifolia*, *Phyllanthus fraternus*, *P. maderaspatana*, *Physalis divaricata*, *Portulaca oleracea*, *Sida cordifolia*, *S. ovata*, *Spermacoce hispida*, *S. pusilla*, *Tephrosia purpurea*, *Trianthema portulacastrum*, *Trichodesma indica* var. *amplexicaule*, *Vernonia cinerea*, *Withania somnifera* etc. The common grasses competing with the crops in rainy season are: *Aristida adscensionis*, *Cenchrus biflorus*, *C. ciliaris*, *C. setigerus*, *Chloris* spp., *Dactyloctenium aegyptium*, *D. scindicum*, *Desmostachya bipinnata*, *Dichanthium annulatum*, *Echinochloa colona*, *Eragrostis* spp., *Ochthochloa compressa*, *Tetrapogon tenellus* etc. *Cyperus rotundus* is the only sedge showing its presence with these grasses.

SYNOPSIS OF THE FLORA

In the present work 455 indigenous and naturalized species belonging to 247 genera under 74 families have been enumerated. (Table 2)

Table 2: Synopsis of the flora.

Taxonomic group	Families		Genera		Species	
	No.	%	No.	%	No.	%
ANGIOSPERMS						
Dicotyledons	64	85.49	193	78.14	354	77.80
Monocotyledons	9	12.16	53	21.46	100	21.98
GYMNOSPERMS						
	1	1.35	1	0.40	1	0.22
TOTAL	74	100.00	247	100.00	455	100.00

The phytodiversity of the Sanctuary shows that, among the dicotyledons, the class Polypetale dominates and represented by 177 species (38.99%) belonging to 95 genera and 36 families. Fabaceae is the largest family with 42 species and Malvaceae occupies second place with 21 species in Polypetalae. Gamopetalae finds second place and represented by 130 species (38.63%), 73 genera and 20 families. Convolvulaceae is the largest family with 22 species in gamopetalae followed by Asteraceae and Boraginaceae with 19 and 17 species. The class Monochlamydeae is represented by 47 species (10.35%) belonging to 25 genera and 8 families. Amaranthaceae is the largest family in Monochlamydeae with 16 species, followed by Euphorbiaceae with 15 species.

Monocotyledon & shows poor representation in the Sanctuary with only 100 species (22.02%) belonging to 53 genera and 9 families. It is interesting to note that out of 100 species of monocots, Poaceae is represented with 66 species and Cyperaceae with 18 species; the other 7 families of monocots have only 16 species. Gymnosperm was represented by single taxa.

The ratio of species belonging to Monocotyledons to Dicotyledons is 1: 3.5, of genera 1: 3.6 and of families 1: 7.1. The ratio of total number of genera to species is 1: 1.84 which is rather low in comparison to the corresponding ratio for Flora of Gujarat which is about 1: 2.2 (Shah, 1978), 1: 2.3 (Pandey & Singh, 1999), 1: 2.4 (Singh & Parabia, 2003) and 1: 2.5 (Meena & Pandey, 2004), but it is about equal to the ratio for Flora of Kachchh 1: 1.8 (Thakar, 1926) and Flora of North Gujarat 1: 1.8 (Saxton & Sedgwick, 1918).

ECONOMIC POTENTIALITY OF PHYTODIVERSITY

The phytodiversity of the Sanctuary is quite rich in economic resources and many of them have potentiality to add to the economy of the State.

Medicinal plants: The therapeutic properties of plant have created wide interest among people to learn about plants and their parts, which may be used as a source for new drugs. The local inhabitants of the Sanctuary have acquired a deep knowledge in this field due to their long association with the local plants in the forests. Some important medicinal plants used by the inhabitants of Narayan Sarovar WLS for the treatment of various diseases are: *Abrus precatorius*, *Acacia nilotica* ssp. *indica*, *A. nilotica* ssp. *subalata*, *A. senegal*, *Achyranthes aspera*, *Aerva javanica*, *Amaranthus tricolor*, *A. viridis*, *Ammannia baccifera*, *Aristolochia bracteolata*, *Asparagus racemosus*, *Avicennia marina*, *Bacopa monnieri*, *Balanites aegyptiaca*, *Barleria prionitis*, *Bergia suffruticosa*, *Blepharis linariaefolia*, *Boerhavia diffusa*, *Bombax ceiba*, *Cadaba fruticosa*, *Cajanus cajan*, *Calotropis procera*, *Capparis cartilaginea*, *C. decidua*, *Cardiospermum halicacabum*, *Cassia siamea*, *Catharanthus pusillus*, *Celosia argentea*, *Cenchrus setigerus*, *Chenopodium album*, *Citrullus colocynthis*, *C. lanatus*, *Clerodendrum phlomidis*, *Cleome brachycarpa*, *C. gynandra*, *C. viscosa*, *Clitoria ternatea*, *Coccinia grandis*, *Coldenia procumbens*, *Commiphora wightii*, *Convolvulus auricomus*, *Corchorus depressus*, *Cordia perrottetii*, *Cressa cretica*, *Crotalaria burhia*, *C. hebecarpa*, *Cucumis callosus*, *C. prophetarum*, *Cymbopogon martinii*, *Cyperus rotundus*, *Dactyloctenium aegyptium*, *D. scindicum*, *Datura metel*, *Desmostachya bipinnata*, *Echinochloa colona*, *Eclipta prostrata*, *Enicostema axillaris*, *Evolvulus alsinoides*, *Euphorbia caducifolia*, *E. hirta*, *Fagonia schweinfurthii*, *Ficus benghalensis*, *Gisekia pharnaceoides*, *Glinus lotoides*, *Grewia tenax*, *G. villosa*, *Helichrysum cutchicum*, *Indigofera cordifolia*, *I. oblongifolia*, *I. tinctoria*, *Ipomoea nil*, *I. pes-tigridis*, *Launaea procumbens*, *Lepidagathis trinervis*, *Leptadenia pyrotechnica*, *L. reticulata*, *Leucas cephalotes*, *L. urticaefolia*, *Luffa acutangula* var. *amara*, *Lumnitzera racemosa*, *Lycium barbarum*, *L. edgeworthii*, *Mimosa hamata*, *Momordica balsamina*, *Mukia maderaspatana*, *Ochthochloa compressa*, *Oxystelma esculenta*, *Panicum antidotale*, *P. trypheron*, *Pedaliium murex*, *Peganum harmala* var. *stenophylla*, *Pergularia daemia*, *Periploca aphylla*, *Peristrophe bicalyculata*, *Phyllanthus fraternus*, *Polygonum plebeium*, *Premna resinosa*, *Prosopis juliflora*, *P. cineraria*, *Pulicaria angustifolia*, *Rhynchosia minima*, *Rivea hypocrateriformis*, *Ricinus communis*, *Salvadora oleoides*, *S. persica*, *Salvia santolinaefolia*, *Scaevola taccada*, *Senna auriculata*, *Sida cordata*, *S. cordifolia*, *S. ovata*, *Solanum nigrum*, *Suaeda fruticosa*, *Taverniera cuneifolia*, *Tephrosia purpurea*, *Teramnus labialis*, *Thespesia populnea*, *Trianthema portulacastrum*, *Tribulus terrestris*, *Vernonia cinerea*, *Withania somnifera*, *Ziziphus nummularia*, *Zygophyllum simplex*.

Timber yielding plants: Timber is most essential for the economic development of an area, which is used variously in the daily life of human beings. Some of the common timbers yielding plants of the Sanctuary are: *Acacia leucophloea*, *A. nilotica* subsp. *indica*, *A. nilotica* subsp. *subalata*, *A. senegal*, *Albizia lebbbeck*, *Capparis decidua*, *C. grandis*, *Cassia siamea*, *Prosopis cineraria*, *P. juliflora*.

Firewoods: The woody plants used by villagers residing in the Sanctuary for firewood in their day-to-day life are: *Acacia leucophloea*, *A. nilotica* subsp. *indica*, *A. senegal*, *Aerva javanica*, *Capparis decidua*, *Commiphora wightii*, *Cordia dichotoma*, *Crotalaria burhia*, *Gossypium arboreum*, *Grewia tenax*, *Ficus* spp., *Leptadenia pyrotechnica*, *Prosopis juliflora*, *P. cineraria*, *Salvadora oleoides*, *S. persica*, *Senna auriculata*, *Ziziphus mauritiana*.

Gum / Resin-yielding plants: Some of the tree species yield gum / resin, which is used for various purposes, e.g. *Acacia leucophloea*, *A. nilotica* ssp. *indica*, *A. nilotica* ssp. *subalata*, *A. senegal*, *Commiphora wightii*, *Prosopis cineraria*, *P. juliflora*.

Tannin yielding plants: The common tannin yielding plants are: *Acacia leucophloea*, *A. nilotica* ssp. *indica*, *A. nilotica* ssp. *subalata*, *Avicennia marina*, *Senna auriculata* and *Ziziphus mauritiana*.

Dye yielding plants: The common dye yielding plants are: *Abrus precatorius*, *Acacia nilotica* ssp. *indica*, *A. senegal*, *Achyranthes aspera*, *Eclipta prostrata*, *Indigofera tinctoria*, *Peganum harmala* var. *stenophylla*, *Phyllanthus fraternus*, *Prosopis juliflora*, *Senna auriculata*.

Fiber-yielding plants: Some of the common fiber yielding plants are: *Acacia leucophloea*, *A. nilotica* ssp. *indica*, *A. nilotica* ssp. *subalata*, *Bombax ceiba*, *Calotropis procera*, *Cordia dichotoma*, *C. perrotetii*, *Corchorus olitorius*, *Crotalaria burhia*, *Desmostachya bipinnata*, *Ficus benghalensis*, *Gossypium arboreum*, *Leptadenia pyrotechnica*, *L. reticulata*, *Ochthochloa compressa*, *Pergularia daemia*, *Phragmites karka*, *Saccharum bengalense*, *Senna auriculata*, *Sida cordata*, *S. ovata*, *S. rhomboidea*, *Typha angustata*.

Edible fruits: Usually edible fruits are obtained from plants grown in orchards. But, local people use a number of wild plants species for their edible value, viz. *Acacia nilotica* ssp. *indica*, *Acacia senegal*, *Aegle marmelos*, *Asparagus racemosus*, *Capparis decidua*, *Citrullus colocynthis*, *C. lanatus*, *Cucumis callosus*, *C. melo*, *Cordia gharaf*, *C. perrotetii*, *Ficus benghalensis*, *Grewia tenax*, *G. villosa*, *Leptadenia reticulata*, *Prosopis cineraria*, *Rhus mysorensis*, *Salvadora oleoides*, *S. persica*, *Solanum nigrum*, *Ziziphus nummularia*.

Plants used as vegetable: Common fresh green vegetables are hardly available to the local inhabitants living in the Sanctuary. Alternatively, some common species used as vegetable are: *Amaranthus tricolor*, *Capparis decidua*, *Chenopodium album*, *Coccinia grandis*, *Euphorbia caducifolia*, *Momordica balsamina*, *Portulaca oleracea*, *Suaeda fruticosa*, *Trianthema portulacastrum*.

Oil yielding plants: Seeds of many wild plant species yield edible or non edible oil, which is used in food, medicines, varnishes, paints, lubricants, beverages, soap, detergent and perfume industries. The important species whose seeds are the source of oil are: *Citrullus colocynthis*, *C. lanatus*, *Ricinus communis*, etc. Leaves of *Cymbopogon martinii* also yield volatile oil used in medicines.

Fodder-yielding plants: Grasses are the main source of fodders for livestock of the Sanctuary. After rainy season, a number of plant species come up and provide fodder, but during summer and winter only perennial species are the main sources of fodder, viz. *Acacia leucophloea*, *A. nilotica* ssp. *indica*, *A. nilotica* ssp. *subalata*, *A. senegal*, *Aeluropus lagopoides*, *Apluda mutica*, *Brachiaria ramosa*, *Cenchrus biflorus*, *C. ciliaris*, *C. setigerus*, *Chrysopogon fulvus*, *Clerodendrum phlomidis*, *Crotalaria burhia*, *Cymbopogon martinii*, *Cynodon dactylon*, *Dactyloctenium aegyptium*, *D. scindicum*, *D. pertusum*, *Desmostachya bipinnata*, *Dichanthium annulatum*, *D. foveolatum*, *Dinebra retroflexa*, *Echinochloa colona*, *Eragrostis tenella*, *E. tremula*, *Gisekia pharnaceoides*, *Grewia tenax*, *Heteropogon contortus*, *Indigofera cordifolia*, *I. oblongifolia*, *Lycium edgeworthii*, *Ochthochloa compressa*, *Panicum antidotale*, *P. trypheron*, *Pennisetum typhoides*, *Phragmites karka*, *Prosopis cineraria*, *P. juliflora*, *Salvadora oleoides*, *S. persica*, *Setaria verticillata*, *Sporobolus ioclados*, *Tribulus terrestris*, *Zea mays*, *Ziziphus nummularia*.

Plants used as famine food: Famine is a common phenomenon in the entire district of Kachchh. The number of rainy days are very few, and sometimes there is no rain or occur only few showers, resulting in shortage of water, as such no cultivation and ultimately severe famine. In the shortage of food grains, the residents use a number of plants species for foods, viz. *Acacia senegal*, *Achyranthes aspera*, *Brachiaria ramosa*, *Capparis decidua*, *Citrullus colocynthis*, *C. lanatus*, *Cyperus rotundus*, *Cenchrus biflorus*, *C. setigerus*, *Dactyloctenium aegyptium*, *Grewia tenax*, *Indigofera cordifolia*, *Panicum antidotale*, *Prosopis cineraria*, *Salvadora oleoides*, *S. persica*, *Setaria verticillata*, *Tribulus terrestris*, *Ziziphus nummularia*.

Tender twigs of *Acacia nilotica* ssp. *nilotica*, *Ficus benghalensis*, *Senna auriculata* etc are the alternative source of toothbrush.

Some of the plant species may be exploited commercially and may add a new source of revenue for the State Government. Some of these species are: *Calotropis procera*, *Aerva javanica* (fibers & stuffing materials), *Capparis decidua* (pickles), *Acacia senegal*, *Commiphora wightii* (gum & resin), *Citrullus colocynthis* (non - edible oil), *Balanites aegyptica* (medicines), *Avicennia marina*, *Senna auriculata* (tannin).

WILD RELATIVES OF CULTIVATED PLANTS

The present day cultivated plants have evolved from their wild relatives, which are still of considerable importance for the improvement of crops and other useful cultivated plants. In India, about 323 wild relative species of cultivated plants have been recorded so far (Arora & Nair, 1985). Recently 116 wild relatives of 64 cultivated plants have been recorded from Gujarat (Pandey & Padhye, 2000). Present study reveals that quite a considerable numbers of wild relatives of cultivated plants grow in Narayan Sarovar WLS, which are tabulated below.

Crop/ cultivated plants with Chromosome nos.	Wild relative & related species with chromosome nos.
Cereals & Millets:	
<i>Eleusine coracana</i> (36,37,38,39,43)	<i>Ochthochloa compressa</i>
Leguminous plants:	
<i>Vigna dalzellina</i> (22)	<i>Vigna aconitifolia</i> (22,44)
<i>Vigna radiata</i> (22,23,24,44)	<i>Vigna trilobata</i> (22,24)
Fruit plants:	
<i>Citrullus lanatus</i> (22)	<i>Citrullus colocynthis</i> (22,24,44)
<i>Cordia dichotoma</i>	<i>Cordia gharaf</i> (72)
<i>Grewia asiatica</i> (36)	<i>Grewia tiliaefolia</i> (18)
<i>Ziziphus mauritiana</i> (48)	<i>Ziziphus nummularia</i> (24,40,48,72)
Vegetable crop plants:	
<i>Luffa acutangula</i> (26,52)	<i>Luffa acutangula</i> var. <i>amara</i>
<i>Momordica chrantia</i> (22)	<i>Momordica balsamina</i> (22)
<i>Portulaca pilosa</i> ssp. <i>grandiflora</i> (10,18,36)	<i>Portulaca oleracea</i> (14,18,36,45)
<i>Solanum melongena</i> (24,36,48)	<i>Solanum incanum</i> (24)
Fiber yielding plants:	
<i>Corchorus capsularis</i> (8,14,16,28)	<i>Corchorus olitorius</i> (7,14,28,35) &
<i>Corchorus trilocularis</i> (14)	
Miscellaneous:	
<i>Physalis peruviana</i> (24,28)	<i>Physalis minima</i> (48,72)

ENDEMIC, RARE AND THREATENED TAXA AND THEIR CONSERVATION

Pandey & Singh (1999) listed 16 species of endemic plants confined to Gujarat State. Shah (1983) reported 61 species, Nayar & Shastry (1988) & WCMC (1994) recorded 47 taxa, Singh & Parabia (2003) enlisted 51 and Meena & Pandey (2004) reported 76 species of endemic, rare and threatened plants from Gujarat. Recently, Gujarat Ecological Society (2003) published a booklet on rare and endangered plants and animals of Gujarat, reported 39 plant species as rare and endangered to Gujarat. Out of this, 22 species are

reported from different parts of Kachchh. Parmar & Singh (2003) added five more species to this work, of which three are endemic to India, one is rare and one species new to India. Sabnis & Rao (1983) enumerated a list of 13 plants from Kachchh, whereas Rao (1981) and Bhatt (1993) reported 35 and 7 species in their thesis on flora of South- Eastern & flora of western Kachchh respectively. Present study revealed that out of 16 endemic species from Gujarat (Pandey & Singh, *l.c.*), 4 species are represented in Narayan Sarovar WLS, viz. *Tamarix kachchhensis*, *T. stricta* and *Viola cinerea* var. *stocksii* and *Helichrysum cutchicum*.

The floral diversity of Narayan Sarovar WLS is facing different degrees of threats due to heavy biotic pressure and high demand of natural produce. Further, in and around areas of the Sanctuary harbour rich mineral deposits, particularly for cement and lignite industries. As such, mining also produces an adverse impact on the ecosystem. The endemic, rare and threatened plants recorded from Narayan Sarovar WLS are given below:

Endemic plants:

Helichrysum cutchicum (Asteraceae)

Tamarix kachchhensis (Tamaricaceae)

Tamarix stricta (Tamaricaceae)

Viola cinerea var. *stocksii* (Violaceae)

Rare & Threatened plants:

Abelmoschus tuberculatus var. *deltoidefolia* (Malvaceae)

Aeluropus lagopoides (Poaceae)

Camphylanthus ramosissimus (Scrophulariaceae)

Capparis cartilaginea (Capparaceae)

Citrullus colocynthis (Cucurbitaceae)

Cleome simplicifolia (Cleomaceae)

Commiphora wightii (Burseraceae)

Convolvulus auricomus var. *volubilis* (Convolvulaceae)

Convolvulus stocksii (Convolvulaceae)

Cyperus rotundus var. *centiflora* (Cyperaceae)

Dactyliandra welwitschii (Cucurbitaceae)

Dalechampia scandens var. *codofana* (Euphorbiaceae)

Ephedra foliata (Gnetaceae)

Heliotropium bacciferum var. *suberosum* (Boraginaceae)

Heliotropium bacciferum var. *tuberculatum* (Boraginaceae)

Heliotropium rariflorum (Boraginaceae)

Heliotropium tuberculosum (Boraginaceae)

Indigofera caerulea var. *monosperma* (Fabaceae)

Ipomoea kotschyana (Convolvulaceae)

Limonium stocksii (Plumbaginaceae)

Merremia rajasthanensis (Convolvulaceae)

Oxystelma esculenta (Asclepiadaceae)

Periploca aphylla (Periplocaceae)
Premna resinosa (Verbenaceae)
Pycnus flavidus var. *strictus* (Cyperaceae)
Scaevola taccada (Goodeniaceae)
Senra incana (Malvaceae)
Solanum elaeagnifolium (Solanaceae)
Stylosanthis fruticosum (Fabaceae)
Taverniera cuneifolia (Fabaceae)
Taverniera glabra (Fabaceae)
Tephrosia pentaphylla (Fabaceae)
T. uniflora ssp. *petrosa* (Fabaceae)
Tribulus rajasthanensis (Zygophyllaceae)
Urochondra setulosa (Poaceae)

The importance of phytodiversity of an area is determined by the presence of rare threatened and endemic taxa. It is proved in terms of a small area of about 436.8 sq km; Narayan Sarovar WLS sustains 39 species out of about 75 rare threatened and endemic species of Gujarat State. As these species grow in small-scattered patches with thin population, biotic pressure, over grazing, human interference and mining activities may adversely affect their existence. Therefore, immediate measures need to be taken to control these activities in the Sanctuary; otherwise the day is not far away when they will become extinct from the nature.

Conservation methods:

The endemic, rare and threatened plants represent a small but an important part of the flora. They are very susceptible to the effect of environmental change, because they occur in small population or at scattered localities and are confined to unique and localized habitat. Biotic activities, such as land clearing, cutting, over-grazing, development of monoculture forest etc cause inadequate reproductive mechanism, inviability of seeds and lower the range of adaptation, resulting in dwindling of plant taxa. Therefore, immediate scientific measures need to be taken to conserve such germplasm in *in-situ* and *ex-situ* conditions. Some of the conservation methods effective to conserve biodiversity are:

1. Maximum afforestation and after care in *in situ* condition.
2. Use of advanced bio-technics for multiplication of such species, like tissue culture etc.
3. Habitat protection/ conservation.
4. Germplasm of depleting species may be preserved in seed bank.
5. Sustainable use of economically important species.
6. People's participation in conservation programme.
7. People's awareness and education for nature conservation.

Besides this, the research alone cannot help to restore the biodiversity loss unless there is a will, awareness and involvement of local people in conservation programme. Thanks to Government of Gujarat who is very particular in this subject and creating awareness among the people and educating them for the reaching implications of ecological degradation

RECOMMENDATIONS

The present study also supports the guidelines provided for the management of Narayan Sarovar WLS (Annon., 2001). The major themes of guidelines broadly cover the zoning of the Sanctuary, biodiversity

conservation, eco-development measures, eco-tourism and mitigation of potential threats from future economic activities. The following are the recommendations.

1. Measures to conserve rare and endangered species of flora and fauna.
2. Creation of two mini core areas- Two zones viz. 'Pipar' and 'Mindhiari' (Rakhals), due to their rich floral and faunal assemblage, covering an area of about 18000 hectors.
3. Preservation of corridor areas- In view of future mining activities, 'Godhatal' zone is considered as very critical for wildlife movement, suggested as an important corridor zone.
4. Eco-tourism- Due to its close proximity to the famous temples of Narayan Sarovar and Koteswar, 'Halapar zone' is suggested for development of eco-tourism.
5. In order to develop some multiple use areas, two buffer areas need to be identified in the eastern and western parts of the Sanctuary.
6. Improvement of water availability and vegetation cover management under habitat improvement programme is suggested.
7. Measures need to be taken to control biotic pressure.
8. Regulatory protection is the necessity of the Sanctuary.
9. Shifting of mineral (lignite, limestone and bentonite) and cement industries and thermal power station.
10. Removal of fast spreading species of *Prosopis juliflora*.
11. People's awareness and education for nature conservation.

Thus ecologically Narayan Sarovar is an important unit as it falls under a separate biotic province of the Indian desert and have a distinct 'gene pool'. It also supports the remaining patches of "Desert thorn forest" in the country. Abundance of 'Savanna' (grassland)- a typical habitat of arid regions, and coastal habitat (Mangroves) in association of the above, form a unique ecological matrix and home for several rare and endangered fauna and flora (Annon., 2001). Thus, Narayan Sarovar WLS is a paradise for floral and faunal diversity of this unique ecological zone.

FAUNAL DIVERSITY

The faunal diversity of Narayan Sarovar WLS may be grouped into three major groups:

- (i) Herpeto fauna (Amphibian & Reptiles)
- (ii) Avi fauna (Birds) and
- (iii) Mammals

Among these the common ones are: *Spiny tailed lizard, ** Indian Chamaeleon, Red Sand boa, Black Cobra, Spectacle Cobra, ** Checkered Keel Back Snake, Common Trinket Snake, Saw Scaled Viper, Frogs, Tods, Lesser spotted Eagle, Jungle Cat, Desert Cat, Caracal, Ratel or Honey Badger, Indian Percupine, Chinkara or Indian Gazelle, Nilgai or Blue Bull, Small Indian Civet, Small Indian Mongoose, Grey Wolf, Golden Jackal, Common Fox, Desert Fox, Striped Haeyna, Rufous Tailed Hare, Indian Pangolin and Leopard (not now). It is also very interesting to note that some of the animals marked with *(Schedule – I) and ** (Schedule- II) are threatened upto IUCN status. Thus, the faunal diversity of the sanctuary is also very rich in the area (Annon. 2001).

ENUMERATION

MENISPERMACEAE

***Coculus hirsutus** (L.) W. Theob. "*Vevidi, Vadhi no vevlo, Vagvai*".

***Coculus pendulus** (J.R. & G. Forst.) Diels, "*Ordad, Value, Parwatti*".

BRASSICACEAE

***Brassica rapa** L. var. **campestris** (L.) A.R. Clapham, “Sarsav”.

CLEOMACEAE

Cleome gynandra L. “*Talavasi*”.

Common in moist sandy gravelly soil.

Fl. & Fr.: Sept.- Dec.

Guhar nani, *V. Singh* 15814 (BSJO); Sandrovadh R. F., *R. P. Pandey* 20003 (BSJO); Narayan Sarovar, *R.P. Pandey* 20019 (BSJO).

***Cleome scaposa** DC.

Cleome simplicifolia (Camb.) Hook.f. & Thomson, “*Roto bidhro, Ratirai, Sanunbidhro*”.

Rare along stream in moist rocky habitat.

Fl. & Fr.: Oct.- Dec.

Mindhiari R.F., *R. P. Pandey* 13979 (BSJO).

Cleome vahliana Fresen.

Common in open rocky gravelly habitat.

Fl. & Fr.: Sept.- Dec.

Narayan Sarovar, *R.S. Raghavan* 114912 (BSI), *R.P. Pandey* 13993, *V. Singh* 15918 (BSJO); Baranada, *R.P. Pandey* 19871 (BSJO).

Cleome viscosa L. “*Pilitalavani*”.

Common in open places in sandy-loam to gravelly soil.

Fl. & Fr.: Sept.- Jan.

Mindhiari R.F., *V. Singh* 15785; *R. P. Pandey* 17754 (BSJO); Nareda, *R. P. Pandey* 19882 (BSJO).

CAPPARACEAE

Cadaba fruticosa (L.) Druce, “*Taliokand, Jangli Mirchi, Karopijoro*”.

Common woody climber on hedges and in scrub jungle in rocky gravelly or sandy habitat.

Fl. & Fr.: Oct.- Jan.

Narayan Sarovar, *R.S. Raghavan* 114631, 114943 (BSI); Sinapur along Lakhpur, *R.P. Pandey* 14000 (BSJO); Mindhiari R.F., *V. Singh* 15856 (BSJO).

Capparis cartilaginea Decne. “*Parbatral*”.

Rare on old walls and rocky habitat.

Fl. & Fr.: July- Feb.

Narayan Sarovar temple and on wall of old building near tank, *R.P. Pandey* 19840, 13991, 19840 (BSJO); Kannoji, *V. Singh* 15981 (BSJO).

Uses: Fruits are cooked as vegetable and squirrels eat the pulp of the fruit.

Capparis decidua (Forssk.) Edgew. “*Kerdo*”.

Common in open sandy gravelly habitat.

Fl. & Fr.: Almost throughout the year.

Mindhiari R.F., *V. Singh* 15852 (BSJO); Guhar village, *R.P. Pandey* 17744 (BSJO); Guhar moti, *R.P. Pandey* 19866 (BSJO).

Capparis grandis L. f. "*Dumrejo jad, Ghuti*".

Common in protected forest, on hills.

Fl. & Fr.: Dec.- May.

Mota Dhola Rakhal, *S.K. Jain* 61902 (BSI).

Capparis sepiaria** L. "*Kanthar*".Capparis spinosa** L. "*Kanthar*".

VIOLACEAE

Viola cinerea Boiss. var. **stocksii** (Boiss.) W. Becker

Rare in moist gravelly habitat.

Fl. & Fr.: July- Oct.

Haman Khudi, *V. Singh* 15915 (BSJO).

POLYGALACEAE

Polygala erioptera DC. "*Patsan, Bhoisan*".

Common in gravelly-loamy plains.

Fl. & Fr.: Oct.- Dec.

Watch tower, Halapar. *R.P. Pandey* 13944 (BSJO); Guhar dam, *R.P. Pandey* 17792 (BSJO); Mindhiari R.F., *V. Singh* 15742 (BSJO).

Polygala persicariaefolia DC. "*Rati Bhoidan*".

Rare in moist gravelly habitat.

Fl. & Fr.: During Monsoon season.

Haman Khudi, *V. Singh* 15927 (BSJO).

***Polygala polifolia** Presl, "*Pili bhonsysan, Perpatsan*".

CARYOPHYLLACEAE

Polycarpacea corymbosa (L.) Lam. "*Jangli suwa, Rupakuli*".

Common weed in the forest.

Fl. & Fr.: Aug.- Feb.

Guhar nani, *V. Singh* 15832 (BSJO).

Polygala spicate** Wight & Arn. "*Fulchhogaro*".Spergula arvensis** L.

PORTULACACEAE

Portulaca oleracea L. "*Lakha Luni, Kutabo, Moti Luni*".

Common along stream in moist, rocky loamy habitat.

Fl. & Fr.: Oct.- Dec.

Narayan Sarovar, *V. Singh* 15802, *R.P. Pandey* 20014 (BSJO); Mindhiari, R.F., *R. P. Pandey* 13966 (BSJO).

Portulaca pilosa L. "*Rati Luni, Varandhyun*".

Fairly common in moist sandy-loam soil.

Fl. & Fr.: July- Nov.

Guhar, *R.P. Pandey* 19844 (BSJO).

***Portulaca quadrifida** L. "*Zini luni*".

TAMARICACEAE

Tamarix ericoides Rottler & Willd.

Common in moist saline habitat.

Fl. & Fr.: Aug.- Mar.

Narayan Sarovar, *R.S. Raghavan* 114649 (BSI).

Tamarix indica Willd. "*Laijo Jad, Lai; Ratilai, Jhav, Tavuka*".

Common in saline habitat.

Fl. & Fr.: Aug.- Dec.

Kannoj, *V. Singh* 15977 (BSJO).

Tamarix kachchensis B.V. Shetty & R.P. Pandey

Frequently found along sea-coast in moist clayey soil.

Fl. & Fr.: Oct.- Jan.

Narayan Sarovar tank side, *R.P. Pandey* 13901 (BSJO).

ELATINACEAE

Bergia ammannioides Roxb. ex Roth, "*Jal ukharan, Jal Okharan*".

Common in moist places.

Fl. & Fr.: Aug.- Oct.

Mindhiari R.F., *V. Singh* 15887 (BSJO).

***Bergia capensis** L. "*Jal Jamavo*".

Bergia suffruticosa (Delile) Fenzl. "*Ropatri, Gandharo Okhrad, Vithi Kharsan*".

Common in moist places.

Fl. & Fr.: Oct.- Dec.

Guhar tank, *R.P. Pandey* 17748 (BSJO); Kunri, *V. Singh* 15902 (BSJO).

MALVACEAE

Abelmoschus tuberculatus Pal & Singh var. **deltoideifolia** T.K. Paul & Nayar

Rare in moist sandy gravelly habitat.

Fl. & Fr.: Aug.- Dec.

Mindhiari R.F., *V. Singh* 17717 (BSJO).

Abutilon fruticosum Guill. & Perr. "*Saneri dabliaar, Jhinki khapat*".

Common on low hills in rocky habitat.

Fl. & Fr.: Sept.- Jan.

Mindhiari Rakhal R.F., *R.P. Pandey* 13970 (BSJO); Kannoj, *V. Singh* 15974 (BSJO).

***Abutilon indicum** (L.) Sweet, "*Khapat*".

Abutilon pannosum (G. Forst.) Schlecht. “*Dabliaar, Daloli*”.

Common in rocky gravelly habitat.

Fl. & Fr.: Sept.- Dec.

Mindhiari R.F., *V. Singh* 15739 (BSJO).

Gossypium arboreum L. “*Kapas*”.

Commonly cultivated as a crop.

Fl. & Fr.: Dec.- April.

Mota Dhora Rakhal, *S. K. Jain* 61898 (BSI).

Hibiscus hirtus L.

Fl. & Fr.: Oct.- March.

Frequently found in forest undergrowth.

Mori R.F., *V. Singh* 15991 (BSJO).

Hibiscus lobatus (Murray) Kuntze, “*Ranbhindi, Tali*”.

Fl. & Fr.: Aug.- Nov.

Common in gravelly moist soil.

Midhariari R.F., *V. Singh* 15774, 15883 (BSJO); Halapar, *V. Singh* 15950 (BSJO).

Hibiscus micranthus L. f. “*Furalvel, Chanbhindi, Adbawal*”.

Common on, low hills in rocky- gravelly habitat.

Fl. & Fr.: Sept.- Jan.

Narayan Sarovar, *V. Singh* 15903A (BSJO).

Hibiscus palmatus Forssk.

Frequently found in gravelly habitat.

Fl. & Fr.: Sept.- Jan.

Rodasar, *V. Singh* 15955 (BSJO).

***Pavonia arabica** Hochst & Steudel ex Boiss.**Pavonia glechomaefolia** (A. Rich.) Garcke ex Schweinf. “*Dhatuvaljajad, Kathrotio, Adalia*”.

Rarely found in moist sandy-gravelly habitat.

Fl. & Fr.: Aug.- Dec.

Mori R.F., *V. Singh* 15988 (BSJO).

Pavonia procumbens (Wall. ex Wight & Arn.) Walp.

Not common in moist loamy soil.

Fl. & Fr.: Oct.- Dec.

Haman Khudi river bed, *R .P. Pandey* 13929 (BSJO); Mori R.F., *V. Singh* 15996 (BSJO).

***Pavonia zeylanica** (L.) Cav.**Senra incana** Cav.

Rare in open rocky-gravelly habitat.

Fl. & Fr.: Oct.- Dec.

Halapar along Nalia, *R.P. Pandey* 13931(BSJO); Haman Khudi, *V. Singh* 15925 (BSJO).

Sida alba L.

Common in open gravelly- loamy habitat.

Fl. & Fr.: Aug.- Dec.

Narayan Sarovar, *R.P. Pandey* 20018 (BSJO).

Sida cordata (Burm. f.) Borss. Walk. "*Pat Balbuvaro, Nindhi dhatuvel*".

Common in gravelly-loamy soil.

Fl. & Fr.: Oct.- Dec.

Haman Khudi, *R.P. Pandey* 13906, *V. Singh* 15917 (BSJO); Mindhiari R.F. , *V. Singh* 15774 A (BSJO).

Sida cordifolia L. "*Balbuvaro, Balbuvarejo Jad, Bala, Kharmonthi*".

Common in gravelly-loamy habitat.

Fl. & Fr.: Sept.- Dec.

Mindhiari R.F., *V. Singh* 15760 (BSJO).

Sida ovata Forssk.

Common in gravelly-loamy soil.

Fl. & Fr.: Oct.- Jan.

Along Guhar tank, *R.P. Pandey* 17736 (BSJO).

Sida rhombifolia L.

Frequently found in gravelly habitat.

Fl. & Fr.: Aug.- Dec.

Guhar nani, *V. Singh* 15842 (BSJO).

Sida spinosa L. "*Kandharo Babulvaro, Kantalo Bal, Kharanto*".

Rare in moist gravelly sandy soil.

Fl. & Fr.: Aug.- Dec.

Mindhiari R.F., *V. Singh* 15868 (BSJO).

Thespesia populnea (L.) Soland. ex Correa, "*Paras pipdo*".

Planted along roadsides in rocky loamy habitat.

Fl. & Fr.: Jan.- Dec.

Pavapar, along Nakatarana Narayan Sarovar road, *R.P. Pandey* 13985 (BSJO).

BOMBACACEAE

Bombax ceiba L.

Occasionally seen in rocky habitat in the forest.

Fl. & Fr.: April- June.

Mota Dhola Rakhal, *S.K. Jain* 61894 (BSI).

STERCULIACEAE

***Helicteres isora** L. "*Marad sing, Ati*".**Melhania futteyporensis** Munro ex Master, "*Vagda Ukhapato, Adba Ukapat*"

Not common in rocky habitat.

Fl. & Fr.: Aug.- Dec.

Mindhiari R.F., *V. Singh* 15752 (BSJO).

Waltheria indica L.

Not common in rocky- gravelly habitat.

Fl. & Fr.: Aug.- Dec.

Miadhariari R.F., *V. Singh* 15796 (BSJO).

TILIACEAE

***Corchorus capsularis** L. "*Borchuchni*".

Corchorus aestuans L. "*Kaggisodi, Kagkela*".

Frequently found in moist loamy soil.

Fl. & Fr.: Aug.- Dec.

Mindhiari R.F., *V. Singh* 15705 (BSJO); Along river bed, near Haman Khudi, *R.P. Pandey* 13912 (BSJO).

Corchorus depressus (L.) Vicary, "*Bahuphali, Munderi*".

Common in gravelly- rocky habitat.

Fl. & Fr.: Sept.- Jan.

Guhar tank side, *R.P. Pandey* 17757 (BSJO); Guhar nani, *V. Singh* 15840 (BSJO).

Corchorus olitorius L. "*Kargisodo, Gunpatjojad*".

Common in open places, in moist rocky- loamy soil.

Fl. & Fr.: Sept.- Dec.

Mindhiari R.F., *R.P. Pandey* 13978, *V. Singh* 15703 (BSJO).

Corchorus trilocularis L. "*Ubhimundheri, Lambi Chunch, Kadui Chunchdi*".

Common in gravelly rocky habitat.

Fl. & Fr.: Sept.- Dec.

Haman Khudi, *R.P. Pandey* 13902 (BSJO); Mindhiari R.F., *V. Singh* 15726, 15880 (BSJO).

***Grewia abutilifolia** Vent. ex A. Juss.

Grewia tenax (Forssk.) Fiori, "*Gangeti*".

Common on hills, in rocky habitat.

Fl. & Fr.: Sept.- Jan.

Kunri, R.F., *V. Singh* 15903 (BSJO); Guhar nani, *V. Singh* 15808 (BSJO); Halapar, *R.P. Pandey* 13935 (BSJO); Kuriani, *R.P. Pandey* 20027 (BSJO); Haman Khudi, *R.P. Pandey* 19853 (BSJO).

Grewia tiliifolia Vahl

Occasionally found in scrub forest.

Fl. & Fr.: Aug.- Dec.

Mindhiari R.F., *V. Singh* 15732 (BSJO).

Grewia villosa Willd.

Common on hills in rocky habitat.

Fl. & Fr.: Oct.- Jan.

Mindhiari R.F., *R.P. Pandey* 13967 (BSJO); Barania, *R. P. Pandey* 19874 (BSJO).

Melochia corchorifolia L.

Frequently found in gravelly habitat.

Fl. & Fr.: Aug.- Jan.

Halapar R.F., *V. Singh* 15945 (BSJO).

Triumfetta malabarica Koen. ex Rottlb. "*Jibto, Bhurato, Berbhunt*".

Common in scrub forest.

Fl. & Fr.: Aug.- Dec.

Mori R.F., *V. Singh* 15993 (BSJO).

ZYGOPHYLLACEAE

Fagonia indica Burm. f. "*Dhamaso*".

Common in rocky- gravelly plains.

Fl. & Fr.: Oct.- Jan.

Along Guhar village, *R.P. Pandey* 17738 (BSJO); Junachar river, *R.P. Pandey* 12104 (BSJO).

Fagonia schweinfurthii (Hadidi) Hadidi

Common in gravelly- loamy soil.

Fl. & Fr.: Sept.- Jan.

Nalia, *R.P. Pandey* 17726 (BSJO); Near watchtower, Halapar, *R.P. Pandey* 13942 (BSJO); Guhar nani, *V. Singh* 15841 (BSJO).

Tribulus rajasthanensis Bhandari & B.D. Sharma

Common in moist sandy-loam soil.

Fl. & Fr.: Sept.- Jan.

Guhar tank & Guhar village, *R.P. Pandey* 17749, 17770 (BSJO); Mindhiari R.F., *V. Singh* 15740, 15757 (BSJO).

Tribulus terrestris L. "*Gokhru*".

Common in gravelly habitat.

Fl. & Fr.: Sept.- Jan.

Guhar nani, *V. Singh* 15820 (BSJO).

Zygophyllum simplex L. "*Patlani, Atheli, Alethi*".

Not common in loamy habitat.

Fl. & Fr.: Aug. - Dec.

Kunri R.F., *V. Singh* 15899 (BSJO); Kanno, *V. Singh* 15982 (BSJO).

OXALIDACEAE

***Biophytum sensitivum** (L.) DC. "*Risamnu, Zarero*".

GERANIACEAE

Monsonia senegalensis Guill. & Perr.

Rare in open gravelly sandy habitat.

Fl. & Fr.: July - Nov.

Haman Khudi, *R.P. Pandey* 19848 (BSJO).

BALANITACEAE

***Balanites roxburghii** Planch. "*Ingorio, Hingirio*".

BURSERACEAE

Commiphora wightii (Arn.) Bhandari, "*Gugar, Mitho Gugod*".

Common in sandy- gravelly- rocky habitat.

Fl. & Fr.: After rainy season.

Kunri R.F., *V. Singh* 15913 (BSJO); Tera village, *R.P. Pandey* 17775 (BSJO); Mindhiari Rakhal R.F., *R.P. Pandey* 20008 (BSJO); Narayan Sarovar, *R.S. Raghavan* 114917 (BSI).

MELIACEAE

***Azadirachta indica** A. Juss. "*Limdo*".

***Melia azedarach** L. *Bakani nim*".

CELASTRACEAE

***Maytenus senegalensis** (Lam.) Exell. "*Vico, Vickro*".

RHAMNACEAE

***Ziziphus mauritiana** Lam. "*Bor, Bordi*".

Ziziphus nummularia (Burm. f.) Wight & Arn. "*Chaniabor*".

Common throughout, in mixed habitat.

Fl. & Fr.: Oct.- Dec.

Sheh, *V. Singh* 15969 (BSJO); Mindhiari R.F., *R.P. Pandey* 13957 (BSJO); Junachar hills, *R.P. Pandey* 12105 (BSJO).

SAPINDACEAE

Cardiospermum halicacabum L. "*Tridhari vel, Velfolti, Bakanfofli*".

Common in rocky and gravelly-loamy habitat.

Fl. & Fr.: Oct.- Dec.

Mindhiari R.F., *R.P. Pandey* 13969, *V. Singh* 15744 (BSJO); Nareda- along Nalia Road, *R.P. Pandey* 13948 (BSJO).

MORINGACEAE

***Moringa oleifera** Lam. "*Saragvo*".

FABACEAE

***Abrus precatorius** L. "*Chanothi*".

Aeschynomene indica L. "*Patagdodi*".

Frequently found in moist habitat.

Fl. & Fr.: Aug.- Jan.

Halapar R.F., *V. Singh* 15944 (BSJO).

Alysicarpus hamosus Edgew.

Common in moist sandy-loam soil.

Fl. & Fr.: Sept.- Dec.

Guhar, *R.P. Pandey* 17760 (BSJO).

Alysicarpus longifolius (Rottler & Spreng.) Wight & Arn. "*Vedo samervo, Ghodo samervo*".

Common among grasses in wastelands and in hedges.

Fl. & Fr.: Aug.- Dec.

Mindhiari R.F., *V. Singh* 15753, 15866 (BSJO).

Alysicarpus tetragonolobus Edgew.

Common among grasses.

Fl. & Fr.: Aug.- Nov.

Mindhiari R.F., *V. Singh* 15891 (BSJO).

Alysicarpus vaginalis (L.) DC. "*Pat samervo, Ridh samervo*".

Common in moist sandy- gravelly habitat.

Fl. & Fr.: July- Dec.

Mindhiari R.F., *V. Singh* 15863 (BSJO).

****Arachis hypogaea*** L. "*Mugfali*" (Cultivated).

****Butea monosperma*** (Lam.) Taub. "*Kesurdo, Khakhro*".

****Cajanus platycarpus*** (Benth.) Maesen

Clitoria ternatea L. "*Ganeli*".

Not common in moist loamy soil.

Fl. & Fr.: Oct.- Jan.

Haman Khudi river, *R.P. Pandey* 13913 (BSJO); Mori R.F., *V. Singh* 15995 (BSJO).

Crotalaria burhia Buch.-Ham. ex Benth. "*Khadsan, Sangetro*".

Common in sandy- hummocky plains.

Fl. & Fr.: Oct.- Jan.

Sinapar, along Lakhpatt, *R.P. Pandey* 13998 (BSJO); Kunri R.F., *V. Singh* 15912 (BSJO).

Crotalaria hebecarpa (DC.) Rudd

Common in moist rocky- loamy habitat along stream.

Fl. & Fr.: Oct.- Dec.

Mindhiari R.F., *R.P. Pandey* 13972, *V. Singh* 15745 (BSJO).

Crotalaria medicaginea Lam. "*Mirio, Untmirio, Ran methi*".

Common in sandy- gravelly habitat.

Fl. & Fr.: Aug.- Feb.

Mindhiari R.F., *V. Singh* 15754 (BSJO).

Crotalaria mysorensis Roth

Frequently found in open grassland.

Fl. & Fr.: Aug.- Jan.

Mindhiari R.F., *V. Singh* 15876 (BSJO).

Crotalaria orixensis Willd.

Rarely found among grasses.

Fl. & Fr.: Sept.- Dec.

Mindhiari R.F. *V. Singh* 15873 (BSJO).

***Cyamopsis teteragonoloba** (L.) Taub. "*Guwar, Gawar*".**Indigofera caerulea** Roxb. var. **monosperma** Santapau

Rare in sandy- gravelly habitat.

Fl. & Fr.: Aug.- Dec.

Mindhiari R.F., *V. Singh* 15731 (BSJO).

Indigofera cordifolia Heyne ex Roth

Common throughout, in sandy- loam soil.

Fl. & Fr.: Aug.- Dec.

Guhar, *R.P. Pandey* 17759(BSJO); Nareda, *R.P. Pandey* 19879 (BSJO); Mindhiari R.F., *V. Singh* 15723 (BSJO).

Indigofera glandulosa Willd. "*Vekerio*".

Very common in open sandy-loam habitat.

Fl. & Fr.: July- Nov.

Guhar, *R.P. Pandey* 19846 (BSJO).

Indigofera hochstetteri Baker, "*Bethi Gali*".

Common in sandy moist habitat.

Fl. & Fr.: Sept.- Dec.

Along Guhar, *R.P. Pandey* 17753, 17773 (BSJO); Mindhiari R.F., *R.P. Pandey* 13973, *V. Singh* 15708, 15778 (BSJO).

***Indigofera linifolia** (L.f.) Retz. var. **campbellii** Wight ex Baker**Indigofera linnaei** Ali, "*Patgali, Bhoynkali, Jinkigali*".

Common in sandy- loam soil.

Fl. & Fr.: Sept.- Dec.

Guhar, *R.P. Pandey* 17765 (BSJO); Guhar nani, *V. Singh* 15822 (BSJO).

Indigofera oblongifolia Forssk. "*Zil, Ziladi, Zilado*".

Common in sandy- loamy habitat.

Fl. & Fr.: Sept.- Dec.

Narayan Sarovar forest, *W.J. Stower*, Acc. No. 33002 (BSI); Guhar nani, *V. Singh* 15827 (BSJO).

Indigofera tinctoria L. "*Gudi, Nil, Garijo jad*".

Common in rocky habitat.

Fl. & Fr.: Sept.- Dec.

Mindhiari R.F., *R.P. Pandey* 13982, *V. Singh* 15769 (BSJO).

Rhynchosia minima (L.) DC. "*Dariavel*".

Common herbaceous climber, in moist rocky- gravelly and loamy habitat.

Fl. & Fr.: Sept.- Dec.

Haman Khudi river, *R.P. Pandey* 13917 (BSJO); Mindhiari R.F., *V. Singh* 15712, 15743 (BSJO); Narayan Sarovar, *R.S. Raghavan* 114923 (BSI).

Sesbania bispinosa (Jacq.) Wight, "*Ikad*".

Common weed in moist places.

Fl. & Fr.: Aug.- Feb.

Mindhiari R.F., *V. Singh* 15721 (BSJO).

***Sesbania sesban** (L.) Merr.**Stylosanthes fruticosa** (Retz.) Alston

Common in open gravelly-loamy habitat.

Fl. & Fr.: Sept.- Jan.

Along Narayan Sarovar tank, *R.P. Pandey* 17732, 20013 (BSJO); Guhar nani, *V. Singh* 15843 (BSJO).

Taverniera cuneifolia (Roth) Arn.

Rarely found in gravelly habitat.

Fl. & Fr.: Aug.- Oct.

Halapar, R.F., *V. Singh* 15952 (BSJO).

Taverniera glabra Boiss.

Rare in gravelly sandy habitat.

Fl. & Fr.: Sept.- Jan.

Sheh, *V. Singh* 15971 (BSJO).

Tephrosia leptostachya DC.

Not common in gravelly habitat.

Fl. & Fr.: Aug.- Dec.

Guhar nani, *V. Singh* 15813 (BSJO).

Taverniera pentaphylla (Roxb.) G. Don

Rare in gravelly sandy habitat.

Fl. & Fr.: Sept.- Nov.

Mindhiari R.F., *V. Singh* 15871 (BSJO).

***Taverniera purpurea** (L.) Pers. "*Sarpankho*".**Taverniera strigosa** (Dalzell) Santapau & Mahesh

Common on low hillocks, in rocky habitat.

Fl. & Fr.: Sept.- Dec.

Along Narayan Sarovar tank, *R.P. Pandey* 17733 (BSJO); Mindhiari R.F., *V. Singh* 15936 (BSJO).

Taverniera tinctoria (L.) Pers.

Common in open loamy habitat.

Fl. & Fr.: Sept.- Jan.

Near Beta village, *R.P. Pandey* 17711 (BSJO).

Taverniera uniflora Pers. subsp. **petrosa** (Blatt. & Hallb.) Gillette & Ali

Rare in sandy- loamy habitat.

Fl. & Fr.: Aug.- Dec.

Mindhiari R.F., *V. Singh* 15777 (BSJO); Mori R.F. 15992 (BSJO).

Teramnus labialis (L. f.) Spreng. "*Adad vel, Rambhval singriyaar*".

Common on hedges and low shrubs in sandy- loamy soil.

Fl. & Fr.: After rainy season.

Narayan Sarovar, *V. Singh* 15807 (BSJO).

Teramnus mollis Benth. "*Runchal singriyaar*".

Common climbing or trailing herbs on undershrubs.

Fl. & Fr.: After rainy season.

Mori R.F., *V. Singh* 19586 (BSJO).

Vigna aconitifolia (Jacq.) Marechal, "*Math*".

Common in open moist places in rocky loamy soil.

Fl. & Fr.: Aug.- Dec.

Mindhiari R.F., *R.P. Pandey* 13976 (BSJO); Narayan Sarovar, *R.S. Raghavan* 114936 A (BSI).

Vigna mungo (L.) Hepper var. **sublobata** B.D. Sharma

Frequent, in loamy soil.

Fl. & Fr.: July - Dec.

Mindhiari R.F., *V. Singh* 15851 (BSJO).

***Vigna radiata** (L.) Wilczek, "*Mug*" (Cultivated).

Vigna trilobata (L.) Verdc.

Common in moist loamy habitat.

Fl. & Fr.: After rainy season.

Mindhiari R.F., *V. Singh* 15755 (BSJO).

CAESALPINIACEAE

***Caesalpinia bonduc** (L.) Roxb.

Cassia siamea Lam.

Planted along roadside.

Fl. & Fr.: Almost throughout the year.

Ravapar, *R.P. Pandey* 13986 (BSJO).

Chamaecrista pumila (Lam.) V. Singh

Common in moist rocky- loamy habitat.

Fl. & Fr.: After rainy season.

Mindhiari R.F., *V. Singh* 15728, 15758 (BSJO); Kanno, *V. Singh* 15980 (BSJO).

***Piliostigma malabarica** (Roxb.) Benth.

Senna auriculata (L.) Roxb. "*Aval*".

Fairly common in rocky habitat.

Fl. & Fr.: Sept.- Jan.

Nalia, along Jakhu, *R.P. Pandey* 17725 (BSJO).

Senna italica Mill.

Frequently found in wastelands in moist sandy- gravelly habitat.

Fl. & Fr.: Sept.- Dec.

Mindhiari R.F., *V. Singh* 15776 (BSJO).

Senna obtusifolia (L.) Irwin & Barneby

Common, along roadsides and undergrowth of forest in loamy soil.

Fl. & Fr.: Sept.- Jan.

Mindhiari R.F., *V. Singh* 15765, 15879 (BSJO).

Senna occidentalis (L.) Link

Common in sandy-loam soil.

Fl. & Fr.: Almost throughout the year.

Mindhiari R.F., *V. Singh* 15791 (BSJO).

Senna tora (L.) Roxb.

Common in moist sandy soil.

Fl. & Fr.: Oct.- Feb.

Along Guhar, *R.P. Pandey* 17750 (BSJO).

***Tamarindus indicus** L. "*Amlī*".

MIMOSACEAE

Acacia bivenosa DC.

Commonly planted in gravelly-loamy soil.

Fl. & Fr.: Oct.- Jan.

Forest plantation, Halapar, *R.P. Pandey* 13939 (BSJO).

Acacia leucophloea (Roxb.) Willd. "*Harmo baval*".

Common in rocky habitat on hills.

Fl. & Fr.: Oct.- Mar.

Mata Na Math R.F., *R.P. Pandey* 13988 (BSJO).

Acacia nilotica (L.) Willd. ex Del. subsp. **indica** (Benth.) Brenan

Common in loamy- sandy soil.

Fl. & Fr.: Almost throughout the year.

Sheh, *V. Singh* 15966 (BSJO).

Acacia nilotica (L.) Willd. ex Del. subsp. **subalata** (Vatke) Brenan, "*Baval*".

Common in sandy gravelly habitat and on hills.

Fl. & Fr.: Oct.- Mar.

Guhar, *R.P. Pandey* 17746 (BSJO).

Acacia senegal (L.) Willd. "*Goradio – baval*".

Common on hills and in hummocky plains in rocky gravelly habitat.

Fl. & Fr.: Sept.- Feb.

Mata Na Math R.F., *R.P. Pandey* 17730 (BSJO); Haman Khudi river, *R.P. Pandey* 13923 (BSJO); Mindhiari R.F., *V. Singh* 15853 (BSJO).

***Acacia tortilis** (Forssk.) Heyne var. **raddiana** (Savi) Brenan

Albizia lebbeck Benth. "*Shirish*".

Commonly planted along roadsides and near habitations.

Fl. & Fr.: Mar.- June.

Nalia, *R.S. Raghavan* 114968 (BSI); Mata Na Math R.F., *R.P. Pandey* 13989 (BSJO).

***Dichrostachya cinerea** (L.) Wight & Arn. var. **indica** Brenan & Brummit. "*Mor Dhun-dhiyu*".

Mimosa hamata Willd.

Common, along valley in moist rocky habitat.

Fl. & Fr.: Oct.- June.

Mindhiari R.F., *R.P. Pandey* 13954 (BSJO); Jadava, *R.P. Pandey* 19888, *V. Singh* 15733 (BSJO).

***Mimosa pudica** L. "*Kasi, Kaibaval*".

Neptunia triquetra Benth.

Occasional, in moist clayey soil.

Fl. & Fr.: Sept.- Feb.

Narayan Sarovar, *R.S. Raghavan* 114919 (BSI).

***Pithecellobium dulce** (Roxb.) Benth. "*Goras amlī*" (Planted).

***Prosopis cineraria** (L.) Druce, "*Khijado*".

Prosopis juliflora (Sw.) DC. "*Gando – baval*".

Common throughout in mixed habitat.

Fl. & Fr.: Oct.- Mar.

Mindhiari R.F., *V. Singh* 15855 (BSJO); Guhar village, *R.P. Pandey* 17745 (BSJO).

COMBRETACEAE

Lumnitzera racemosa Willd.

Not common in mangrove swamps.

Fl. & Fr.: Dec.- Apr.

Lakki mangrove forest, *R.P. Pandey*, 177744-A (BSJO).

Terminalia catappa L.

Planted, in sandy- loam soil.

Fl. & Fr.: Oct.- Mar.

Narayan Sarovar Rest house, *R.P. Pandey* 17743, 20020 (BSJO).

MYRTACEAE

***Eucalyptus hybrida** Maiden, “*Nilgiri*” (Planted).

LYTHRACEAE

Ammannia baccifera L.

Common throughout in marshy habitat.

Fl. & Fr.: Sept.- Mar.

Nalia, R.S. *Raghavan* 114982 (BSI); Mindhiari R.F., *V. Singh* 15735, 15892 (BSJO).

Ammannia multiflora Roxb.

Common in moist habitat.

Fl. & Fr.: Aug.- Nov.

Mindhiari R.F., *V. Singh* 15897 (BSJO).

***Lawsonia inermis** L. “*Mendhi*” (Planted).

CUCURBITACEAE

Citrullus colocynthis (L.) Schard. “*Tumbo*”.

Common weed in waste places.

Fl. & Fr.: Aug.- Dec.

Guhar nani, *V. Singh* 15828 (BSJO).

Citrullus lanatus (Thunb.) Matsum. & Nakai, “*Matiro, Kharbujo*”.

Escape from cultivation in waste places.

Fl. & Fr.: July- Nov.

Kannoj, *V. Singh* 15983 (BSJO).

Coccinia grandis (L.) Voigt, “*Tindora*”.

Common climber on trees and shrubs near habitations.

Fl. & Fr.: Almost throughout the year particularly after rains.

Kannoj, *V. Singh* 15973 (BSJO); Narayan Sarovar, *V. Singh* 15806 (BSJO); Baranda, *R.P. Pandey* 19872 (BSJO).

Corallocarpus epigaeus (Rottl. & Willd.) Benth. & Hook.f.

Common on hedges and in scrub jungle in rocky habitat.

Fl. & Fr.: Oct.- Dec.

Mata Na Math R.F., *R.P. Pandey* 13990 (BSJO); Mindiyari Rakhal R.F., *R.P. Pandey* 20009 (BSJO).

Ctenolepis cerasiformis (Stocks) Hook.f.

Common climbing herbs on trees in moist places.

Fl. & Fr.: Aug.- Dec.

Halapar R.F., *V. Singh* 15942 (BSJO).

Ctenolepis garcinii (Burm. f.) Naud.

Common climber on *Prosopis juliflora* in moist sandy-loam soil.

Fl. & Fr.: Oct.- Jan.

Haman Khudi, *R.P. Pandey* 13916 (BSJO).

Cucumis callosus (Rottler) Cogn.

Common weed in waste places and in cultivated fields.

Fl. & Fr.: Aug.- Dec.

Mindhiari R.F., *V. Singh* 15702 (BSJO).

Cucumis prophetarum L. "*Alndri*".

Common in moist gravelly soil.

Fl. & Fr.: Oct.- Jan.

Guhar dam, *R.P. Pandey* 17782 (BSJO); Moti chheralong, Lakhpat, *R.P. Pandey* 20022 (BSJO); Mindhiari R.F., *V. Singh* 15781, 15875 (BSJO).

Dactyliandra welwitschii Hook. f.

Common climbing herb on hedges.

Fl. & Fr.: Aug.- Dec.

Guhar nani dam, *V. Singh* 15837 (BSJO); Sandrovadh R.F., *R.P. Pandey* 19900 (BSJO).

Luffa acutangula (L.) Roxb. var. **amara** (Roxb.) C.B. Clarke, "*Kadvi - Tori*".

Common a climbing herb on trees and shrubs in moist loamy places.

Fl. & Fr.: After rainy season.

Mindhiari R.F., *V. Singh* 15706, 15730 (BSJO); Haman Khudi river, *R.P. Pandey* 13924 (BSJO).

Momordica balsamina L.

Not common found on hedges after rains.

Fl. & Fr.: After rainy season.

Mindhiari R.F., *V. Singh* 15784 (BSJO).

Mukia maderaspatana (L.) Roem.

Common climber on hedges in rocky habitat.

Fl. & Fr.: Aug.- Dec.

Mindhiari R.F., *R.P. Pandey* 13971, *V. Singh* 15767 (BSJO).

CACTACEAE

***Opuntia elatior** Mill. "*Phaphdo thor*".

AIZOACEAE

Trianthema portulacastrum L. "*Satodi*".

Common weed in moist loamy soil.

Fl. & Fr.: July - Nov.

Mindhiari R.F., *V. Singh* 15797 (BSJO); Haman Khudi, *R.P. Pandey* 19896, 19899 (BSJO).

Trianthema triquetra Rottler ex Willd.

Not common in moist rocky habitat.

Fl. & Fr.: Sept.- Dec.

Mindhiari R.F., *V. Singh* 15850, *R.P. Pandey* 13962 (BSJO); Haman Khudi river, *R.P. Pandey* 13919 (BSJO); By the side of Narayan Sarovar, *R.P. Pandey* 13995 (BSJO).

Zaleya govindia (Buch.- Ham. ex G. Don) Nair

Common in moist loamy- clayey soil.

Fl. & Fr.: Sept.- Dec.

Mindhiari R.F., *V. Singh* 15751 (BSJO); By the side of Narayan Sarovar, *R.P. Pandey* 13997 (BSJO); Guhar moti, *R.P. Pandey* 19862 (BSJO).

MOLLUGINACEAE

Gisekia pharnaceoides L.

Not common in sandy soil.

Fl. & Fr.: Sept.- Jan.

Guhar, *R.P. Pandey* 19843 (BSJO); Guhar nani, *R.P. Pandey* 17778, *V. Singh* 15824 (BSJO); Narayan Sarovar, *V. Singh* 15803 (BSJO).

Glinus lotoides L.

Common in drying moist grounds.

Fl. & Fr.: Almost throughout the year.

Narayan Sarovar, *V. Singh* 15801 (BSJO).

Mollugo cerviana (L.) Ser.

Common in moist gravelly habitat.

Fl. & Fr.: Sept.- Dec.

River near Haman Khudi, *R.P. Pandey* 13911 (BSJO); Guhar nani, *R.P. Pandey* 17720 (BSJO).

APIACEAE

***Cuminum cyminum** L. “*Jiru*” (Cultivated).

***Foeniculum vulgare** Mill. “*Valiari*” (Cultivated).

RUBIACEAE

***Catunareguam spinosa** (Thunb.) Tirvengadam, “*Mindhal, Medhelo*”.

Hedyotis corymbosa (L.) Lam. var. **linearis** (DC.) Deb & Dutta

Common weed in cultivated fields.

Fl. & Fr.: Sept.- Dec.

Guhar nani, *R.P. Pandey* 17779 (BSJO).

Hedyotis puberula (G. Don) Arn.

Rare in moist sandy- loam soil.

Fl. & Fr.: Oct.- Dec.

Mori R.F., *V. Singh* 15987 (BSJO); Mindhiari R.F., *V. Singh* 15864 (BSJO).

Kohautia aspera (Heyne ex Roth) Bremek.

Occasional, in moist sandy soil.

Fl. & Fr.: Sept.- Dec.

Guhar nani, *R.P. Pandey* 17761; Haman Khudi, *V. Singh* 15928 (BSJO).

Spermacoce articularis L. f. “*Gantiyeli*”.

Not common in moist loamy soil.

Fl. & Fr.: Sept.- Dec.

Mindhiari R. F., *V. Singh* 15780 (BSJO); Haman Khudi, *R.P. Pandey* 13908 (BSJO).

***Spermacoce pusilla** Wall.

ASTERACEAE

Blainvillea acmella (L.) Philipson

Frequently found in gravelly- loamy habitat.

Fl. & Fr.: Aug.- Dec.

Mindhiari R.F., *V. Singh* 15720 (BSJO).

Blumea obliqua (L.) Druce

Not common in moist loamy habitat.

Fl. & Fr.: Aug.- Nov.

Haman Khudi, *V. Singh* 15916 (BSJO); Mindhiari R.F., *V. Singh* 15845 (BSJO).

***Conyza stricta** Willd.

Eclipta prostrata (L.) L. "*Bhangaro*".

Common in marshy habitat.

Fl. & Fr.: Sept.- Jan.

Guhar dam, *R.P. Pandey* 17790 (BSJO).

Gnaphalium luteo-album L. subsp. **affine** (D. Don) Koster

Common in moist gravelly- loamy habitat.

Fl. & Fr.: Sept.- Dec.

Halapar, near watchtower, *R.P. Pandey* 13940 (BSJO).

Garangea maderaspatana (L.) Poir.

Common in moist sandy- loam soil.

Fl. & Fr.: Sept.- Dec.

Mindhiari R.F., *V. Singh* 15865 (BSJO).

Helichrysum cutchicum (C.B.Clarke) R.S. Rao & Deshp.

Common in sandy to clayey-gravelly habitat.

Fl. & Fr.: Sept.- Mar.

Haman Khudi, *V. Singh* 15921 (BSJO); Narayan Sarovar, *R.S. Raghavan*. 114920 (BSI).

Laggera aurita (L. f.) Sch.-Bip. ex C.B.Clarke

Very common in gravelly- rocky habitat.

Fl. & Fr.: Sept.- Jan.

Halapar, *R.P. Pandey* 13930, 13932 (BSJO).

Launaea procumbens (Roxb.) Rammayya & Rajgopal, "*Bhonpatri*".

Common in sandy- loam habitat.

Fl. & Fr.: Aug.- Dec.

Haman Khudi, *V. Singh* 15935 (BSJO).

Launaea sarmentosa (Will.) Alst.

Common along sea-coast and in riverbeds.

Fl. & Fr.: Almost throughout the year.

Kannoj, *V. Singh* 15976 (BSJO).

Launaea resedifolia (L.) Kuntze

Not common in moist sandy-loam habitat.

Fl. & Fr.: Aug.- Nov.

Mindhiari R.F., *V. Singh* 15763 (BSJO).

Oligochaeta ramosa (Roxb.) Wagenitz

Common in gravelly habitat.

Fl. & Fr.: Oct.- Jan.

Guhar nani, *V. Singh* 15839, *R.P. Pandey* 17740 (BSJO).

Pluchea arguta Boiss.

Common in saline habitat.

Fl. & Fr.: Sept.- Jan.

Haman Khudi, *V. Singh* 15926 (BSJO).

Pluchea tomentosa DC.

Rare in moist sandy-loam soil.

Fl. & Fr.: Sept.- Jan.

Mori R.F., *V. Singh* 15990 (BSJO).

Pulicaria angustifolia DC.

Common in forest undergrowth in rocky places.

Fl. & Fr.: Sept.- Dec.

Mindhiari R.F., *R.P. Pandey* 13977, *V. Singh* 15725 (BSJO); Kunri R.F., *V. Singh* 15907 (BSJO).

Pulicaria wightiana (DC.) C.B. Clarke

Occasional, among grasses, in sandy-loam soil.

Fl. & Fr.: Aug.- Dec.

Sheh, *V. Singh* 15970 (BSJO).

Sonchus asper** (L.) Hill.Tridax procumbens** L. "*Pardesi bhangro*".***Vernonia cinerascens** Sch.-Bip.**Vernonia cinerea** (L.) Less. "*Sidoi*".

Common along stream in gravelly- loamy to moist rocky habitat.

Fl. & Fr.: Almost throughout the year.

Mindhiari Rakhal R.F., *V. Singh* 15718, *R.P. Pandey* 13980 (BSJO); Haman Khudi, *R.P. Pandey* 13905 (BSJO); Jadava, *R.P. Pandey* 19869 (BSJO).

PLUMBAGINACEAE

***Plumbago zeylanica** L. "*Chitrak*".

SAPOTACEAE

***Manilkara hexandra** (Roxb.) Dub. "*Rayan*".

GOODNIACEAE

Scaevola taccada (Gaertn.) Roxb. "*Rudraksh*".

Rare along sea-coast.

Fl. & Fr.: Aug. - Nov.

Haman Khudi, *V. Singh* 15941 (BSJO); Narayan Sarovar, *R. P. Pandey* 20031 (BSJO).

SALVADORACEAE

Salvadora oleoides Decne, "*Jal*".

Common in gravelly- rocky habitat.

Fl. & Fr.: Dec.- April.

Bhonar hills, *R.P. Pandey* 12103 (BSJO); Narayan Sarovar, *R.S. Raghavan* 114932 (BSI).

Salvadora persica L. "*Jal, Pillo, Piludi*".

Fairly common in loamy soil.

Fl. & Fr.: Oct.- Dec.

Narayan Sarovar, *R.P. Pandey* 13996 (BSJO).

APOCYNACEAE

Catharanthus pusillus (Murr.) G. Don, "*Sadabahar*".

Not common in rocky loamy soil.

Fl. & Fr.: Oct.- Jan.

Mindhiari R.F., *R.P. Pandey* 13965 (BSJO); Sandrovadh, *R.P. Pandey* 20001 (BSJO).

ASCLEPIADACEAE

***Calotropis gigantea** (L.) R. Br.

Calotropis procera (Ait.) Ait. f.

Common in open places in sandy- loam soil.

Fl. & Fr.: Almost throughout the year.

Guhar nani, *V. Singh* 15809 (BSJO); Haman Khudi river, *R.P. Pandey* 13927 (BSJO).

Leptadenia pyrotechnica (Forssk.) Decne.

Common in sandy places.

Fl. & Fr.: Aug.- Dec.

Guhar nani, *V. Singh* 15830 (BSJO); Guhar dam, *R.P. Pandey* 17794 (BSJO).

Lalotropis reticulata (Retz.) Wight & Arn. "*Mithidodi*".

Common twinner of the area, in sandy habitat.

Fl. & Fr.: July- Mar.

Guhar Moti, *R.P. Pandey* 19865 (BSJO).

Oxystelma esculenta (L.f.) R. Br.

Not common twining herb on hedges in sandy- loam soil.

Fl. & Fr.: Aug.- Oct.

Mindhiari Rakhal R.F., *V. Singh* 15884 (BSJO).

***Pentatropis capensis** (L.f.) Bullock, “*Dudheli*”.**Pentatropis nivalis** (Gmel.) Field & Wood. “*Mithidodi*”.

Common on hedges in sandy- loam soil.

Fl. & Fr.: Aug.- Dec.

Sheh, *V. Singh* 15967 (BSJO); Guhar nani, *V. Singh* 15800 (BSJO).

Pergularia daemia (Forssk.) Chiov.

Common climbing herbs on trees and shrubs in moist loamy habitat.

Fl. & Fr.: Oct.- Jan.

Haman Khudi River, *R.P. Pandey* 13914 (BSJO); Mindhiari R.F., *V. Singh* 15709; *R.P. Pandey* 13952 (BSJO).

Sarcostemma viminale** (L.) R. Br. “*Son*”.Telosma cordata** (Burm.f.) Merr.***Wattakaka volubilis** (L.f.) Stapf

PERIPLOCACEAE

***Hemidesmus indicus** (L.) R. Br. “*Dudhivel, Uplsari, Sariva, Anat mul*”.**Periploca aphylla** Decne. “*Dudhi - bel*”.

Common among bushes, in rocky- gravelly habitat.

Fl. & Fr.: Sept.- Jan.

Haman Khudi, *V. Singh* 15933 (BSJO); Halapar, near watch tower, *R.P. Pandey* 13941 (BSJO); Nani chher, *R.P. Pandey* 20030 (BSJO); Narayan Sarovar, *R.S. Raghavan* 144933 (BSI).

GENTIANACEAE

Enicostema axillare (Lam.) Raynal, “*Mamejao*”.

Common in moist sandy habitat.

Fl. & Fr.: Sept.- Dec.

Mindhiari Rakhal R.F., *V. Singh* 15722, *R.P. Pandey* 13968 (BSJO); Guhar dam, *R.P. Pandey* 17787 (BSJO); Guhar moti, *R.P. Pandey* 19864 (BSJO).

BORAGINACEAE

Coldenia procumbens L.

Common in moist sandy- loam soil.

Fl. & Fr.: Sept.- Dec.

Mindhiari R.F., *V. Singh* 15857, 15878 (BSJO).

Heliotropium bacciferum Forssk.

Common in sandy- loam soil.

Fl. & Fr.: Sept.- Jan.

Guhar nani, *V. Singh* 15821(BSJO); Sandrovadh, R.F., *R.P. Pandey* 20007(BSJO); Narayan Sarovar, *R.P. Pandey* 20016 (BSJO).

***Heliotropium bacciferum* Forssk. subsp. *suberosum* (C.B.Clarke) Bhandari**

Very common in gravelly- loamy habitat.

Fl. & Fr.: Sept.- Apr.

Guhar nani, *V. Singh* 15826 (BSJO); On the way to Koteswar temple, *R.P. Pandey* 121061 (BSJO).

***Heliotropium curassavicum* L.**

Common in saline and moist clayey habitat.

Fl. & Fr.: Sept.- Dec.

Narayan Sarovar tank side, *R.P. Pandey* 13994 (BSJO).

****Heliotropium marifolium* Retz. var. *marifolium*, “Zinku Okharad”.**

***Heliotropium marifolium* Retz. var. *wallichii* C.B.Clarke**

Common in sandy- loam soil.

Fl. & Fr.: Sept.- Jan.

Guhar nani, *R.P. Pandey* 17755 (BSJO).

***Heliotropium ophioglossum* Stock ex Aitch.**

Rare in gravelly to loamy soil.

Fl. & Fr.: Sept.- Dec.

Nareda, *R.P. Pandey* 19884 (BSJO); Narayan Sarovar, *R.S. Raghavan* 194934 (BSI).

***Heliotropium ovalifolium* Forssk.**

Common in dried up tank in clayey soil.

Fl. & Fr.: Oct.- Jan.

Mata Na Math, *R.P. Pandey* 13987 (BSJO); Kanno, *V. Singh* 15979 (BSJO); Mindhiari R.F., *V. Singh* 15862 (BSJO).

***Heliotropium rariflorum* Stocks**

Frequent, in sandy- loam soil.

Fl. & Fr.: Aug.- Nov.

Mindhiari R.F., *V. Singh* 15799 (BSJO).

***Heliotropium strigosum* Willd.**

Common in moist places in sandy- loam soil.

Fl. & Fr.: Aug.- Dec.

Haman Khudi, *V. Singh* 15939 (BSJO).

***Heliotropium subulatum* (Hochst. ex DC.) Vatke**

Common in sandy - gravelly habitat.

Fl. & Fr.: Oct.- Jan.

Guhar nani village, *R.P. Pandey* 17765, 17785(BSJO); *V. Singh* 15815 (BSJO).

***Heliotropium tuberosum* Boiss.**

Not common in sandy gravelly habitat.

Fl. & Fr.: Sept.- Jan.

Narayan Sarovar, *R.S. Raghavan* 114927 (BSI).

Heliotropium zeylanicum (Burm.f.) Lam.

Fairly Common in open gravelly- loamy soil.

Fl. & Fr.: July- Nov.

Nareda, *R.P. Pandey* 19881 (BSJO).

Sericostoma pauciflorum Stocks ex Wight

Common on hummocky plains in sandy habitat.

Fl. & Fr.: Oct.- Jan.

Guhar dam, *R.P. Pandey* 17795 (BSJO); Way to Lakhpat, *R.P. Pandey* 12107 (BSJO); Sinapar, along Lakhpat, *R.P. Pandey* 13999 (BSJO); Haman Khudi, *R.P. Pandey* 19858 (BSJO).

Trichodesma indica (L.) R. Br.

Common in sandy- loam to gravelly habitat.

Fl. & Fr.: Sept.- Apr.

Narayan Sarovar, *R.S. Raghavan* 114910-A (BSI).

Trichodesma indica (L.) R. Br. var. ***amplexicaule*** (Roth) T. Cooke

Common in sandy- loam soil.

Fl. & Fr.: Sept.- Apr.

Mindhiari Rakhal R.F., *V. Singh* 15711, 15768, 15881, (BSJO).

Trichodesma inaequale Edgew.

Not common in sandy- loam habitat.

Fl. & Fr.: July- Nov.

Nareda, *R.P. Pandey* 19878 (BSJO).

EHRETIACEAE

Cordia dichotoma Forst. f.

Planted, in sandy- loam soil.

Fl. & Fr.: Jan.- May.

Narayan Sarovar, *R.S. Raghavan* 114937 (BSI).

Cordia gharaf (Forssk.) Ehrenb. ex Asch.

Common in sandy- gravelly soil.

Fl. & Fr.: Oct.- May.

Haman Khudi, *R.P. Pandey* 19854 (BSJO); Nalia, *R.S. Raghavan* 114969 (BSI).

Cordia perrottetii Wight, “*Gundo*”.

Common on hills, in rocky habitat.

Fl. & Fr.: Jan.- May.

Mindhiari R.F., *R.P. Pandey* 13984 (BSJO).

CONVOLVULACEAE

Cressa cretica L. “*Khariyu*”.

Fairly common in marshy saline habitat.

Fl. & Fr.: Sept.- Mar.

Near Lakhi Mangrove, *R.P. Pandey* 17796 (BSJO); Kunri R.F., *V. Singh* 15898 (BSJO); Narayan Sarovar, *R.S. Raghavan* 114944 (BSI).

Convolvulus auricomus (A. Rich.) Bhandari

Not common in rocky- loamy habitat.

Fl. & Fr.: Sept.- Dec.

Mindhiari R.F., *R.P. Pandey* 13958 (BSJO).

Convolvulus auricomus (A. Rich.) Bhandari var. **volubilis** (C.B. Clarke) Bhandari

Not common in loamy habitat.

Fl. & Fr.: Sept.- Dec.

Mindhiari R.F., *V. Singh* 15795 (BSJO).

***Convolvulus prostratus** Forssk. “*Shankhavli, Mankhni*”.**Convolvulus rhynospermus** Hochst. ex Choisy

Fairly common in gravelly- loamy soil.

Fl. & Fr.: Sept.- Dec.

Narayan Sarovar, along Nalia, *R.P. Pandey* 17731 (BSJO); Guhar nani, *V. Singh* 15823, 15838 (BSJO); Rodasar, *V. Singh* 15962 (BSJO).

Convolvulus stocksii Boiss.

Common in sandy-loam soil.

Fl. & Fr.: Sept.- Dec.

Mindhiari, *V. Singh* 15715, 15749 (BSJO).

Evolvulus alsinoides (L.) L. “*Shankhapuspi, Vishnugandhi*”.

Common among grasses, in sandy-loam soil.

Fl. & Fr.: Sept.- Jan.

Mindhiari Rakhal R.F., *V. Singh* 15715-A; Kunri, *V. Singh* 15900 (BSJO).

Hewittia subulata (L. f.) Kuntze

Frequent, on hedges in sandy-loam soil.

Fl. & Fr.: Sept.- Dec.

Mindhiari R.F., *V. Singh* 15750 (BSJO).

Ipomoea carica (L.) Sweet

Common herbaceous climber on *Prosopis juliflora*, in moist loamy soil.

Fl. & Fr.: Oct.- Dec.

Haman Khudi River, *R.P. Pandey* 13921 (BSJO).

Ipomoea eriocarpa R. Br.

Common among grasses in sandy-loam soil.

Fl. & Fr.: After rainy season.

Rodasar, *V. Singh* 15956 (BSJO).

Ipomoea kotschyana Hochst. ex Choisy

Rare in sandy-loam soil.

Fl. & Fr.: Aug.- Dec.

Mindhiari R.F., *V. Singh* 15783 (BSJO).

Ipomoea nil (L.) Roth, “*Krishnabija*”.

Frequent, in scrub jungle.

Fl. & Fr.: Sept.- Dec.

Halapar R.F., *V. Singh* 15943 (BSJO); Mindhiari R.F., *R.P. Pandey* 13974 (BSJO).

Ipomoea pes-caprae (L.) R. Br.

Common herbaceous twinner in open moist places, in gravelly-loamy soil.

Fl. & Fr.: Sept.- Jan.

Along Narayan Sarovar road from Nakhtarana, *R.P. Pandey* 17728 (BSJO).

Ipomoea pes-tigridis L.

Common on hedges in wastelands.

Fl. & Fr.: Sept.- Dec.

Kunri R.F., *V. Singh* 15908 (BSJO).

Ipomoea sindica Stapf

Common creeper, in moist loamy soil.

Fl. & Fr.: Sept.- Dec.

Haman Khudi river, *R.P. Pandey* 13920 (BSJO); Mindhiari R.F., *V. Singh* 15746, 15885 (BSJO).

Ipomoea tuberculata Ker-Gawl.

Common in sandy-loam soil.

Fl. & Fr.: Sept.- Dec.

Mori R.F., *V. Singh* 15985 (BSJO).

Ipomoea verticillata Forssk.

Not common in rocky habitat.

Fl. & Fr.: Sept.- Nov.

Mindhiari R.F., *R.P. Pandey* 13955 (BSJO).

****Merremia aegyptia*** (L.) Urban, “*Panch pan ni fudardi*”.

Merremia rajasthanensis Bhandari

Climbing herbs on hedges and trees in loamy soil.

Fl. & Fr.: Sept.- Dec.

Mindhiari R.F., *V. Singh* 15748 (BSJO).

Rivea hypocrateriformis (Desr.) Choisy

Common climber on hedges and trees, in moist gravelly-loamy soil.

Fl. & Fr.: Sept.- Jan.

Haman Khudi River, *R.P. Pandey* 13926 (BSJO); Mindhiari R.F., *V. Singh* 15738 (BSJO).

****Seddera latifolia*** Hochsl. & Steud.

Xenostegia tridentata (L.) Austin & Staples, "*Prasarni*".

Fairly common in open places in moist sandy-loam soil.

Fl. & Fr.: Sept.- Jan.

Kunri R.F., *V. Singh* 15910 (BSJO); Narayan Sarovar, *R.S. Raghavan* 114911 (BSI).

CUSCUTACEAE

Cuscuta campestris Yunker

Common parasite on hedges.

Fl. & Fr.: Sept.- Dec.

Mindhiari R.F., *V. Singh* 15861 (BSJO).

SOLANACEAE

Datura fastuosa L. "*Dhaturo*".

Common in dried up tanks and waste places in moist clayey soil.

Fl. & Fr.: Sept.- Jan.

Narayan Sarovar tank side, *R.P. Pandey* 13992 (BSJO).

Datura innoxia Mill. "*Dhaturo, Kalo dathuro*".

Not common in clayey- loam soil.

Fl. & Fr.: Sept.- Jan.

Near Koteswar temple, *R.P. Pandey* 13950 (BSJO).

Lycium barbarum L.

Common in sandy habitat.

Fl. & Fr.: Aug.- Jan.

Haman Khudi, *R.P. Pandey* 19856 (BSJO).

Lycium edgeworthii Dun.

Not common in dry clayey soil and on sandy sea-shores.

Fl. & Fr.: Sept.- Dec.

Mori R.F., *V. Singh* 15997 (BSJO).

Physalis divaricata D. Don

Common weed in open sandy-loam places.

Fl. & Fr.: Sept.- Jan.

Haman Khudi, *V. Singh* 15932 (BSJO); Mindhiari R.F., *V. Singh* 157800 (BSJO). Desalpar, *R.S. Raghavan* 114892 (BSI).

Solanum anguivi Lam.

Common in open gravelly - loamy habitat.

Fl. & Fr.: July - Jan.

Baranda, *R.P. Pandey* 19873 (BSJO).

Solanum dubium Fresen.

Common in open sandy habitat.

Fl. & Fr.: Oct.- Jan.

Along Guhar village, *R.P. Pandey* 17751 (BSJO).

Solanum elaeagnifolium Cav.

Rare in sandy-loam soil.

Fl. & Fr.: Sept.- Jan.

Guhar nani, *V. Singh* 15811 (BSJO).

Solanum incanum L.

Not common in open sandy places.

Fl. & Fr.: Sept.- Dec.

Halapar R.F., *V. Singh* 15953 (BSJO).

Solanum nigrum L. "*Ubringini, Piludi*".

Not common in moist sandy soil.

Fl. & Fr.: Sept.- Jan.

Guhar village, *R.P. Pandey* 17793 (BSJO); Mindhiari R.F., *V. Singh* 15874 (BSJO).

***Solanum virginianum** L. "*Bhoringini*".**Withania somnifera** (L.) Dun. "*Aswagandha*".

Common weed in open waste places in mixed habitat.

Fl. & Fr.: Oct.- Feb.

Along Guhar, *R.P. Pandey* 17741 (BSJO); Narayan Sarovar, *R.P. Pandey* 20017 (BSJO); Mindhiari R.F., *V. Singh* 15786 (BSJO).

SCROPHULARIACEAE

Bacopa monnieri (L.) Pennell, "*Nevari*".

Frequently found in patches in moist sandy-loam soil.

Fl. & Fr.: Aug.- Jan.

Mindhiari R.F., *V. Singh* 15860 (BSJO).

***Camphylanthus ramosissimus** Wight**Kickxia ramosissima** (Wall.) Janchen

Common on dilapidated walls, river slopes or rock cuttings.

Fl. & Fr.: Sept.- Dec.

Haman Khudi river, *V. Singh* 15931, *R.P. Pandey* 13928 (BSJO).

***Schweinfurthia papilionacea** (L.) Merr.**Striga angustifolia** (D. Don) Saldanha

Common a root parasite of grasses.

Fl. & Fr.: After rainy season.

Haman Khudi, *V. Singh* 15940 (BSJO).

Striga densiflora (Benth.) Benth.

Not common in sandy-loam soil and on rock crevices.

Fl. & Fr.: Oct.- Dec.

Mindhiari R.F., *R.P. Pandey* 13975 (BSJO); Halapar, 13933 (BSJO).

***Striga gesneroides** (Willd.) Vayke

PEDALIACEAE

Pedaliium murex L. "*Moto gokhru*".

Not common in moist sandy-loam soil.

Fl. & Fr.: Sept.- Dec.

Guhar dam side, *R.P. Pandey* 17784(BSJO); Haman Khudi, *R.P. Pandey* 19851(BSJO); Mindhiari R.F., *V. Singh* 15793 (BSJO).

Sesamum indicum L. "*Til*".

Common weed in fallow and wastelands.

Fl. & Fr.: Aug.- Dec.

Mindhiari R.F., *V. Singh* 15704 (BSJO).

ACANTHACEAE

Barleria acanthoides Vahl, "*Vajardanti*".

Occasionally found in sandy gravelly habitat.

Fl. & Fr.: Sept.- Dec.

Mindhiari R.F., *V. Singh* 15794 (BSJO).

Barleria prionitis L. "*Kantaserito*".

Common along roadside and in forests in sandy-loam soil.

Fl. & Fr.: Sept.- Dec.

Mindhiari R.F., *V. Singh* 15707 (BSJO).

Blepharis linariaefolia Pers.

Common in sandy gravelly habitat.

Fl. & Fr.: Sept.- Dec.

Haman Khudi, *V. Singh* 15938 (BSJO).

***Blepharis maderaspatensis** (L.) Roth**Dipteracanthus patulus** (Jacq.) Nees

Common in rocky- gravelly habitat.

Fl. & Fr.: Sept.- Jan.

Narayan Sarovar, Kunri, R.F., *V. Singh* 15901 (BSJO).

Dipteracanthus patulus (Jacq.) Nees var. **alba** (Saxton) Bhandari

Common forest undergrowth, in rocky habitat.

Fl. & Fr.: Aug.- Jan.

Mindhiari R.F., *R.P. Pandey* 13983(BSJO); Sandrovadh dam R.F., *R.P. Pandey* 20010 (BSJO).

Justicia japonica Thunb.

Common in moist sandy-loam soil.

Fl. & Fr.: Sept.- Dec.

Mindhiari R.F., *V. Singh* 15701 (BSJO).

Lepidagathis trinervia Wall. ex Nees

Common in sandy-loam soil.

Fl. & Fr.: Sept.- Jan.

Haman Khudi, *V. Singh* 15924 (BSJO).

Peristrophe paniculata (Forssk.) Brum. "*Kali - agedhi*".

Common in hedges and as forest undergrowth.

Fl. & Fr.: Sept.- Jan.

Mindhiari R.F., *V. Singh* 15770 (BSJO).

***Rostellularia diffusa** (Willd.) Nees**Rostellularia procumbens** (L.) Nees

Common in moist rocky- gravelly habitat.

Fl. & Fr.: Oct.- Dec.

Miadhriasri Rakhal, *R.P. Pandey* 13981 (BSJO).

AVICENNIACEAE

Avicennia marina (Forssk.) Vierh.

Abundant, forming a pure formation in saline marshy/ aquatic habitat.

Fl. & Fr.: Oct.- Jan.

Lakki mangrove forest, *R.P. Pandey* 17800 (BSJO).

VERBENACEAE

Clerodendrum multiflorum (Burm.f.) Kuntze, "*Arni*".

Common in open sandy soil.

Fl. & Fr.: Aug.- Dec.

Mindhiari R.F., *V. Singh* 15854 (BSJO).

***Premna integrifolia** L.**Premna resinosa** Schau.

Not common in gravelly- rocky habitat.

Fl. & Fr.: Sept.- Dec.

Mori R.F., *V. Singh* 16001(BSJO); Guhar moti, *R.P. Pandey* 19863 (BSJO).

Phyla nodiflora (L.) Green, "*Ratvelio*".

Common in marshy habitat.

Fl. & Fr.: Sept.- Dec.

Mindhiari R.F., *V. Singh* 15870 (BSJO); Sheh, along Dayapar, *R.P. Pandey* 13951 (BSJO).

LAMIACEAE

Leucas cephalotes (Koen. ex Roth) Spreng. "*Kubo*".

Common in moist sandy-loam habitat.

Fl. & Fr.: After rainy season.

Mindhiari R.F., *V. Singh* 15759 (BSJO).

Leucas urticaefolia (Vahl) R. Br.

Frequent, in moist sandy-loam shady places.

Fl. & Fr.: Aug. - Dec.

Mindhiari Rakhal R.F., *V. Singh* 15747 (BSJO); Haman Khudi river, *R.P. Pandey* 13918 (BSJO).

Ocimum americanum** L.Ocimum basilicum** (L.) Druce, "*Ran tulsi, Takmaria, Jangli tulsi*".**Salvia santolinifolia** Boiss.

Common in open sandy- gravelly places.

Fl. & Fr.: Sept. - Dec.

Haman Khudi, *V. Singh* 15923 (BSJO).

NYCTAGINACEAE

Boerhavia procumbens Banks ex Roxb. "*Sathodi*".

Not common in mixed habitat.

Fl. & Fr.: Oct.- Dec.

Guhar, *R.P. Pandey* 17763 (BSJO); Kunri R.F., *V. Singh* 15906 (BSJO).

Boerhavia repens L. "*Satho*".

Common in sandy soil.

Fl. & Fr.: Oct.- Jan.

Guhar, *R.P. Pandey* 17774(BSJO); Nareda, *R.P. Pandey* 19876(BSJO); Haman Khudi, *R.P. Pandey* 19898 (BSJO).

***Commicarpus chinensis** (L.) Heimerl**Commicarpus helenae** (Schult.) Meikle, "*Moti - Sathodi*".

Common in sandy- gravelly habitat.

Fl. & Fr.: Sept.- Dec.

Mindhiari R.F., *V. Singh* 15737 (BSJO); Moti chher, *R.P. Pandey* 20024(BSJO); Haman Khudi, *R.P. Pandey* 19859 (BSJO).

AMARANTHACEAE

Achyranthes aspera L. var. **aspera**, "*Agedho*".

Common weed of the area, in mixed habitat.

Fl. & Fr.: Sept.- Jan.

Mindhiari R.F. *V. Singh* 15761(BSJO); Narayan Sarovar, *R.S. Raghavan* 114939 (BSI).

***Achyranthes aspera** L. var. **porphyristachya** Hook.f.

Aerva javanica (Burm. f.) Juss. ex Schult.

Common weed in open sandy-loam soil.

Fl. & Fr.: Sept.- Feb.

Guhar nani, *V. Singh* 15825 (BSJO).

***Aerva lanata** (L.) Juss. ex Schult.**Aerva javanica** (Burm. f.) Juss. ex Schult. var. **bovei** Webb.

Common in hummocky open places in sandy habitat.

Fl. & Fr.: Oct.- Feb.

Guhar village, *R.P. Pandey* 17758(BSJO); Kuriani, *R. P. Pandey* 20028 (BSJO).

Alternanthera sessilis (L.) R. Br. ex DC. "*Matsyaksi*".

Common in moist sandy-loam soil.

Fl. & Fr.: Sept.- Dec.

Mindhiari R.F., *V. Singh* 15877 (BSJO); Kannoji, *V. Singh* 15975 (BSJO).

Amaranthus hybridus L. subsp. **cruentus** (L.) Thell var. **paniculata** (L.) Thell. "*Tanduliya*".

Not common in waste places in sandy-loam soil.

Fl. & Fr.: Sept.- Dec.

Mindhiari R.F., *V. Singh* 15772 (BSJO).

Amaranthus polygonoides L.

Common weed in neglected areas, in mixed habitat.

Fl. & Fr.: After rainy season.

Deshalpar, *R.S. Raghavan* 114891 (BSI).

***Amaranthus spinosus** L.**Amaranthus tenuifolius** Willd.

Common weed, in open waste places.

Fl. & Fr.: Aug.- Dec.

Mindhiari R.F., *V. Singh* 15858 (BSJO).

Amaranthus tricolor L.

Common weed, in open moist places in sandy-loam habitat.

Fl. & Fr.: Oct.- Jan.

Haman Khudi, *R.P. Pandey* 13904 (BSJO); Tera village, *R.P. Pandey* 17776 (BSJO); Moti chher, *R.P. Pandey* 20023 (BSJO); Narayan Sarovar, *V. Singh* 15805 (BSJO).

Amaranthus viridis L.

Common weed, in open sandy moist waste places.

Fl. & Fr.: After rainy season.

Mindhiari R.F., *V. Singh* 15798 (BSJO).

Celosia argentea L. "*Lampadi*".

Common weed in fallow fields and open waste places.

Digera muricata (L.) Mart.

Common weed in open sandy- gravelly habitat.

Fl. & Fr.: Sept.- Jan.

Along Guhar, *R.P. Pandey* 17734 (BSJO); Haman Khudi, *R.P. Pandey* 19849 (BSJO); Mindhiari R.F., *V. Singh* 15727 (BSJO).

Nothosaerva brachiata (L.) Wight

Common in drying moist grounds.

Fl. & Fr.: Sept.- Dec.

Mindhiari R.F., *V. Singh* 15867 (BSJO); Halapar R.F., *V. Singh* 15946 (BSJO).

Pupalia lappacea (L.) Juss.

Common weed in mixed habitat.

Fl. & Fr.: Sept.- Feb.

Mindhiari R.F., *V. Singh* 15734 (BSJO); Mori R.F., *V. Singh* 15989 (BSJO); Along Guhar, *R. P. Pandey* 17752 (BSJO).

CHENOPODIACEAE

Atriplex stocksii (Wight) Boiss.

Common in saline habitat.

Fl. & Fr.: Sept.-Feb.

Narayan Sarovar, *R.S. Raghavan* 114928 (BSI).

Chenopodium album L. "*Chili*".

Common weed in cultivated fields.

Fl. & Fr.: Sept.- Dec.

Guhar, *R.P. Pandey* 17756 (BSJO).

Chenopodium murale L.

Common weed in fallow fields.

Fl. & Fr.: Sept.- Mar.

Devisar, *R.S. Raghavan* 114871 (BSI).

Salicornia brachiata Roth, "*Lantho*".

Not common in tidal zone saline habitat.

Fl. & Fr.: Sept.- Apr.

Narayan Sarovar, *R.S. Raghavan* 114942 (BSI).

Suaeda fruticosa (L.) Forssk. ex Fanel, "*Moral*".

Common along coastal area in saline habitat.

Fl. & Fr.: Sept.- Apr.

Lakhi Mangrove forest, *R.P. Pandey* 17797 (BSJO); Koteswar along sea, *R.P. Pandey* 12108, 13949 (BSJO); Narayan Sarovar, *R.S. Raghavan* 114938, 114941, *S.K. Jain* 61924, 61925 (BSI).

Suaeda maritima (L.) Dumort, "*Moral, Unth - moral*".

Rare in saline habitat.

Fl. & Fr.: Sept.- Mar.

Kannoj, *V. Singh* 15984.

****Suaeda nudiflora*** (Willd.) Moq., "*Lana*".

POLYGONACEAE

Polygonum plebeium R. Br.

Rare in moist sandy-loam soil.

Fl. & Fr.: Sept.- Dec.

Mindhiari R.F., *V. Singh* 15859 (BSJO).

ARISTOLOCHIACEAE

Aristolochia bracteolata Lam. "*Kidamari*".

Common along dam- side, ponds etc in sandy- clayey soil.

Fl. & Fr.: Sept.- Mar.

Desalpar, *R.S. Raghavan* 114885 (BSI).

EUPHORBIACEAE

****Breynia retusa*** (Dennst.) Alston, "*Kamboi, Kali kamboi*".

Dalechampia scandens L. var. ***cordofana*** (Hochst. ex Webb.) Muell.- Arg. "*Virshchekali*".

Herbaceous climber on hedges and trees.

Fl. & Fr.: Sept.- Jan.

Haman Khudi, *R.P. Pandey* 13915(BSJO); Sandrovadh R.F., *R.P. Pandey* 20005 (BSJO); Mindhiari R.F., *V. Singh* 15710 (BSJO).

Euphorbia caducifolia Haines, "*Thor*".

Common in rocky gravelly habitat.

Fl. & Fr.: Sept.- Dec.

Rodasar, *V. Singh* 15965 (BSJO); Bhonar hills, *R.P. Pandey* 12102 (BSJO).

Euphorbia clarkeana Hook. f. "*Dudheli*".

Common in open moist rocky habitat.

Fl. & Fr.: After rainy season.

Mindhiari R.F., *R.P. Pandey* 13959, *V. Singh* 15779 (BSJO); Guhar tank, *R.P. Pandey* 17735(BSJO); Sandrovadh R.F., *R.P. Pandey* 20011(BSJO); Kunri R.F., *V. Singh* 15905 (BSJO); *R.S. Raghavan* 114930 (BSI).

****Euphorbia geniculata*** Orteg.

Euphorbia heterophylla L.

Common weed in open sandy moist places.

Fl. & Fr.: Sept.- Dec.

Mindhiari R.F., *V. Singh* 15773 (BSJO).

Euphorbia heyneana Spreng.

Common in moist sandy habitat.

Fl. & Fr.: Sept.- Jan.

Guhar, *R.P. Pandey* 17767 (BSJO); Narayan Sarovar, *V. Singh* 15804, *R.P. Pandey* 20015 (BSJO).

Euphorbia hirta L. "*Dudheli*".

Common in moist gravelly-loamy soil.

Fl. & Fr.: Sept. - Jan.

Haman Khudi, *R.P. Pandey* 13904 (BSJO); Mindhiari R.F., *V. Singh* 15764 (BSJO).

Euphorbia indica Lam.

Common weed in moist sandy-loam soil.

Fl. & Fr.: After rainy season.

Haman Khudi, *V. Singh* 15919 (BSJO).

Euphorbia nivulia** L. "*Vad thor*".Euphorbia tirucalli** L. "*Kharsani*" (Planted).**Phyllanthus fraternus** Webster, "*Bhionamlli*".

Not common in moist loamy habitat.

Fl. & Fr.: After rainy season.

Haman Khudi, *R.P. Pandey* 13909 (BSJO); Mindhiari R.F., *R.P. Pandey* 13956 (BSJO); Guhar, *R. P. Pandey* 19845 (BSJO).

Phyllanthus maderaspatana L.

Common in moist loamy- sandy soil.

Fl. & Fr.: Sept.- Dec.

Mindhiari R.F., *V. Singh* 15762, 15893 (BSJO).

Ricinus communis L.

Commonly cultivated in sandy-loam soil as a crop.

Fl. & Fr.: Aug.- Mar.

Narayan Sarovar, *R.P. Pandey* 20021 (BSJO).

***Securinega virosa** (Roxb. ex Willd.) Baillon, "*Safed fail, Pichrun*".

MORACEAE

Ficus benghalensis L.

Commonly planted near habitations, along roads and temples, in mixed habitat.

Fl. & Fr.: Aug.- Mar.

Narayan Sarovar, *R.P. Pandey* 20032 (BSJO).

Ficus microcarpa L. f.

Commonly planted near habitations, in sandy-loam soil.

Fl. & Fr.: Aug.- Feb.

Narayan Sarovar, *R. P. Pandey* 20033 (BSJO).

CASURINACEAE

***Casurina equisetifolia** L. "*Sharu*".

HYDROCHARITACEAE

***Hydrilla verticillata** (L.f.) Royle

Vallisneria spiralis L. var. **denseserrulata** Makino

Not common in aquatic habitat.

Fl. & Fr.: Sept.- Dec.

Mindhiari, R.F., *V. Singh* 15846 (BSJO).

LILIACEAE

***Aloe vera** (L.) Burm.f. "*Kunvarpato*".**Asparagus africanus** Lam.

Common in rocky- gravelly habitat.

Fl. & Fr.: Sept.- Jan.

Guhar dam, *R. P. Pandey* 17786 (BSJO).

Asparagus dumosus Baker

Common in rocky- gravelly places.

Fl. & Fr.: Sept.- Jan.

Kunri R.F., *V. Singh* 15914 (BSJO); Narayan Sarovar tank side, *R. P. Pandey* 19841 (BSJO); Narayan Sarovar, *S. K. Jain* 61954 (BSI).

Asparagus racemosus Willd.

Common in rocky- gravelly habitat.

Fl. & Fr.: Sept.- Dec.

Mindhiari R.F., *V. Singh* 15714 (BSJO).

Dipcadi erythraeum Webb. & Berth.

Common along river-beds and on low hillocks in sandy to gravelly places.

Fl. & Fr.: July- Nov.

Haman Khudi, *R.P. Pandey* 19850 (BSJO).

COMMELINACEAE

Commelina benghalensis L.

Common in moist sandy-loam soil.

Fl. & Fr.: Aug.- Nov.

Kuriani, along Lakhpat, *R.P. Pandey* 20025 (BSJO).

Commelina forsskalaei Vahl

Common in moist sandy-loam shady places.

Fl. & Fr.: Aug.- Dec.

Mindhiari R.F., *V. Singh* 15771, *R.P. Pandey* 13964 (BSJO).

***Commelina hasskarlii** C.B. Clarke**Commelina suffruticosa** Blume

Frequent, in moist sandy-loam soil.

Fl. & Fr.: Sept.- Dec.

Mindhriari Rakhal R.F., *V. Singh* 15741 (BSJO); Narayan Sarovar, *V. Singh* 15904 (BSJO).

ARECACEAE

***Phoenix dactylifera** L. “*Khajuri*”.

***Phoenix sylvestris** (L.) Roxb. “*Khajuri*”.

TYPHACEAE

Typha domingensis Pers.

Not common in marshy or aquatic habitat.

Fl. & Fr.: Aug.- Dec.

Mindhiari R.F., *V. Singh* 15719 (BSJO).

***Typha elephantina** Roxb.

POTAMOGETONACEAE

Potamogeton nodosus Poir.

Common in aquatic habitat.

Fl. & Fr.: Aug.- Dec.

Guhar dam, *V. Singh* 15836 (BSJO).

NAJADACEAE

Najas minor All.

Common in aquatic habitat.

Fl. & Fr.: Sept.- Jan.

Mindhiari R.F., *V. Singh* 15849 (BSJO).

CYPERACEAE

Bolboschoenus maritimus (L.) Palla

Not common in moist loamy- clayey soil.

Fl. & Fr.: Sept.- Dec.

Mindhiari R.F., *V. Singh* 15716 (BSJO); Guhar dam, *R.P. Pandey* 17780 (BSJO); Nareda, *R.P. Pandey* 19880 (BSJO), *V. Singh* 15831 (BSJO).

Cyperus atkinsonii C.B. Clarke

Common in gravelly- sandy soil.

Fl. & Fr.: Sept.- Jan.

Nareda- along Nalia, *R.P. Pandey* 13946 (BSJO); Guhar nani, *V. Singh* 15818 (BSJO).

Cyperus compressus L.

Occasional, in moist sandy places.

Fl. & Fr.: Sept.- Jan.

Guhar village, *R.P. Pandey* 17764 (BSJO).

Cyperus difformis L.

Frequent, in moist sandy places.

Fl. & Fr.: Sept.- Dec.

Mindhiari R.F., *V. Singh* 15848 (BSJO).

Cyperus flabelliformis Rottb.

Common in moist sandy-loam habitat.

Fl. & Fr.: Sept.- Jan.

Mindhiari R.F., *V. Singh* 15882 (BSJO).

Cyperus iria L.

Not common in moist sandy places.

Fl. & Fr.: Sept.- Dec.

Halapar R.F., *V. Singh* 15947 (BSJO).

Cyperus pygmaeus Rottb.

Common in marshy habitat.

Fl. & Fr.: Sept.- Dec.

Guhar dam, *R.P. Pandey* 17788, *V. Singh* 158233 (BSJO).

Cyperus rotundus L. "*Motha, Mostha*".

Common in moist rocky- loamy habitat.

Fl. & Fr.: Sept.- Jan.

Haman Khudi, *R.P. Pandey* 13907 (BSJO).

Cyperus rotundus L. var. **centiflora** C.B.Clarke

Common in moist sandy-loam soil.

Fl. & Fr.: Sept.- Jan.

Guhar nani, *V. Singh* 15819 (BSJO).

Eleocharis geniculata (L.) Roem. & Schult.

Common in moist sandy soil.

Fl. & Fr.: Sept.- Jan.

Mindhiari R.F., *V. Singh* 15713 (BSJO).

Fimbristylis bisumbellata (Forssk.) Bubani

Common in marshy places.

Fl. & Fr.: Sept.- Dec.

Mindhiari R.F., *V. Singh* 15869 (BSJO).

Fimbristylis ferruginea (L.) Vahl

Common in marshy places.

Fl. & Fr.: Sept.- Dec.

Mindhiari R.F., *V. Singh* 15872 (BSJO).

Fimbristylis quinquangularis (Vahl) Kunth

Very common in moist loamy soil.

Fl. & Fr.: Aug.- Dec.

Halapar, *R.P. Pandey* 13934 (BSJO).

Mariscus squarrosus (L.) C.B. Clarke

Very common along stream in marshy loamy habitat.

Fl. & Fr.: Sept.- Dec.

Halapar, *R.P. Pandey* 13938 (BSJO).

Pycreus flavidus (Retz.) Koyama

Common in moist sandy places.

Fl. & Fr.: Sept.- Dec.

Sheh, *V. Singh* 15968 (BSJO).

Pycreus flavidus (Retz.) Koyama var. **strictus** (Lam.) Parmar

Rare in moist sandy places.

Fl. & Fr.: Sept.- Dec.

Guhar nani, *V. Singh* 15835 (BSJO).

***Pycreus pumilus** (L.) Nees ex C.B. Clarke**Schoenoplectus roylei** (Nees) Lye

Common in moist sandy habitat.

Fl. & Fr.: Sept.- Dec.

Guhar dam, *R.P. Pandey* 17783, *V. Singh* 15812 (BSJO); Mindhiari R.F., *V. Singh* 15886 (BSJO).

POACEAE

Acrachne racemosa (Heyne ex Roem. & Schult.) Ohwi

Common in sandy-loam habitat.

Fl. & Fr.: July- Nov.

Haman Khudi, *R. P. Pandey* 19895 (BSJO).

Aeluropus lagopoides (L.) Trin. ex Thw.

Fairly common in saline habitat.

Fl. & Fr.: Sept.- Dec.

Rodasar, *V. Singh* 15957 (BSJO); Narayan Sarovar, *R.S. Rao* 114914 (BSI).

***Andropogon pumilus** L. "Zinzuo".**Apluda mutica** L.

Common in sandy gravelly habitat.

Fl. & Fr.: Sept.- Dec.

Mori, R.F., *V. Singh* 15999 (BSJO); Mindhiari R.F., *V. Singh* 15756 (BSJO).

Aristida adscensionis L.

Very common in open gravelly plains.

Fl. & Fr.: Sept.- Dec.

Watchtower, Halapar, *R. P. Pandey* 13945 (BSJO); Rodasar, *V. Singh* 15959 (BSJO).

Aristida funiculata Trin. & Rupr.

Common in dry open sandy soil.

Fl. & Fr.: Sept.- Dec.

Mindhiari R.F., *V. Singh* 15888 (BSJO).

Brachiaria ramosa (L.) Stapf

Common in gravelly- rocky places.

Fl. & Fr.: Sept.- Jan.

Mindhiari R.F., *V. Singh* 15782, 15788 (BSJO).

Cenchrus biflorus Roxb.

Common in open sandy-loam soil.

Fl. & Fr.: Sept.- Jan.

Guhar nani, *V. Singh* 15828 (BSJO).

Chloris barbata Sw.

Common in open places and in mixed habitat.

Fl. & Fr.: Sept.- Dec.

Narayan Sarovar, *R.P. Pandey* 17742 (BSJO).

Cristida ciliaris L.

Common in sandy-loam soil.

Fl. & Fr.: Sept.- Dec.

Guhar nani, *V. Singh* 15834 (BSJO).

Cristida prieurii (Kunth) Maire

Fairly common along stream in rocky- loamy habitat.

Fl. & Fr.: Sept.- Dec.

Mindhiari R.F., *R.P. Pandey* 13953(BSJO); Baranda, *R.P. Pandey* 19870 (BSJO).

Cristida setigerus Vahl

Common in hummocky plains in moist loamy soil.

Fl. & Fr.: Sept.- Jan.

Haman Khudi River, *R.P. Pandey* 13925 (BSJO); Sheh, *V. Singh* 15972 (BSJO).

Cristida virgata Sw.

Common in moist sandy-loam soil in open places.

Fl. & Fr.: Sept.- Dec.

Mindhiari R.F., *V. Singh* 15766 (BSJO).

Chrysopogon aucheri (Boiss.) Stapf

Common in open dry rocky gravelly habitat.

Fl. & Fr.: Sept.- Dec.

Haman Khudi, *V. Singh* 15934 (BSJO).

Cristida fulvus (Spreng.) Chiov.

Common in open places, in moist loamy soil.

Fl. & Fr.: Sept.- Jan.

Halapar, R.F., *R.P. Pandey* 13937 (BSJO).

Cristida serrulatus Trin.

Common in gravelly- loamy soil.

Fl. & Fr.: July- Nov.

Jadava, along Baranda road, Devisar, *R.P. Pandey* 19868, 19813 (BSJO).

Cymbopogon commutatus (Steud.) Stapf

Not common in sandy habitat.

Fl. & Fr.: Sept.- Jan.

Rodasar, *V. Singh* 15960 (BSJO).

Cristida martinii (Roxb.) W. Watson

Common in sandy- gravelly habitat.

Fl. & Fr.: Sept.- Jan.

Along Guhar village, *R.P. Pandey* 17747 (BSJO).

Cristida parkerii Stapf

Not common in sandy gravelly habitat.

Fl. & Fr.: Sept.- Jan.

Narayan Sarovar, *R.S. Raghavan* 114936 (BSI).

***Cynodon dactylon** (L.) Pers. “*Darbh*”.**Dactyloctenium aegyptium** (L.) Willd.

Common in open sandy-loam soil.

Fl. & Fr.: Oct.- Jan.

Guhar, *R.P. Pandey* 17777(BSJO); Haman Khudi, *R.P. Pandey* 19893 (BSJO); Mindhiari R.F., *V. Singh* 15792 (BSJO).

Dactyloctenium aristatum Link

Common in sandy places.

Fl. & Fr.: July- Nov.

Haman Khudi, *R. P. Pandey* 19860 (BSJO).

Dactyloctenium scindicum Boiss.

Fairly Common in sandy soil.

Fl. & Fr.: Sept.- Jan.

Guhar, *R. P. Pandey* 17769, *V. Singh* 15817(BSJO); Nareda, *R. P. Pandey* 19883 (BSJO).

Desmostachya bipinnata (L.) Stapf, “*Dab*”.

Common in sandy to gravelly habitat.

Fl. & Fr.: Sept.- Jan.

Kunri R.F., *V. Singh* 15911 (BSJO).

Dichanthium annulatum (Forssk.) Stapf

Common in moist sandy-loam to gravelly- loam soil.

Fl. & Fr.: Sept.- Dec.

Haman Khudi, *V. Singh* 15929 (BSJO); Mori R.F., *V. Singh* 15994 (BSJO); Nalia village, *R.P. Pandey* 17727 (BSJO).

Dichanthium foveolatum (Del.) Roberty

Common in sandy-loam soil.

Fl. & Fr.: Sept.- Dec.

Mori R.F., *V. Singh* 15998 (BSJO).

***Dichanthium pertusum** (L.) Clayton, “Zenzvo, Jinjvo”.

Digitaria ciliaris (Retz.) Koel.

Not common in moist sandy-loam soil.

Fl. & Fr.: Sept.- Dec.

Kunri R.F., *V. Singh* 15909 (BSJO).

Dinebra retroflexa (Vahl) Panz.

Frequent, in dry loamy- clayey soil.

Fl. & Fr.: Sept.- Dec.

Rodasar, *V. Singh* 159534 (BSJO).

Echinochloa colona (L.) Link

Common along streams in moist rocky habitat.

Fl. & Fr.: Sept.- Dec.

Mindhiari R.F., *R.P. Pandey* 13963 (BSJO); Jadava, *R.P. Pandey* 19887 (BSJO); Halapar R.F., *V. Singh* 15949 (BSJO); Mori R.F., *V. Singh* 16000 (BSJO).

Echinochloa crusgallii (L.) P. Beauv.

Common in moist sandy- clayey soil.

Fl. & Fr.: Sept.- Dec.

Mindhiari R.F., *V. Singh* 15847 (BSJO).

Eragrostis cilianensis (All.) Vignolo- Lutai

Common in sandy- clayey soil.

Fl. & Fr.: Sept.- Dec.

Halapar R.F., *V. Singh* 15948 (BSJO); Nalia, *W.J. Stower* C-64 (BSI).

Eragrostis ciliaris (L.) R. Br.

Common in moist sandy soil.

Fl. & Fr.: Sept.- Dec.

Guhar, *R.P. Pandey* 17768 (BSJO); Mindhiari R.F., *V. Singh* 15790 (BSJO).

Eragrostis ciliaris (L.) R. Br. var. **brachystachya** Boiss.

Not common in moist sandy soil.

Fl. & Fr.: Sept.- Dec.

Haman Khudi, *V. Singh* 15967 (BSJO).

Eragrostis gangetica (Roxb.) Steud.

Common in sandy-loam soil.

Fl. & Fr.: Sept.- Dec.

Rodasar, *V. Singh* 15961 (BSJO).

Eragrostis japonica (Thunb.) Trin.

Common in open sandy-loam soil.

Fl. & Fr.: Sept.- Dec.

Rodasar, *V. Singh* 15964 (BSJO); Mindhiari R.F., *V. Singh* 15895 (BSJO).

Eragrostis minor Hochst.

Common in sandy places.

Fl. & Fr.: Sept.- Dec.

Rodasar, *V. Singh* 159631 (BSJO); Mindhiari R.F., *V. Singh* 15894 (BSJO).

Eragrostis tremula (L.) Hochst. ex Steud.

Common in moist sandy-loam soil.

Fl. & Fr.: Sept.- Jan.

Mindhiari R.F., *R.P. Pandey* 13960, *V. Singh* 15789 (BSJO).

***Eragrostis uniolooides** (Retz.) Nees ex Steud.

Heteropogon contortus (L.) P. Beauv. ex Roem. & Schult.

Common in gravelly rocky places.

Fl. & Fr.: Sept.- Dec.

Mindhiari R.F., *V. Singh* 15890 (BSJO).

***Ischaemum indicum** (Houtt.) Merr.

***Iseilema laxum** Hack.

Melanocenchris jacquemontii Jaub. & Spach.

Common in open gravelly habitat.

Fl. & Fr.: Sept.- Dec.

Near Halapar watch tower, *R.P. Pandey* 13943(BSJO); Nareda, *R.P. Pandey* 19885 (BSJO); Haman Khudi, *V. Singh* 15922 (BSJO).

Ochthochloa compressa (Forssk.) Hilu

Not common in gravelly-loamy soil.

Fl. & Fr.: Oct.- Dec.

Guhar dam, *R.P. Pandey* 17791, 17799 (BSJO).

Panicum antidotale Retz.

Common in gravelly- sandy habitat in clumps.

Fl. & Fr.: Sept.- Jan.

Along Guhar tank, *R.P. Pandey* 17737 (BSJO).

Panicum trypheron Schult.

Common in moist sandy places.

Fl. & Fr.: Sept.- Dec.

Mindhiari R.F., *V. Singh* 15782-A (BSJO).

***Paspalum scrobiculatum** L. “Kodri, Maniakodru”.

***Pennisetum glaucum** (L.) R. Br. “Bajri, Bajro” (Cultivated).

Phragmites karka (Retz.) Trin. ex Steud.

Not common in moist sandy soil.

Fl. & Fr.: Sept.- Dec.

Kannoj, *V. Singh* 15978 (BSJO).

***Saccharum bengalensis** Retz.

***Sehima sulcatum** (Hack.) A. Camus

***Setaria glauca** (L.) P. Beauv.

***Sorghum bicolor**(L.) Mrench. “Jowar” (Cultivated).

***Setaria fertilis** (Steud.) Clayton

***Setaria helvolus** (Trin.) Thw.

Setaria ioclados (Nees ex Trin.) Nees

Common in saline habitat and in moist clayey soil.

Fl. & Fr.: Sept.- Dec.

Lakki mangrove forest, *R.P. Pandey* 17798 (BSJO); Nareda along Nalia road, *R.P. Pandey* 13947 (BSJO); Mindhiari R.F., *V. Singh* 15844 (BSJO).

Setaria maderaspatenus Bor

Common in moist sandy-loam soil.

Fl. & Fr.: Sept.- Dec.

Rodasar, *V. Singh* 15958 (BSJO).

Setaria tenuissimus (Sch.) Kuntze

Common in moist sandy-loam habitat.

Fl. & Fr.: Sept.- Dec.

Mindhiari R.F., *V. Singh* 15896 (BSJO).

Setaria verticillata (L.) P. Beauv.

Common in moist sandy habitat.

Fl. & Fr.: Sept.- Dec.

Mindhiari R.F., *V. Singh* 15787 (BSJO).

Sporobolus indicus (L.) R.Br. var. **flaccidus** (Roem. & Schult.) Veldk.

Common in moist sandy habitat.

Fl. & Fr.: Sept.- Nov.

Guhar dam, *R.P. Pandey* 17789 (BSJO).

Tetrapogon tenellus (Roxb.) Chiov.

Common near streams in moist rocky habitat.

Fl. & Fr.: Sept.- Dec.

Mindhiari R.F., *R.P. Pandey* 13961, *V. Singh* 15889 (BSJO); Guhar dam, *R.P. Pandey* 19891 (BSJO).

Themeda cymbaria Hack.

Not common in moist sandy-loam soil.

Fl. & Fr.: Sept.- Jan.

Guhar nani, *V. Singh* 15816 (BSJO).

***Themeda tremula** (Nees ex Steud.) Hack.

Tragus roxburghii Panigrahi

Not common in sandy- gravelly soil.

Fl. & Fr.: Sept.- Dec.

Guhar tank, *R.P. Pandey* 17771 (BSJO).

***Triticum aestivum** L. “*Gauv*” (Cultivated).

Urochondra setulosa (Trin.) Hubb.

Rare in sandy- gravelly or saline habitats.

Fl. & Fr.: Sept.- Dec.

Halapar R.F., *V. Singh* 15951 (BSJO).

GYMNOSPERM : GNETACEAE

***Ephedra foliata** Boiss. “*Andho khip*”.

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नारायण सरोवर वन्यजीव अभयारण्य, कच्छ, गुजरात, भारत की वनस्पति विविधता

आर.पी. पाण्डेय, वी. सिंह एवं पी.जे. परमार

सार संक्षेप

प्रस्तुत शोधपत्र में वनस्पति, पुष्पी संरचना एवं विश्लेषण, वन के प्रकार तथा उनके साहचर्य के विवरण हैं। इनमें 247 वंशों एवं 74 कुलों के अंतर्गत संवहनी पौधों की 455 जातियाँ हैं। इसके अलावा जैव परिप्रेक्ष्य वाले महत्वपूर्ण आर्थिक पौधे, कृषि पौधे और उनके 14 वन्य कुटुम्ब, 39 ऐसे दुर्लभ, संकटापन्न एवं स्थानिक टैक्सा जिनके जर्मप्लाज्म के हेतु प्रभावी संरक्षण के उपाय, प्रबंधन दबाव तथा संस्तुतियाँ दी गई हैं।