CHAPTER 5
RESULTS AND DISCUSSION

General Vegetation in GNPS

The vegetation of the area can be divided into two division Gir East and Gir West. In most of the sub-forest types recorded in Gir, the vegetation is tropical dry deciduous forest interspersed with tropical thorny forest (Champion and Seth, 1968). Of the 13 different sub forest types the dominant forests are of tropical dry deciduous type with *Tectona grandis* as the most dominant species (Chavan, 1993).

The vegetation of the GNPS area is divided under the following heads.

1. General view of the vegetation.
2. Vegetation along roadsides and railway lines.
3. Vegetation of hedges along roadsides and cultivated fields.
4. Vegetation of ponds and ditches.
5. Weeds of GNPS.
6. Parasites in the area.
7. Seasonal variation in the flora.

1. General View of the Vegetation

The general vegetation of the GNPS is divided into top / middle / ground (herbs) / climbers and grasses. The order of dominance of varied vegetation is different in various forest areas.

Table 5: The top canopy vegetation in order of dominance in GNPS

Order of Dominance	Sanctuary West	Sanctuary East	National Park
Top Canopy			
1	*Tectona grandis* L.f.	*Anogeissus latifolia* (Roxb. ex. DC.) Wall.	*Tectona grandis* L.f.
2	*Aegle marmelos* (L.) Corr.	*Aegle marmelos* (L.) Corr.	*Wrightia tinctoria* R. Br.
3	*Wrightia tinctoria* R. Br.	*Terminalia cuneata* Roth.	*Zizyphus mauritiana* Lam.
4	*Nyctanthes arbor-tristis* L.	*Soymida febrifuge* (roxb.) A. Juss.	*Kydia calycina* Roxb.
5	*Acacia nilotica* (L.) Willd ex. Delile.	*Diospyros melanoxylon* Roxb.	*Diospyros melanoxylon* Roxb.
6	*Diospyros melanoxylon* Roxb.	*Acacia catechu* (L. f.) Willd	*Acacia catechu* (L.f.) Willd.
7	*Ailanthus excelsa* Roxb.	*Zizyphus mauritiana* Lam.	*Hymenodictyon orixense* (Roxb.) Mabb.
8	*Capparis grandis* L.f.	*Flacourtia montana* Grah.	*Ailanthus excelsa* Roxb.
9	*Terminalia elliptica* Willd.	*Acacia nilotica* (L.) Willd. ex. Delile.	*Grewia tiliaefolia* Vahl.
10	*Gmelina arborea* Roxb.	*Bombax ceiba* L.	*Azadirachta indica* A. Juss.
Middle Canopy			
1	*Sesbania bispinosa* (Jacq.) W.F. Wight.	*Barleria cuspidate* Heyne. ex. Ness.	*Barleria cuspidate* Heyne. ex. Ness.
2	*Barleria cuspidate* Heyne. ex. Ness.	*Lantana camara* L.	*Securinega leucopyrus* (Willd.) Mauell-Arg.
3	*Helicteres isora* L.	*Mimosa hamata* Willd.	*Capparis sepiaria* L.
4	*Lantana camara* L.	Capparis sepiaria L.	*Helicteres isora* L.
5	*Calotropis gigantea* (L.) Ait.	*Zizyphus nummulaia* (Burm.f.) Wight & Am.	*Carissa congesta* Wight.

Order of Dominance	Sanctuary West	Sanctuary East	National Park
6	*Capparis decidua* (Forssk.) Edgew.	*Carissa congesta* Wight.	*Clerodendron multiflorum* (Burm.f.) O.Ktze.
7	*Zizyphus nummulaia* (Burm.f.) Wight & Arn.	*Capparis decidua* (Forssk.) Edgew.	*Duranta repens* L.
8	*Capparis sepiaria* L.	*Cassia auriculata* L.	Capparis *decidua* (Forssk.) Edgew.
9	*Securinega leucopyrus* (Willd.) Mauell-Arg.	*Maytenus senegalensis* (Lam.) Excell.	*Grewia hirsuta* Vah.
10	*Carissa congesta* Wight.	*Sesbania bispinosa* (Jacq.) W.F. Wight.	*Grewia tenex* (Forssk.) Fiori.
Ground Cover			
1	*Corchorus aestuans* L.	*Leucas cephalotes* (Koenig. ex. Roth.) Spreng.	*Amaranthus viridis* L.
2	*Evolvulus nummularius* (L.) L.	*Barleria prionitis* Linn.	*Curcuma inodora* Blatt.
3	*Cassia tora* L.	*Vicoa indica* (L.) DC.	*Cassia tora* L.
4	*Crotalaria medicaginea* Lam.	*Tribulus terrestris* L.	*Commelina forskalaei* Vahl.
5	*Curcuma inodora* Blatt.	*Impatiens balsamina* L. var. *coccilnea* Hk.f.	*Sida acuta* Burm.f.
6	*Sida acuta* Burm.f.	*Crotalaria medicaginea* Lam.	*Biophytum candolleanum* Wight.
7	*Tridax procumbens* L.	*Leucas aspera* (Willd.) Linn.	*Impatiens balsamina* L. var. *coccilnea* Hk.f.
8	*Chlorophytum tuberosum* (Roxb.) Baker.	*Tridax procumbens* L.	*Crotalaria medicaginea* Lam.
9	*Impatiens balsamina* L. var. *coccilnea* Hk.f.	*Leucas biflora* R. Br.	*Ageratum conyzoides* L.
10	*Enicostemma hyssopifolium* (Lam.) Willd.	*Desmodium repandum* (Vahl.) DC.	*Neuracanthus sphaerostachys* (Ness.) Dalz.
Climbers			
1	*Cocculus hirsutus* (L.) Theob.	*Asparagus racemosus* Willd.	*Hemidesmus indicus* (L.) Schult.
2	*Acacia pennata* (L.) Willd.	*Cocculus hirsutus* (L.) Theob.	*Cocculus pendulus* (J.R. & G. Forst.) Diels.
3	*Abrus precatorius* L.	*Acacia pennata* (L.) Willd.	*Cocculus hirsutus* (L.) Theob.
4	*Hemidesmus indicus* (L.) Schult.	*Ceropegia bulbosa* Roxb.	*Abrus precatorius* L.
5	*Asparagus racemosus* Willd.	*Cardiospermum halicocabum* L.	*Acacia pennata* (L.) Willd.
6	*Celastrus paniculata* Willd.	*Lablab purpureus* (L.) Sweet.	*Mucuna prurita* Hook.
7	*Cocculus pendulus* (J.R. & G. Forst.) Diels.	*Telosma pallida* (Roxb.) Craib.	*Cissus repanda* Vahl.
8	*Dioscorea bulbifera* Linn.	*Vigna trilobata* (L.) Verdcourt.	*Ceropegia bulbosa* Roxb.
9	*Cissus repanda* Vahl.	*Cissampelos pareira* L.	*Combretum albidum* G. Don.
10	*Ceropegia bulbosa* Roxb.		*Dioscorea bulbifera* Linn.
Grasses			
1	*Oplismenus burmannii* (Retz.) P. Beauv.	*Oryza sativa* L.	*Oplismenus burmannii* (Retz.) P. Beauv.
2	*Themeda cymbaria* Hack.	*Pennisetum americanum* (L.) K. Schum.	*Chloris barbata* Sw.
3	*Heteropogon contorutus* (L.) P. Beauv. ex. R. & S.	*Eragrostis japonica* (Thunb.) Trin.	*Eragrostis japonica* (Thunb.) Trin.
4	*Eragrostis ciliaris* Link.	*Chloris barbata* Sw.	*Heteropogon contorutus* (L.) P. Beauv. ex. R. & S.
5	*Dimeria orinthopoda* Trin.	*Themeda cymbaria* Hack.	*Themeda cymbaria* Hack.
6	*Chloris dolichostachya* Lagasca.	*Echinochloa colonum* (L.) Link.	*Eragrostis ciliaris* Link.
7	*Chloris barbata* Sw.	*Heteropogon contorutus* (L.) P. Beauv. ex. R. & S.	*Sorghum halepense* (L.) Pers.
8	*Aristida adscensionis* L.	*Eragrostis ciliaris* Link.	*Aristida adscensionis* L.
9	*Eragrostis japonica* (Thunb.) Trin.	*Dimeria orinthopoda* Trin.	*Apluda mutica* Linn.
10	*Sorghum halepense* (L.) Pers.	*Zea mays* L.	*Chloris dolichostachya* Lagasca.

2. Vegetation along roadsides and railway lines

The vegetation along roadsides and railway lines is very poorly represented by few trees and shrubs - *Acacia catachu* Willd., *Ailanthus excelsa* Roxb., *Azadirachta indica* Juss., *Cassia auriculata* Linn., *Calotropis gigantea* (L.) R. Br., *Calotropis procera* (Ait.) R. Br., *Diospyros melanoxylon* Roxb., *Ficus benghalensis* Linn., *Ficus racemosa* Linn., *Indigofera tinctoria* Linn., *Mangifera indica* Linn., *Mitragyna parviflora* (Roxb.) Korth., *Pithecellobium dulce* (Roxb.) Benth., and *Prosopis cineraria* Linn.

Along roadsides a number of herbs such as, *Acanthospermum hispidum* DC., *Argemone mexicana* Linn., *Anisomeles indica* (Linn.) O. Kuntze., *Martynia annua* Linn., and *Xanthium strumarium* Linn., are found growing gregariously during postmonsoon period. Some of the weeds that are usually found growing along railway line and roadsides are listed below.

Plants observed are *Acanthospermum hispidum* DC., *Aerva lanata* (Linn.) Juss., *Alysicarpus longifolius* Wight and Arn., *Amaranthus spinosus* Linn., *Anisomeles indica* (Linn.) O. Kuntze., *Argemone mexicana* Linn., *Boerhavia diffusa* Linn., *Cassia occidentalis* Linn., *Cleome gynandra* Linn., *Cleome viscosa* Linn., *Corchorus olitorius* Linn., *Jatropha gossypifolia* Linn., *Launaea procumbens* (Roxb.) Ramayya and Rajgopal., *Physalis minima* Linn., *Sesamum indicum* Linn., *Sida alba* Linn., *Triumfetta rotundifolia* Lam., *Vernonia cinerea* (Linn.) Less, *Amaranthus tricolor* Linn., *Indigofera linifolia* Linn., *Indigofera trita* Linn., *Martynia annua* Linn., *Phyllantus fraternus* Webst., *Portulaca oleracea* Linn., *Sida acuta* Burm. f., *Solanum nigrum* Linn., *Solanum surattense* Burm. f., *Tephrosia villosa* (L.) Pers., *Urena lobata* Linn.

Species met with are *Abelmoschus esculentus* (Linn.) Moench., *Abelmoshcus manihot* (Linn.) Medic., *Alysicarpus pubescens* Linn., *Anethum graveolens* Linn., *Arachis hypogea* Linn., *Biophytum sensitivum* (Linn.) DC., *Brassica juncea* (Linn.) Czem and Coss., *Cassia tora* Linn., *Crotalaria retusa* Linn., *Echinops echinatus* Roxb., *Medicago sativa* Linn., *Mimosa hamata* Willd., *Raphnus sativus* Linn., *Solanum indicum* Linn., *Trianthema portulacastrum* Linn., *Tribulus terrestris* Linn., *Trigonella foenum-graceum* Linn., *Withania somnifera* (Linn.) Dunal.

3. Vegetation of hedges along roadsides and cultivated fields

The plant species that are cultivated as hedges by the locals of Gir National Park and Sanctuary forest division are *Agave amaricana* L., *Euphorbia tirucalli* Linn., *Jatropha curcas* Linn., *Lawsonia inermis* Linn., dry twigs of *Capparis grandis* L. f., *Zizyphus mauritiana* Lamk.

The following plants by the virtue of their habit also form natural hedges at few places

includes *Barleria prionitis* Linn., *Caesalpinia crista* Linn., *Capparis decidua* (Forsk.) Edgew., *Maytenus emarginatus* (Willd.) Dinghou.,

During the explorations few plants are found growing among the agricultural and roadsides hedges. They are *Alianthus excelsa* Roxb., *Albizzia lebbeck* (Linn.) Willd., *Boswellia serrata* Colebr., *Butea monosperma* (Lamk.) Taub., *Alangium salvifolium* (L. f.) Wang., *Annona squamosa* Linn., *Balanites aegyptiaca* Roxb., *Clerodendrum multiflorum* Baker., *Ficus hispida* Linn., *Flacourtia indica* (Burm. f.) Merill., *Lantana camara* Linn, *Achyranthes aspera* Linn., *Aerva lanata* (Linn.) Juss., *Ageratum conyzoides* Linn., *Boerhaavia diffusa* Linn., *Evolvulus alsinoides* (Linn.) Linn., *Leucas biflora* R. Br., *Sida acuta* Linn., *Sida cordata* (Burm. f.) Borss., *Tridax procumbens* Linn.

A number of climbers belonging to the families Menispermaceae, Sapindaceae, Rhamnaceae, Fabaceae, Caesalpiniaceae, Cucurbitaceae, Convolvulaceae, Dioscoreaceae, Liliaceae etc are found. Some of the twiners of climbers are quite distinct either by their foliage or the flowers. Some of such plants are *Abrus precatorius* Linn., *Canavalia gladiata* (Jacq.) DC., *Cardiospermum halicacabum* Linn., *Dioscorea bulbifera* Linn., *Gloriosa superba* Linn., and *Mucuna prurita* Hook. f.

4. Vegetation of ponds and ditches

Free floating hydrophytes

These are plants that are in contact with water and air only. *Ipomoea aquatica* Forsk, Suspended hydrophytes. These are rootless, submerged hydrophytes that are in contact with water only, *Ceratophyllum demrsum.*

Attached submerged hydophytes

These are entirely or at least the most part, in contact with soil and water. Plants are *Hydrilla verticillata* (L. f.) Royle, *Limnophila indica* (L.) Druce in Rep, *Nymphaea nouchali* Burm.

Attached hydrophytes with floating leaves

These are in contact with soil, water as well as air. The plants noted are *Ottelia alismoides* (L.) Pers. Syn, *Paspalidium flavidum* (Retz.) A. Camus.

Wetland hydrophytes

These are rooted in the soil that is usually saturated with water at least in the early part of their life. The plants found were *Aeschynomene indica* L., *Ammannia baccifera* L., *Ammannia senegalensis* Lam, *Bacopa monnieri* (L.) Penn, *Cyperus*

compressus L., *Eclipta prostrata* (L). L. Mant, *Heliotropium indicum* L., *Heliotropium supinum* Linn., *Hygrophila auriculata* (Buch-Ham.) M. R. & S. M. Almeida in J, *Phyla nodiflora* (L.) E. Greene, *Sesbania bispinosa* (Jacq) W. F. Wight, *Typha angustifolia* L.

The plants occurring along wet banks / margins of rivers, ponds, streams, or water logged areas or rocky crevices along water courses or river beds include *Bergia ammannioides* Roxb, *Coldenia procumbens* L., *Tamarix ericoides* Rottl.

5. Weeds of GNPS

Weed is a plant that interferes with human intentions. A weed in general is a plant out of place. They are plants, which are not wanted where they are growing. The classified category of weed was not separated before agriculture and probably the category of weed emerged along with the crops. Man played a key role in the distribution of weeds. Unlike other plants, weeds are capable of growing everywhere. Weeds are the biggest competitors beautification. They cause tremendous loss to crop production. Although, weeds are usually undesirable plants, they are usuful in many cases as fodder for animals, food or medicine for man and also as ornamentals.

Weeds are generally classified based on their habitat viz. weeds of cultivated crop fields, fallow fields or harvested fields, etc. there are some categories of weed swhich can be termed as 'Special weeds' this category come special characteristic features they possess. Under this category come parasites, epiphytes, poisonous, aquatic weeds, etc. However, it has been observed that a particular weed is not specific to any particular habitat or crop.

A large number of weeds growing in cultivated and harvested fields have been collected or noted; and classified on the basis of their flowering period into two categories

1. Weeds flowering from July to October (monsoon weeds)
2. Weeds flowering from November to April (autumn weeds.)

Weed species of the first category are mainly found in cultivated fields of groundnut, rice and sugar – cane; while those of the second category are found in harvested fields of rice and cultivated fields of wheat. Besides seedlings of tree species like *Azadirachta indica* A. Juss, *Ficus racemosa* L, *Ficus religiosa* Linn, are of common occurrence along the cracks of walls, wells, open stairs, walls, roofs etc. The following are some of the common weeds occurring in different habitats of GNPS, like cultivated fields (including bunds, fallow and harvested fields), waste places, in

gardens and orchards, on old walls and roof tops, etc.

Abelmoschus manihot (L) Medik, *Abutilon indicum* (L) Sweet, *Abutilon pannosum* (forst. F.) Schlect. Bot, *Acalypha indica* L., *Acanthospermum hispidum* DC, *Achynanthes aspera* Linn, *Aerva lanata* (L.) Juss. ex Schult, *Ageratum conyzoides* L., *Alloteropsis cimicina* (L.) Stapf in Prain, *Alysicarpus hamosus* Edgew, *Alysicarpus monilifer* (L.) DC, *Alysicarpus pubescens* Edgew, *Amaranthus tricolor* L., *Amaranthus viridis* L., *Ammannia baccifera* L., *Ammannia multiflora* L., *Anagallis arvensis* L., *Apluda mutica* Linn., *Argemone mexicana* L., *Aristida adscensionis* L., *Arudinella pumila* (Hochst. Ex A. Rich.) Steud. *Bacopa monnieri* (L.) Penn, *Barleria cristata* Linn., *Barleria prionitis* Linn. , *Bergia ammannioides* Roxb, *Bidens biternata* L., *Biophytum sensitivum* Wight, *Blainvillea acmella* (L.) Philip son in Blumea, *Cardiospermum halicacabum* L., *Cassia absus* L., *Cassia pumila* Lam, *Cassia tora* L., *Catharanthus rosea* (L.) G. Don., *Celosia argentea* L., *Centella asiatica* (L.) Urban in Mart, *Chloris barbata* Swartz, *Clitoria ternatea* L., *Coix lacryma – jobi* Koen. Ex. Roxb, *Coldenia procumbens* L., *Commelina benghalensis* L., *Commelina diffusa* Burm, *Commelina forsskalaei* Vahl., *Corchorus aestuans* L., *Corchorus fascicularis* Lam , *Corchorus olitoriums* Lam, *Crotalaria medicaginea* Burm, *Crotalaria nana* Burm, *Cyathocline purpurea* (Ham. ex D. Don) O. Ktze, *Cynodon dactylon* (L.) Pers, *Cyperus comprssus* L., *Datura innoxia* Mill., Gard, *Datura metel* L., *Dendrophthoe falcate* (L.f) Etting in Denkschr. Kaiserl. Akad. Wiss. Math. Naturw, *Dentella repens* (L) J. R. & G. Forst. Char. Gen, *Desmodium dichotomum* (Willd) DC, *Desmodium triflorum* (L.) DC, *Digera muricata* (L.) Mart, *Digitaria ciliaris* (L.) Mart, *Echinops echinatus* Roxb., *Eclipta prostrate* (L.) L., *Emilia sonchifolioa* (L.) DC., *Enicostemma axillare* L., *Eragrostis ciliaris* Linn., *Eragrostis japonica* (Thunb.)Trin., *Euphorbia geniculata* Ort., *Euphorbia heterophylla* L., *Euphorbia hirta* Linn., *Euphorbia parviflora* L., *Euphorbia prostrate* Ait., *Euphorbia tiorucalli* L., *Evolvulus alisinoides* L., *Glinus lotoides* L., *Gloriosa superba* L., *Goniocaulon indicum* (Klein ex Wild.) C.B.Cl. Comp, *Hoppea dichotoma* Heyne.ex. Willd, *Indigofera astragalina* DC, *Indigofera cordifolia* Heyne ex Roth, *Indigofera linifolia* (L.) Retz, *Ipomoea aquatica* Forsk., *Ipomoea carnea* Jacq. ssp. *fistulosa* (Mart. Ex. Choisy) Austin., *Ipomoea nil* Linn., *Jatropha gossipifolia* L, *Kickxia ramosisima* (Wall), *Lantana camara* L *Lepidagathis cristata* Wild, *Leucas aspera* (Willd.), *Leucas cephalotes* (Roth), *Limnophila indica* (L.), *Lindenbergia muraria* (Roxb.), *Lindernia crustacean* (L.) F. Muell., *Martynia annua* Linn, *Momordica charantia* L, *Ocimum americanum* Linn, *Opuntia elatior* Mill., *Ottelia alismoides*(L.), *Oxalis cornicuata* L, *Parthenium hysterophorus* L, *Paspalidium flavidum* (Retz.), *Pavonia zeylanica* (L.), *Pergularia daemia* (Forssk.), *Phyla nodiflora* (L.), *Phyllanthus fraternus* (Repr.)., *Physalis minima* L, *Polygalal arvensis* Willd,

Polygala eriptera Prodr, *Polygonum plebiuum* R. Br. Prodr, *Portulaca oleracea* L, *Portulaca quadrifida* L. *Pupalia lappacea* (L.), *Rhynchosia minima* (L.), *Ricinus communis* Linn. *Rivia hypocrateriformis* (Desr.), *Saccharum spontaneum* L *Sesamum orientale* L, *Sesbania bispinosa* (Jacq), *Sida rhombifolia* L, *Sida retusa* (L), *Smithia conferta* J. E. Sm. In Rees, *Solanum nigrum* Linn., *Sonchus brachyotus* DC., *Sorghum halepense* (L.), *Striga angustifolia* Pers. Syn. PI, *Striga gesnerioides* (Willd.), *Synedrella nodiflora* (L.), *Tephrosia purpurea* (L.), *Tephrosia strigosa* (Dalz), *Tephrosia villosa* (Linn.), *Tribulus terrestris* L, *Trichodesma indicum* (L.) *Tridax procumbens* L, *Typha angustifolia* Sp. PI, *Triumfetta rhomboidea* Jacq., *Vernonia cinerea* (L.), *Vigna trilobata* (Linn.) Verdc *Viscum articulatum* Burm, *Vitex negundo* L, *Waltheria indica* L, *Xanthium strumarium* Koen. In Roxb and *Zornia diphylla* Auct., etc.

6. Parasites in the area

During the survey following parasites were also observed:

(1) The root parasites are *Striga angustifolia* (D. Don.) Saldhana *and Striga gesneroides* (willd.) Vatke.

(2) The stem parasite are *Cuscuta chinensis* Roxb., *Cuscuta reflexa* Roxb., *Dendropthoe Falcata* (L.f.) ettings, *Santalum album* L and *Viscum articulatum* Burm. f.

7. Seasonal variation in the flora

Due to extreme climatic conditions there is a great variation in the herbaceous flora. Most of the herbs start their life-cycle by the beginning of the monsoon and complete it by the end of December-January. Some of them, however, can withstand cold weather and many continue to grow upto April, while still others may be seen only upto the end of September. In general the numbers of speices are largest during October and smallest during April – May.

There is a sudden rise in the number of species after the first showers of monsoon. Several bulbuous plant like *Curculigo orchioides* Gaertn., *Curcuma indora* Blatt, *Nervilia aragoana* Gaud., *Nervilia plicata* (Andr.) Schltr. and *Crinum viviparum* (Lam.) R. Ansari & V.J. Nair etc., emerge and come to flower, some of them even before the leaves appear. Soon after that in a week or two, a variety of grasses and other species sprout up and the entire ground becomes green. The common poaceae members are *Apluda mutica* Linn., *Heteropogon contortus* (Linn.) Beauv ex. R. and *Saccharum spontanuem* Linn., *Themeda quadrivalvis* (Linn.) O. Kuntze., *Sorghum*

halepense (Linn.) Pers. etc. Some of these grasses are quite conspicuous by their habit and/or the inflorescence. For example *Sorghum halepense* (Linn.) Pers. is quite distinct by its height and large, laxly paniculate inflorescence. *Saccharum spontaneum* Linn., can be identified even from a considerable distance by the silvery-white silky spike. The gregarious nature of *Apluda mutica* Linn., *Themeda quadrivalvis* (Linn.) O. Kuntze., *Cymbopogon martinii* (Roxb.) Wats., and *Heteropogon contortus* (Linn.) Beauv ex. R. and S., are distinctive. Some of the other common grasses of area are *Dactyloctenium aegyptium* (Linn.) Beauv., *Dichanthium annulatum* (Forsk.) Stapf., and *Eragrostis ciliaris* (Linn.) R. Br., often forming loose mats.

Most of the monocotyledons are short lived and they disappear by the middle of the rainy season. By this time grases grow quite tall, some of them occurring in pure or mixed patches and are often spotable by their height, inflorescence and the habit.

By the end of monsoon or a little later most of the grasses dry up, but some species like *Barleria prionitis* L., *Blumea* spp., *Rungia pectinata* (Linn.) Ness., become dominant at many places and grow gregariously.

From the grasslands number of dicot plants collected include *Aerva lanata* (Linn.) Juss., *Alysicarpus procumbens* Linn., *Alysicarpus vaginalis* (Linn.) DC., *Amaranthus spinosus* Linn., *Boerhavia diffusa* Linn., *Chlorophytum tuberosum* Baker., *Cleome monophylla* Linn., *Curculigo orchioides* Gaertn., *Cyperus compressus* L., *Cyperus triceps* (Rottb.) Endl., *Emilia sonchifolia* (Linn.) DC., *Enicostema hyssopifolium* (Willd.) Verd., *Hemidesmus indicus* (Linn.) R. Br., *Indigofera astragalina* DC., *Indigofera cordifolia* Heyne ex. Roth., *Justicia simplex* D. Don., *Lepidagathis trinervis* Nees., *Launaea procumbens* (Roxb.) Ramayya and Rajgopal., *Trichodesma amplexicaule* Roth., *Xanthium strumarium* Linn., *Crotalaria juncea* Linn., *Urginea indica* Linn., *Alysicarpus monilifer* (Linn.) DC., *Indigofera linifolia* Linn., *Leucas cephalotes* Spreng., *Lindernia ciliata* (Colsmn.)-Pennell., *Rhynchosia minima* (Linn.) DC., *Tricholepis glaberrima* (Burm. f.) R. Br., *Tylophora fasciculata* Ham., *Vigna trilobata* (Linn.) Verdcourt.

Some of the twiners among the grasses are the members of the families Fabaceae, Convolvulaceae, Cucurbitaceae etc. By the end of monsoon or a little earlier most of the grasses dry up. As a result the ground becomes exposed, showing the near barreness of ground vegetation. By the beginning of the hot season the ground cover almost disappears. Many trees such as *Ailanthus excelsa* Roxb., *Bombax ceiba* Linn., *Butea monosperma* (Lamk.) Taub., *Diospyros melanoxylon* Roxb., *Garuga pinnata* Roxb., *Holoptelea integrifolia* (Roxb.) Planch., *Lannea coromandelica* (Houtt.) Merr., *Madhuca indica* Muell.-Arg., *Miliusa tomentosa* (Roxb.) Sinclair.,

Tectona grandis L. f., etc shade their leaves and forests look more open. In very hot season large areas of lands are barren in the scrub forests and are almost without any vegetation except for a few hardy plants such as *Acacia nilotica* (Linn.) Del. subsp. *indica* (Bth.) Brenan., *Balanites roxburghii* Planch., *Calotropis procera* (Ait.) R. Br., *Capparis grandis* L. f., *Maytenus emarginatus* (Willd.) Dinghou, etc. One of the remarkable features of the hot season is conspicuousness of certain trees e.g. *Bombax ceiba* Linn., *Butea monosperma* (Lamk.) Taub., *Sterculia urens* Roxb., *Lannea coromendelica* (Houtt.) Merr.

Various biotic factors are effective on the vegetation and they considerably modify it. Fires, illicit cuttings of forest trees, overgazing, encroachments, soil erosion, floods, tourist, mining, insects and parasites are the major factors affecting growth and development of the plant.

Many of the unprotected lands are too severely grazed, and they look clear - barren even in September and remaining so for the rest of the year. Intensity of grazing changes the structure and the vegetation of the grasslands which are fast deteriorating. Thus, when plant cover is so thinned, the soil is no longer protected from the erosive influence of wind and water. Secondly, it reduces the water retaining coapacity of the soil and as a result, the rain water runs causing soil erosions at several places.

An assessment of floristic in GNPS

The present work is based on the results of more than three years of intensive and extensive study of the plants in GNPS. The analyses of the plant species found are presented in the following way:

Table-6: Life form diversity in GNPS

Life form	Number of species	Percentage of species
Tree	148	24.87
Shrubs	53	8.91
Herbs	288	48.57
Climbers	74	12.44
Grasses	32	5.21
Total	595	100

The plants complete their life cycle during a short duration of favourable condition and become dominant in the form of seeds or propagules as a part of drought avoidance strategy. All the ephemerals fall under this category. Some of the plants

tolerate drought by having special appendages. For example, succulent plants have high capacity to absorb and retain water within for longer period. The plants species like *Acacia senegal, Acacia catechu, Acacia nilotica, Acacia leucophloea, Zizyphus rotendifolia* and *Dischrostachys cinerea* are true xerophytes in the area. They have a very deep penetrating root system and a regeneration capacity to stand against the drought and harsh climatic conditions.

The Table-5 shows the total life from diversity available in the area. Out of the total 595 species available, the dominant one is herbs with 48.57 % composition, tree represents 24. 87 % where as grasses being 5.21% only. The % of climbers is slightly higher than even shrubs. This may be due to the suitable supports available, thick vegetation and protection due to National Park status.

In Rampara Wildlife Sanctuary Patel (2002) noted total 278 plant species which were dominated by herbs and trees. The data in the present study also shows similar trend. Earlier, Kotiwar (1995) in Gir forests reported total 431 plant species and dominated by herbs and trees. Patel (1971) studied forest flora of Gujarat and reported total 219 trees, 157 shrubs, 43 climbers, 15 grasses and 177 herbs. As per this report the tree diversity is more when compared to the herbs.

Table-7: Taxonomic diversity in GNPS

Class		Families		Genera		Species	
		Number	%	Number	%	Number	%
Dicotyledons	Polypetatae	50	49.50	162	42.19	268	45.04
	Gamopetalae	23	22.77	133	34.64	196	32.94
	Apetalae	10	9.90	32	8.33	54	9.24
Monocotyledons	Monocot	18	17.82	57	14.84	77	12.77
Total		**101**	**100**	**384**	**100**	**595**	**100**

The present study enumerated 595 species which belonged to 384 genera and 101 families of flowering plants. Among the total 595, Dicotyledons contributed 519 plant species belonging to 327 genera and 83 families, which is much higher than that of Monocotyledons. The Monocotyledons contributed only 77 species belonging to 57 genera and 18 familes. Except Poaceae and Cyperaceae, Monocotyledons are poorly represented in GNPS.

Earlier, Shah and Menon (1980) enumerated total 1090 plant species belonging to 529 genera and 112 families in Saurashtra region. Among monocotyledons, but for the Cyperaceae and Poaceae, other families are poorly represented. Of the 255

monocotyledons species, 210 species belong to Cyperaceae and Poaceae family. Similarly, Saxton and Sedgewick (1918) worked on Flora of North Gujarat and noted total 614 plant species, the monocotyledons contributed 172 species 68 genera and 14 families. In the other side, among dicotyledons, total 442 species were enlisted belonging to 278 genera and 74 families. As per Anonymous (1996) the biological diversity in Gujarat was 2198 plant species. Dicotyledons contributed 1602 plant species, belonging to 699 genera and 126 families. In contrast. The monocotyledons contributed only 596 plant species belonging to 203 genera and 29 families.

Table-8: Distribution of monocotyledons Dicotyledons as monot to dicot ratio in different zones of GNPS

Zones	Zone Name	Genera	species	Family	Total Genera to species
1.	Devalia	1:4.94	1:5.85	1:4.21	1:1.31
2.	Suraj Gadh	**1:6.68****	**1:8.03****	1:4.85	1:1.43
3.	Raidi	1:6.00	1:7.15	1:4.25	1:1.44
4.	Dhudhala	1:5.38	1:6.37	**1:3.82***	1:1.42
5.	Alawani	1:5.39	1:6.34	1:4.54	**1:2.71****
6.	Sasan	1:5.35	1:6.73	1:4.28	1:1.39
7.	Amla	1:6.17	1:5.97	1:4.85	**1:1.2***
8.	Barwania	1:5.47	1:6.26	1:3.94	1:1.43
9.	Kasagola	1:5.47	1:6.50	1:4.36	1:1.43
10.	Khokhara	1:5.75	1:7.06	1:4.8	1:1.40
11.	Kansoria	1:5.45	1:6.60	1:4.38	1:1.40
12.	Vankidas	1:5.10	1:6.03	1:4.46	1:1.38
13.	Kankai	1:5.89	1:6.65	1:4.53	1:1.37
14.	Rampari	1:5.18	1:6.08	1:4.14	1:1.39
15.	Kachhigadh	1:5.90	1:6.58	1:4.14	1:1.39
16.	Malpara	1:5.66	1:6.93	**1:5.58****	1:1.39
17.	Sapnes	1:6.41	1:6.89	1:5.17	1:1.36
18.	Chhodavadi	1:5.56	1:6.56	1:5.17	1:1.40
19.	Khodiyar	1:5.53	1:6.10	1:4.38	1:1.36
20.	Janwadla	1:6.14	**1:4.94***	1:5.55	1:1.46
21.	Rasulgadh	1:5.97	1:7.24	1:4.31	1:1.38
22.	Jamwala	1:6.29	1:7.15	1:4.13	1:1.41
24.	Bararia	1:6.62	1:7.64	1:4.86	1:1.40
25.	Banej	1:5.80	1:6.50	1:4.40	1:1.39
26.	Bismal	1:5.65	1:6.59	1:5.27	1:1.44
27.	Vanrajambu	1:6.00	1:6.92	1:4.67	1:1.40
28.	Shemardi	1:5.58	1:7.05	1:4.2	1:1.43

Zones	Zone Name	Genera	species	Family	Total Genera to species
29.	Hadala	1:5.88	1:6.30	1:5	1:1.38
30.	Kardapan	1:5.61	1:6.82	1:4.75	1:1.94
31.	Tulsishyam	1:5.48	1:6.82	1:4.87	1:1.44
32.	Jasadhar	1:5.37	1:6.86	1:4.50	1:1.41
33.	Vejalkotha	1:5.28	1:6.23	1:4.13	1:1.39
34.	Timberwa	**1:4.68***	1:5.69	1:3.88	1:1.41
35.	Kotharia	1:5.83	1:7.10	1:4.63	1:1.42
36.	Pipalwa	1:5.68	1:6.82	1:4.79	1:1.43
37.	Bhania	1:6.03	1:6.90	1:5.00	1:1.39

* Minimum ** Maximum

Maximum ratio for Monocotyledons to Dicotyledons with reference to species was noted to be 1: 8.03 for zone 2 (Suraj Gadh), for family 1: 5.58 in zone 6 (Sasan), 1: 6.68 for genera in zone 2 (Suraj Gadh). For total genera to species the maximum ratio was 1: 2.71 in zone 5 (Alawani) only. Minimum ratio for Monocotyledons to Dicotyledons with reference to species was recorded to be 1: 4.68 in zone 20 (Janwadla), for family 1: 3.82 in zone 4 (Dhudhala), 1: 4.68 for genera in zones 36 (Pipalwa) and 1:1.2 for total genera to species in zone 7 (Amla) respectively.

Table-9: Ratio between Monocotyledons and Dicotyledons in GNPS

Family	1:4.61
Genera	1:5.73
Species	1:6.82
Genera to Species	1:1.54

Similar pattern of over-all proportion Monocotyledons to Dicotyledons in was recorded1:4.61 for families, 1:5.73 for genera and 1:6.82 for species respectively. The ratio for the total number of genera to species was found to be 1:1.54 only. This is rather low in comparison to a corresponding ratio 1: 7 for whole of India (Menon, 1979). However, it is more or less in conformity with the similar ratio1: 1.63 of Delhi State (Maheshwari, 1963) and Western Rajasthan being 1:1.9 as reported by Bhandari (1990).

Table-10: Life form distribution among different groups in GNPS

	Trees	Shrubs	Herbs	Climbers
Polypetalae	89	27	107	45
Gamopetalae	38	16	123	19
Apetalae	16	10	26	02
Monocot	05	00	64	08
Total	148	53	320	74

Table-10 shows life form distribution among different groups as per Bentham and Hooker system of classification.

Among polypetalae, trees representation is more when compared to gamopetalae. In gamopetalae representation of herbs is in more comparison to polypetalae.

Table-11: Comparison of ten dominant families of GNPS with different regions of Gujarat state

Sr. No.	Present Study	Gir Forest	Victoria Park	Goghamahal	South Gujarat	Saurashtra Region	Gujarat State
1.	Fabaceae	Fabaceae	Fabaceae	Fabaceae	Poaceae	Fabaceae	Fabaceae
2.	Asteraceae	Poaceae	Poaceae	Poaceae	Fabaceae	Poaceae	Poaceae
3.	Poaceae	Asteraceae	Euphorbiaceae	Euphorbiaceae	Cyperaceae	Asteraceae	Cyperaceae
4.	Acanthaceae	Acanthaceae	Asteraceae	Asteraceae	Asteraceae	Malvaceae	Asteraceae
5.	Euphorbiaceae & Rubiaceae	Euphorbiaceae	Malvaceae	Malvaceae	Euphorbiaceae	Acanthaceae	Acanthaceae
6.	Cucurbitaceae	Amaranthaceae	Acanthaceae	Convolvulaceae	Acanthaceae	Convulvalaceae	Euphorbiaceae
7.	Ceasalpiniaceae	Convolvulaceae	Convolvulaceae	Acanthaceae	Scrophulariaceae	Euphorbiaceae	Malvaceae
8.		Malvaceae	Amaranthaceae	Amaranthaceae	Malvaceae	Cyperaceae	Convolvulaceae
9.		Rubiaceae	Cyperaceae	Cucurbitaceae	Convolvulaceae	Rubiaceae	Scrophulariaceae
10.		Cucurbitaceae	Tiliaceae	Tiliaceae	Labiatae	Cucurbitaceae	cucurbitaceae

A comparision of the present study with other regions of Gujarat State gives a very interesting result. The ten dominant families which are found in GNPS have been compared with other regions of Gujarat viz., Victoria Park reserved forest (Patel, 1982); Goghamahal (Vora et al, 1981); South Gujarat (Yadav, 1979); Saurashtra region (Santapau and Janardhan, 1966) and Gujarat State (Shah, 1978) (Table-10). It is evident that most of the dominant families in the present study have been reported earlier from different regions of Gujarat State, but the order of dominance is different. However, the legumes and grasses occupy the first and second place in all these regions of Gujarat, except South Gujarat, with grasses attaining the first position. The data shows that five (Euphorbiaceae) and six (Rubiaceae) are same including number 8 to 10 are same dominant families as found in the present study.

Table-12: Summary of total dicot and monocot forms in respective zones

Zone No.	Zone Name	Dicotyledons*			Monocotyledons			Total		
		F	G	S	F	G	S	F	G	S
1	Devalia	59	192	268	14	39	50	73	231	318
2	Suraj Gadh	64	202	302	13	30	42	77	232	344
3	Raidi	68	237	364	16	40	55	84	277	419
4	Dhudhala	65	220	333	17	41	54	82	261	387
5	Alawani	59	86	282	13	34	46	72	120	328
6	Sasan	80	292	429	18	53	66	98	345	495
7	Amla	63	193	241	13	31	42	76	224	283
8	Barwania	64	217	330	16	37	52	80	254	382
9	Kasagola	61	196	302	14	35	47	75	231	349
10	Khokhara	73	256	385	15	43	57	88	299	442
11	Kansoria	70	241	364	16	43	57	86	284	421
12	Vankidas	58	172	255	13	32	43	71	204	298
13	Kankai	68	215	308	15	36	48	83	251	356
14	Rampari	58	180	273	14	34	45	72	214	318
15	Kachhigadh	59	195	285	14	33	46	73	228	331
16	Malpara	67	222	328	12	38	51	79	260	379
17	Sapnes	62	196	276	12	31	43	74	227	319
18	Chhodavadi	62	188	276	12	34	45	74	222	321
19	Khodiyar	57	191	276	13	34	48	70	225	324
20	Janwadla	61	186	274	11	30	57	72	216	331
21	Rasulgadh	70	233	339	16	39	52	86	272	391
22	Jamwala	66	214	322	17	35	50	83	249	372
24	Bararia	70	247	374	15	39	53	85	286	427
25	Banej	67	210	314	15	36	49	82	246	363
26	Bismal	58	188	287	11	33	46	69	221	333
27	Vanrajambu	56	189	277	12	32	43	68	221	320
28	Shemardi	63	225	341	15	39	51	78	264	392
29	Hadala	66	210	299	13	35	51	79	245	350
30	Kardapan	58	187	284	13	33	45	71	220	329

Zone No.	Zone Name	Dicotyledons*			Monocotyledons			Total		
		F	G	S	F	G	S	F	G	S
31	Tulsishyam	73	239	362	15	42	54	88	281	416
32	Jasadhar	72	246	370	16	47	59	88	293	429
33	Vejalkotha	66	217	321	16	40	52	82	257	373
34	Timberwa	66	205	312	17	43	57	83	248	369
35	Kotharia	74	251	390	16	42	55	90	293	445
36	Pipalwa	68	233	349	14	41	54	82	274	403
37	Bhania	66	224	321	13	37	50	79	261	371

* F - family; G - genera and S - species

For the convenience of justifying the taxonomic diversity in such a large tract of over 1500 sq kms the area is divided into total 37 zones. The table-12 gives a brief statistical knowhow of the overall flora in these zones. It gives the comparative outlook of Monocotyledon and Dicotyledon plants in Gir National Park and Sanctuary. It is interpreted that almost all the zones show homogenous distribution of plants. Zones 2, 3, 4, 7, 8, 9, 16, 17, 18, 31, 32, 33, 34, 36 and 37 represents almost some of dicot families. Similarly, 16, 17, 18, 24, 25, 29, 30, 32, 33 zones have almost same number of monocot families. As far as total no of species (Dicot + Monocot) are concerned the maximum species are found in 6 (Sasan), 35 (Kotharia) and 10 (Khokhara) zones and minimum species are found in zone 7 (Amla), 12 (Vankidas) and 14 (Rampari).

Table-13: Summary in percentage of total dicot and monocot forms in respective zones

Zone No.	Percentage	Dicotyledons			Monocotyledons			Total		
		F	G	S	F	G	S	F	G	S
1	Devalia	58.42	50.00	45.04	13.86	10.16	8.40	72.28	60.16	53.45
2	Suraj Gadh	63.37	52.60	50.76	12.87	7.81	7.06	76.24	60.42	57.82
3	Raidi	67.33	61.72	61.18	15.84	10.42	9.24	83.17	72.14	70.42
4	Dhudhala	64.36	57.29	55.97	16.83	10.68	9.08	81.19	67.97	65.04
5	Alawani	58.42	22.40	47.39	12.87	8.85	7.73	71.29	31.25	55.13
6	Sasan	79.21	76.04	72.10	17.82	13.80	11.09	97.03	89.84	83.19

Zone No.	Percentage	Dicotyledons			Monocotyledons			Total		
		F	G	S	F	G	S	F	G	S
7	Amla	62.38	50.26	40.50	12.87	8.07	7.06	75.25	58.33	47.56
8	Barwania	63.37	56.51	55.46	15.84	9.64	8.74	79.21	66.15	64.20
9	Kasagola	60.40	51.04	50.76	13.86	9.11	7.90	74.26	60.16	58.66
10	Khokhara	72.28	66.67	64.71	14.85	11.20	9.58	87.13	77.86	74.29
11	Kansoria	69.31	62.76	61.18	15.84	11.20	9.58	85.15	73.96	70.76
12	Vankidas	57.43	44.79	42.86	12.87	8.33	7.23	70.30	53.13	50.08
13	Kankai	67.33	55.99	51.76	14.85	9.38	8.07	82.18	65.36	59.83
14	Rampari	57.43	46.88	45.88	13.86	8.85	7.56	71.29	55.73	53.45
15	Kachhigadh	58.42	50.78	47.90	13.86	8.59	7.73	72.28	59.38	55.63
16	Malpara	66.34	57.81	55.13	11.88	9.90	8.57	78.22	67.71	63.70
17	Sapnes	61.39	51.04	46.39	11.88	8.07	7.23	73.27	59.11	53.61
18	Chhodavadi	61.39	48.96	46.39	11.88	8.85	7.56	73.27	57.81	53.95
19	Khodiyar	56.44	49.74	46.39	12.87	8.85	8.07	69.31	58.59	54.45
20	Janwadla	60.40	48.44	46.05	10.89	7.81	9.58	71.29	56.25	55.63
21	Rasulgadh	69.31	60.68	56.97	15.84	10.16	8.74	85.15	70.83	65.71
22	Jamwala	65.35	55.73	54.12	16.83	9.11	8.40	82.18	64.84	62.52
24	Bararia	69.31	64.32	62.86	14.85	10.16	8.91	84.16	74.48	71.76
25	Banej	66.34	54.69	52.77	14.85	9.38	8.24	81.19	64.06	61.01
26	Bismal	57.43	48.96	48.24	10.89	8.59	7.73	68.32	57.55	55.97
27	Vanrajambu	55.45	49.22	46.55	11.88	8.33	7.23	67.33	57.55	53.78
28	Shemardi	62.38	58.59	57.31	14.85	10.16	8.57	77.23	68.75	65.88
29	Hadala	65.35	54.69	50.25	12.87	9.11	8.57	78.22	63.80	58.82
30	Kardapan	57.43	48.70	47.73	12.87	8.59	7.56	70.30	57.29	55.29
31	Tulsishyam	72.28	62.24	60.84	14.85	10.94	9.08	87.13	73.18	69.92
32	Jasadhar	71.29	64.06	62.18	15.84	12.24	9.92	87.13	76.30	72.10
33	Vejalkotha	65.35	56.51	53.95	15.84	10.42	8.74	81.19	66.93	62.69
34	Timberwa	65.35	53.39	52.44	16.83	11.20	9.58	82.18	64.58	62.02
35	Kotharia	73.27	65.36	65.55	15.84	10.94	9.24	89.11	76.30	74.79

Zone No.	Percentage	Dicotyledons			Monocotyledons			Total		
		F	G	S	F	G	S	F	G	S
36	Pipalwa	67.33	60.68	58.66	13.86	10.68	9.08	81.19	71.35	67.73
37	Bhania	65.35	58.33	53.95	12.87	9.64	8.40	78.22	67.97	62.35

The table-13 shows the percentage of dicot and monocot forms in respective zones. The order of dominance, zones are 6, 35, 10, 32, 24, 11, 3, 31, 36, 28, 21, 4, 8, 16, 33, 22, 37, 34, 25, 13, 29, 9, 2, 26, 20, 15, 30, 5, 19, 18, 27, 17, 14, 1, 12 and 7. As per the data maximum and minimum diverse forms were noted in zone 6 (Sasan) and 7 (Amla) respectively.

Table-14: Dominance of families as campared to the total plant species in GNPS

Sr.No.	Family	Genera	Species	% of Species
1.	Annonaceae	3	4	0.792
2.	Menispermaceae	4	5	0.99
3.	Nymphaeaceae	1	1	0.198
4.	Papaveraceae	1	1	0.198
5.	Brassicaceae	2	4	0.792
6.	Capparidaceae	4	6	1.782
7.	Cleomeceae	1	4	0.99
8.	Flacourtiaceae	2	3	0.594
9.	Polygalaceae	1	3	0.594
10.	Portulacaceae	1	3	0.594
11.	Tamaricaceae	1	1	0.198
12.	Elatinaceae	1	2	0.396
13.	Malvaceae	8	19	3.168
14.	Bombacaceae	3	3	0.594
15.	Sterculiaceae	6	7	1.386
16.	Tiliaceae	3	9	1.584
17.	Malpighiaceae	1	1	0.198
18.	Zygophyllaceae	1	1	0.198
19.	Oxalidaceae	2	2	0.198
20.	Balsaminaceae	1	2	0.396
21.	Rutaceae	4	4	0.594
22.	Simaroubaceae	1	1	0.198
23.	Balanitaceae	1	1	0.198

Sr.No.	Family	Genera	Species	% of Species
24.	Burseraceae	3	3	0.594
25.	Meliaceae	3	3	0.594
26.	Celastraceae	2	2	0.396
27.	Rhamnaceae	1	4	0.99
28.	Vitaceae	3	5	0.792
29.	Leeaceae	1	1	0.198
30.	Sapindaceae	3	4	0.792
31.	Anacardiaceae	5	5	0.594
32.	Moringaceae	1	2	0.396
33.	Fabaceae	33	68	10.891
34.	Caesalpiniaceae	9	19	3.168
35.	Mimosaceae	8	16	2.97
36.	Rosaceae	1	1	0.198
37.	Combretaceae	4	8	1.584
38.	Myrtaceae	3	5	0.99
39.	Lecythidaceae	1	1	0.198
40.	Lythraceae	4	6	0.99
41.	Punicaceae	1	1	0.198
42.	Onagraceae	1	1	0.198
43.	Passifloraceae	1	1	0.198
44.	Caricaceae	1	1	0.198
45.	Cucurbitaceae	10	13	2.178
46.	Cactaceae	1	1	0.198
47.	Aizoaceae	2	2	0.396
48.	Molluginaceae	2	3	0.594
49.	Apiaceae	4	4	0.198
50.	Alangiaceae	1	1	0.198
51.	Rubiaceae	12	16	3.168
52.	Asteraceae	28	33	5.544
53.	Plumbaginaceae	1	1	0.198
54.	Sapotaceae	3	4	0.792
55.	Ebenaceae	1	1	0.198
56.	Oleaceae	3	4	0.792
57.	Apocynaceae	8	10	1.584
58.	Asclepiadaceae	8	10	1.386
59.	Periplocaceae	1	1	0.198
60.	Loganiaceae	1	1	0.198
61.	Gentianaceae	4	7	0.792

Sr.No.	Family	Genera	Species	% of Species
62.	Boraginaceae	3	8	1.386
63.	Ehretiaceae	2	4	0.792
64.	Convolvulaceae	6	17	2.772
65.	Cuscutaceae	1	2	0.396
66.	Solanaceae	8	13	2.365
67.	Scrophulariaceae	6	10	1.386
68.	Bignoniaceae	7	7	0.99
69.	Pedaliaceae	1	1	0.198
70.	Martyniaceae	1	1	0.198
71.	Acanthaceae	17	26	4.158
72.	Verbenaceae	7	9	1.782
73.	Lamiaceae	4	10	1.386
74.	Nyctaginaceae	2	4	0.792
75.	Amaranthaceae	7	11	1.98
76.	Polygonaceae	2	4	0.396
77.	Proteaceae	1	1	0.198
78.	Loranthaceae	2	2	0.396
79.	Santalaceae	1	1	0.198
80.	Euphorbiaceae	12	21	3.96
81.	Ulmaceae	1	1	0.198
82.	Moraceae	3	8	1.386
83.	Casuarinaceae	1	1	0.198
84.	Hydrocharitaceae	2	2	0.396
85.	Orchidaceae	2	3	0.396
86.	Zingiberaceae	1	1	0.198
87.	Musaceae	1	1	0.198
88.	Cannaceae	1	1	0.198
89.	Amaryllidaceae	1	1	0.198
90.	Hypoxidaceae	1	1	0.198
91.	Agavaceae	1	1	0.198
92.	Dioscoreaceae	1	5	0.594
93.	Liliaceae	6	7	0.99
94.	Commelinaceae	3	9	1.188
95.	Arecaceae	4	4	0.792
96.	Pandanaceae	1	1	0.198
97.	Typhaceae	1	1	0.198
98.	Araceae	2	2	0.198
99.	Eriocaulaceae	1	2	0.396

Sr.No.	Family	Genera	Species	% of Species
100.	Cyperaceae	1	3	0.594
101.	Poaceae	27	32	5.148

The table-14 indicates the familywise distribution of genus and species in the area. It is observed that out of total 101 families, monogeneric families are Nymphaeaceae, Papaveraceae, Tamaricaceae, Malpighiaceae, Zygophyllaceae, Simaroubaceae, Balanitaceae, Leeaceae, Rosaceae, Punicaceae, Onagraceae, Passifloraceae, Caricaceae, Cactaceae, Alangiaceae, Plumbaginaceae, Ebenaceae, Periplocaceae, Loganiaceae, Proteaceae, Santalaceae, Ulmaceae, Casuarinaceae, Zingiberaceae, Musaceae, Cannaceae, Amaryllidaceae, Hypoxidaceae, Agavaceae, Pandanceae and Typhaceae. Families with more than 15 species are Fabaceae, Asteraceae, Poaceae, Acanthaceae, Euphorbiaceae, Caesalpiniaceae, Convolvulaceae.

Table-15: Rare plants in GNPS

Botanical Name	Plant Form	Plants in surveyed area
Bombacaceae		
Adansonia digitata L.	T	01
Sterculiaceae		
Firmiana colorata (Roxb.) R.Br.	T	07
Anacardiaceae		
Buchanania cochinchinensis (Lour.) Almeida	T	11
Fabaceae		
***Butea monosperma* var. *lutia* (Witt.) Mahesh.**	T	01
Caesalpiniaceae		
Hardwickia binata Roxb.	T	03
Piliostigma malabaricum (DC)	T	14
Combretaceae		
Terminalia chebula Retz.	T	19
Lecythidaceae		
Couroupita guianensis Abul.	T	01
Apocynaceae		
Wrightia arborea (Dennst.) Mabb	T	01
Loganiaceae		
Strychnos potatorum L.f.	T	02
Bignoniaceae		
Oroxylum indicum (L.) Vent.	T	33
Stereospermum colais (Buch – Ham. Ex. Dillw.) Mabb.	T	08
Tecomella undulate (Sm.) Seem.	T	03
Euphorbiaceae		
Dalechampia scandens Var. *cordofona* (hochst. ex. A. Rich.) Muell-Arg.	C	73
Drypetes roxburghii (Wall.) Hurusawa	T	04
Araceae		
Amorphophallus commutatus Engl.	H	77

The Table-15 shows the list of rare plants found in GNPS. These data indicated the total number of plants in GNPS based on the number of plants of a given the list of rare plants was prepared (Table-15). It was noted that there are 16 genera which have very limited occurrence in GNPS. Among this list except one climber (*Dalechampia scandens* Var. *cordofona* (hochst. ex. A. Rich.) Muell-Arg.) and one herb (*Amorphophallus commutatus* Engl.) of the members are tree forms. It would be interesting to extend their studies to understand the factors controlling limited number of these rare forms.

Ecological Studies of different life forms in GNPS:

Introduction

The most striking feature of earth is the existence of life and the most striking feature of life is its diversity. This biological diversity has long been an amazing source of scientific curiosity, but is increasingly a source of concern. Human domination of earth's ecosystem is markedly reducing the diversity of species within habitats worldwide. One of the more important questions raised by these threats to biodiversity is the extent to which this loss of biodiversity matters. The stability, productivity and other aspects of the functioning of both managed and natural ecosystems is dependent on biodiversity. The existence of so great a diversity of species on earth remains a mystery, the solution to which may also explain why and how biodiversity influences the functioning of ecosystems (Tilman, 2000). The answer may lie in quantifying the organisms over a period in their natural environment.

The study of the relationship between biodiversity and ecosystem processes has made rapid progress in the past decade and is proving an effective catalyst for linking the ecology of individuals, communities and ecosystems. Some general although not universal patterns are emerging as theory and experiment progress together (Loreau, 1998). In fact, biodiversity, which ten years ago was considered not so important by most ecosystem ecologists, has now been shown to impact significantly upon many aspects of ecosystem functioning. Diversity must now be added to the list of factors-including species composition, disturbance regime, soil type and climate that influence ecosystem functioning. The rediscovery of the importance of biodiversity highlights an under-appreciated truth although society is dependent on natural and managed ecosystems for goods and services that are essential for human survival, we know all too little about how ecosystem works. Our understanding of the effects of biodiversity on ecosystem processes and the effectiveness of alternative strategies

for the preservation of biodiversity, are limited by our knowledge of the mechanisms that maintain diversity. The mechanisms most relevant to ecosystem functioning are those that maintain diversity on the local scale within which individuals of one species interact with individuals of other species. It is from such interactions among individuals of different species that diversity is expected to impact ecosystem processes (Tilman, 2000).

The term biodiversity is a simple contraction of biological diversity and at first sight the concept is simple too. Biodiversity is the sum total of all biotic variations from the level of genes to ecosystems. The challenge comes in measuring such a broad concept in ways that are useful in its management. Although biodiversity can never be fully captured by simple numbers, study of specific facets has led to rapid, exciting and sometimes alarming discoveries. Phylogenetic and temporal analyses are shedding light on the ecological and evolutionary processes that have shaped current biodiversity. To proceed very far with the study of biodiversity, we cannot even begin to look at how biodiversity is distributed or how fast it is disappearing, unless we can put units on it. However, any attempt to measure biodiversity quickly runs into the problem that it is a fundamentally multidimensional concept. It cannot be reduced sensibly to a single number (Whittaker, 1972).

Ecological scientists worth citing for contributions in diversity index is Alatalo, (1981) who studied the problems in the measurement of evenness, Barford (1985) worked on Experimental measurements, Bulmer (1975) conducted study on the statistical analysis of density, Camargo (1995) worked on measuring species evenness, Dale (1997) reported spatial pattern. Under analysis in plant Ecology, Greig-Smith (1979) studied the pattern in vegetation, Hill (1973) worked on Diversity and evenness. Hughes (1986) published work on theories and models of species abundance, Kempto (1979) has worked on the structure of species abundance and measurement of diversity. Legendre and Legendre (1983) conducted study on numerical ecology. MacArthur (1965) had published patterns of species diversity. MacIntosh (1967) worked on an index of diversity and the relation of certain concepts to diversity. Peet, (1974, 1975) has worked on the measurement of species diversity and relative diversity indices. Pielou (1966, 1969, 1975, 1977, 1984) has extensively worked on different aspects of ecological diversity. Tothmeresz (1995) compared different methods for diversity ordering. Wilson and Shmidac (1984) has reported work in measuring beta diversity with presence/abscense data and Whittaker (1965) has reported dominance and diversity in land plant communities.

In India also good work has been done in the field of ecology in different fields like Dani, et al (1991) studied phytosociological analysis of forest vegetation of Kantamal.

Pandey, et al (1988) reported comparative vegetation analysis of some plantation ecosystem. Tewari, (1998) has worked on Tree layer analysis of three major forest forming species of Kumaun, Central Himalaya. Bhattacharya and Pandya (1996a, b) studied weed in agroecosystem of Saurashtra. Puri (1951, 1955, 1960) worked extensively on Indian forest ecology. Desai (1994) published his work on forest management in India. Agarwal (1984) worked on species diversity in some grazing lands of Garhwal Himalaya. Meher-Homji (1981) studied the environment implications of life form spectra from India. Ahuja and Singh (1963) worked on ecological studies of the Western Ghats. Ambasht (1963, 1970, 1978) extensively studied different aspects of ecology and Bharucha (1975) worked on ecological and phytosociological studies.

Table-16: Ecological data (frequency, abundance and density) of different life forms in GNPS

Life Form	National Park			Sanctuary West			Sanctuary East			General		
	F	A	D	F	A	D	F	A	D	F	A	D
Trees	7.39	0.57	0.23	7.89	0.67	0.30	6.37	0.52	0.24	21.65	1.75	0.76
Shrubs	8.67	0.51	0.30	12.84	0.73	0.48	9.67	0.59	0.40	31.18	1.83	1.18
Herbs	9.74	2.24	1.37	12.31	2.57	1.51	8.88	1.70	0.93	30.94	6.51	3.81
Climbers	9.0	1.76	0.93	11.51	2.31	1.14	9.45	1.22	0.68	29.96	5.29	2.75
Grasses	14.97	2.16	1.11	16.90	2.52	1.38	14.78	2.40	1.25	46.65	7.08	3.75

The above ecological data of different life-form indicate that in order of dominance is Grasses (46.65%), Shrub (31.18%). Herbs (30.94%), Climber (29.96) and Trees (21.65). However, in terms of abundance and density this dominance order has been different. For abundance, order of dominance in Grasses (7.08). Herbs (6.51), Climbers (5.29), Shurbs (1.83) and Trees (1.75). Moreover with reference to density the order is Herbs (3.81) Grasses (3.75), Climbers (2.75), Shrubs (1.18) and Trees (0.76).

Table-17: Ecological data of different trees species in GNPS

Botanical Name	Sanctuary West			Sanctuary East			National Park		
	F	A	D	F	A	D	F	A	D
Annonaceae									
Annona reticulata L.	2.74	0.58	1.09	0.00	0.00	0.00	0.00	0.00	0.00
Annona squamosa L.	2.23	0.17	0.06	3.49	0.21	0.13	2.17	0.16	0.06
Miliusa tomentosa (Roxb.) Sinclair.	6.01	0.30	0.13	1.14	0.04	0.02	7.54	0.36	0.15
Polyalthia longifolia (Sonn.) Thw.	4.54	0.23	0.13	5.71	0.23	0.13	4.71	0.22	0.08

Botanical Name	Sanctuary West			Sanctuary East			National Park		
	F	A	D	F	A	D	F	A	D
Capparidaceae									
Capparis grandis L.f.	19.14	1.09	0.64	12.86	0.58	0.29	10.00	0.67	0.31
Crataeva magna (Lour.) DC	5.03	0.37	0.08	2.51	0.19	0.05	10.06	0.78	0.18
Flacourtiaceae									
Caseria tomentosa Roxb.	11.91	0.83	0.16	9.43	0.66	0.22	9.94	0.69	0.14
Flacourtia montana Grah.	12.11	0.92	0.31	17.14	0.84	0.52	7.20	0.68	0.19
Malvaceae									
Kydia calycina Roxb.	14.43	1.08	0.57	5.14	0.60	0.18	20.57	1.34	0.71
Thespesia populnea (L.) Soland.ex Corr.	4.87	0.62	0.14	1.71	0.30	0.11	2.29	0.48	0.03
Bombacaceae									
Adansonia digitata L.	1.43	0.06	0.03	0.00	0.00	0.00	0.00	0.00	0.00
Bombax ceiba L.	18.98	1.14	0.45	15.71	0.66	0.35	12.00	0.58	0.19
Ceiba pentandra (L.) Gaertn.	4.29	0.23	0.15	2.97	0.08	0.15	3.86	0.17	0.11
Sterculiaceae									
Firmiana colorata (Roxb.) R.Br.	0.00	0.00	0.00	0.00	0.00	0.00	11.43	0.16	0.03
Guazuma ulmifolia Lam.	0.69	0.05	0.03	0.00	0.00	0.00	0.69	0.05	0.03
Sterculia foetida L.	6.79	0.46	0.31	4.80	0.43	0.29	3.20	0.24	0.16
Sterculia urens Roxb.	13.04	1.05	0.45	12.57	0.55	0.22	12.45	0.94	0.23
Tiliaceae									
Grewia tiliaefolia Vahl.	9.43	0.21	0.17	10.29	0.45	0.22	17.14	0.06	0.24
Rutaceae									
Aegle marmelos (L.) Corr.	23.68	1.45	0.75	18.86	0.88	0.53	15.87	1.45	0.51
Citrus limon (L.) Burm.f.	15.34	0.68	0.46	13.60	0.56	0.42	9.71	0.40	0.30
Limonia acidissima L.	3.57	0.64	0.36	0.00	0.00	0.00	3.14	0.44	0.26
Murraya koenigii (L.) Spr.	10.23	0.40	0.24	10.46	0.19	0.24	6.86	0.16	0.13
Simaroubaceae									
Ailanthus excelsa Roxb.	19.23	0.96	0.51	10.00	0.42	0.28	17.29	0.57	0.26
Balanitaceae									
Balanites aegyptiaca (L.) Del.	15.16	1.10	0.34	8.36	0.66	0.18	10.29	1.44	0.14
Burseraceae									
Boswellia serrata Roxb. ex Colebr.	10.63	0.75	0.28	13.83	1.06	0.53	11.31	1.00	0.21
Garuga pinnata Roxb.	7.43	0.31	0.16	0.00	0.00	0.00	6.29	0.21	0.09
Meliaceae									
Azadirachta indica A.Juss.	10.80	1.03	0.35	5.14	0.60	0.10	17.14	1.20	0.72
Melia azedarach L.	4.49	0.31	0.18	5.03	0.29	0.30	2.51	0.16	0.09
Soymida febrifuge (Roxb.) A.Juss.	17.36	2.04	0.67	18.86	0.44	0.26	13.71	0.93	0.29
Rhamnaceae									
Zizyphus mauritiana Lam.	22.50	1.31	0.71	17.60	0.84	0.51	21.15	1.49	0.78
Sapindaceae									
Sapindus emarginatus Vahl.	6.31	0.69	0.30	4.80	0.38	0.58	13.71	1.92	0.77

Botanical Name	Sanctuary West			Sanctuary East			National Park		
	F	A	D	F	A	D	F	A	D
Sapindus laurifolius Vahl.	8.23	0.79	0.26	6.80	0.70	0.28	12.00	1.10	0.26
Schleichera oleosa (Lour.) Oken.	6.97	0.87	0.15	4.40	0.62	0.14	11.66	1.20	0.34
Anacardiaceae									
Anacardium occidentale L.	2.31	0.36	0.26	0.00	0.00	0.00	2.80	0.50	0.42
Buchanania cochinchinensis (Lour.) Almeida.	2.86	0.44	0.22	0.00	0.00	0.00	2.43	0.38	0.30
Lannea coromandelica (Houtt.) Merr.	11.09	0.63	0.23	14.14	0.57	0.29	9.49	0.57	0.17
Mangifera indica L.	7.77	0.39	0.20	7.71	0.43	0.18	5.83	0.24	0.12
Spondias pinnata (L.f.) Kurz.	4.20	0.19	0.10	6.40	0.32	0.22	1.66	0.06	0.02
Moringaceae									
Moringa concanensis Nimmo.	8.65	1.02	0.27	5.60	0.28	0.25	2.57	0.32	0.04
Moringa oleifera Lam.	5.17	0.39	0.20	5.71	0.38	0.24	5.29	0.30	0.20
Fabaceae (Papilionaceae)									
Butea monosperma (Lamk.) Taubert.	16.57	1.26	0.48	14.65	0.84	0.35	17.14	1.12	0.51
Butea monosperma var. lutea (Witt.) Mahesh.									
Dalbergia lanceolaria Sps. *paniculata* Roxb.	7.94	0.65	0.20	5.71	0.40	0.08	12.72	0.77	0.32
Dalbergia latifolia Roxb.	9.23	0.56	0.18	10.97	0.61	0.26	10.29	0.96	0.14
Dalbergia sissoo Roxb.	4.24	0.31	0.11	5.43	0.20	0.36	10.60	0.78	0.23
Erythrina suberosa Roxb.	3.71	0.16	0.07	4.57	0.16	0.06	16.71	0.68	0.31
Erythrina variegata L.	2.14	0.44	0.34	2.46	0.52	0.44	0.00	0.00	0.00
Pongamia pinnata L.	11.94	0.71	0.20	8.80	0.44	0.22	13.71	1.25	0.29
Pterocarpus marsupium Roxb.	5.79	0.37	0.15	8.00	0.28	0.11	8.50	0.53	0.18
Caesalpiniaceae									
Bauhinia purpurea L.	11.43	1.08	0.42	12.57	0.66	0.08	9.14	0.48	0.19
Bauhinia racemosa Lam.	5.90	0.55	0.22	7.14	0.46	0.24	6.63	0.57	0.24
Bauhinia tomentosa L.	12.00	0.28	0.18	10.29	0.26	0.19	4.57	0.32	0.06
Cassia fistula L.	12.88	0.79	0.24	9.43	0.44	0.13	13.13	0.85	0.29
Cassia siamea Lam.	3.34	0.25	0.11	2.29	0.24	0.13	2.74	0.18	0.08
Delonix elata (L.) Gamble.	2.74	0.56	0.44	0.00	0.00	0.00	1.71	0.22	0.13
Delonix regia (Bojer ex Hook.) Rafin.	8.37	0.49	0.28	5.91	0.36	0.18	6.80	0.28	0.28
Hardwickia binata Roxb.	1.00	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.00
Parkinsonia aculeata L.	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.04	0.03
Peltophorum pterocarpum (DC.) Backer. ex. K.Heyne.	7.17	0.41	0.34	8.00	0.42	0.64	4.00	0.21	0.16
Piliostigma malabaricum (Roxb.) Bth.	1.86	0.34	0.20	0.00	0.00	0.00	0.00	0.00	0.00
Tamarindus indica L.	17.99	0.92	0.48	12.57	0.53	0.22	15.98	0.91	0.38
Mimosaceae									
Acacia auriculiformis A. Cunn.	2.29	0.60	0.44	0.00	0.00	0.00	1.43	0.44	0.25
Acacia catechu (L.f.) Willd.	17.72	1.26	0.59	17.79	1.28	0.70	19.58	1.12	0.50
Acacia ferruginea DC.	14.38	1.15	0.40	12.57	0.66	0.26	15.29	0.91	0.34
Acacia leucophloea (Roxb.) Willd.	14.21	1.04	0.35	12.57	0.79	0.26	15.53	0.86	0.35
Acacia nilotica (L.) Willd ex. Delile.	19.81	1.89	0.96	16.75	1.54	0.75	15.77	0.82	0.27

Botanical Name	Sanctuary West			Sanctuary East			National Park		
	F	A	D	F	A	D	F	A	D
Acacia senegal (L.) Willd.	15.50	3.44	1.53	12.57	3.52	1.41	8.57	0.72	0.12
Albizzia lebbeck (L.) Benth.	8.09	0.85	0.12	5.14	0.40	0.20	8.00	0.45	0.10
Albizzia odoratissima (L.f.) Benth.	5.14	0.42	0.10	3.43	1.20	0.24	5.71	0.34	0.08
Dichrosachys cinerea var. *indica* Brenen.	15.33	1.60	0.67	12.57	0.66	0.26	6.86	1.44	0.29
Leucaena leucocephala (Lamk.) De. Wit.	8.90	0.34	0.32	7.37	0.29	0.05	3.77	0.14	0.22
Pithecellobium dulce (Roxb.)Benth.	3.94	0.96	0.19	3.60	0.56	0.14	2.86	0.60	0.10
Prosopis cineraria (L.) Druce.	1.57	0.12	0.04	4.29	0.24	0.14	0.80	0.04	0.01
Prosopis juliflora (Swartz) DC.	3.51	0.76	0.18	3.29	0.40	0.16	1.43	0.24	0.06
Samanea saman (Jacq.) Merr.	8.23	0.74	0.20	6.86	0.67	0.19	1.29	0.10	0.02
Combretaceae									
Anogeissus latifolia (Roxb. ex DC.) Wall.	3.29	0.28	0.21	25.14	2.16	1.85	1.00	0.08	0.04
Terminalia bellirica (Gaertn.) Roxb.	7.31	0.52	0.23	10.29	0.38	0.29	13.71	0.92	0.49
Terminalia catappa L.	9.34	0.65	0.28	10.29	0.72	0.36	3.51	0.24	0.10
Terminalia chebula Retz.	2.74	0.24	0.09	2.29	0.10	0.08	2.74	0.24	0.09
Terminalia cuneata Roth.	1.43	0.08	0.04	18.86	1.58	0.97	2.86	0.16	0.08
Terminalia elliptica Willd.	18.65	1.51	0.77	15.71	1.35	0.70	17.14	1.32	0.63
Myrtaceae									
Eucalyptus globulus Labill.	9.78	0.67	0.32	10.00	0.78	0.31	5.14	0.34	0.14
Psidium guajava L.									
Syzygium cumini (L.) Skeels.	10.28	1.50	0.27	6.94	1.44	0.29	15.43	0.97	0.22
Syzygium heyneanum (Duthie) Wall. ex Gamble.	14.71	1.93	0.50	0.46	2.56	0.51	14.14	1.93	0.68
Syzyglium rubicandum Wight & Arn.	5.03	0.41	0.14	4.91	0.29	0.14	1.26	0.11	0.04
Lecythidaceae									
Couroupita guianensis Abul.									
Caricaceae									
Carica papaya L.	13.46	0.73	0.35	12.86	0.36	0.47	5.71	0.32	0.19
Alangiaceae									
Alangium salvifolium (L.f.) Wang.	12.43	0.79	0.25	8.57	0.48	0.13	12.86	1.08	0.40
Rubiaceae									
Anthocephalus indicus A. Rich.	3.77	0.20	0.04	8.57	0.65	0.14	1.89	0.10	0.02
Catunaregam spinosa (Thunb.) Tirvengadum.	16.12	1.42	0.61	4.57	0.64	0.13	15.91	1.78	0.79
Gardenia resinifera Roth.	3.43	0.13	0.04	3.43	0.14	0.04	3.43	0.13	0.04
Haldinia cordifolia (Roxb.) Ridsd.									
Hymenodictyon orixense (Roxb.) Mabb.	9.17	0.72	0.49	5.71	0.32	0.58	18.23	1.54	0.84
Ixora brachiata Roxb.	12.00	0.63	0.24	4.57	0.32	0.06	9.14	0.42	0.10
Ixora pavetta Andr.	12.23	1.57	0.33	11.94	0.66	0.31	13.71	0.86	0.19
Mitragyna parvifolia (Roxb.) Korth.	10.64	1.29	0.35	6.29	1.32	0.26	12.93	1.36	0.45
Morinda citriflora L.	7.43	0.45	0.10	5.14	0.40	0.20	8.57	0.48	0.12
Morinda pubescens J. E. Sm.	14.43	0.63	0.25	10.29	0.36	0.14	12.00	0.63	0.23
Tamilnadia uliginosa (Retz.) Tirveng. & Sastre.	5.00	0.32	0.09	5.71	0.40	0.08	9.43	0.50	0.25

Botanical Name	Sanctuary West			Sanctuary East			National Park		
	F	A	D	F	A	D	F	A	D
Sapotaceae									
Madhuca indica J.F. Gmel.	1.43	0.08	0.05	2.51	0.19	0.13	0.71	0.04	0.03
Manilkara hexandra (Roxb.) Dubard.	9.94	0.80	0.13	5.71	0.40	0.08	8.57	0.80	0.12
Manilkara zapota (L.) P. Royen.	4.31	0.35	0.05	2.86	0.20	0.04	1.43	0.12	0.01
Mimusops elengi L.	4.86	0.51	0.09	3.43	0.24	0.08	14.29	1.04	0.20
Ebenaceae									
Diospyros melanoxylon Roxb.	19.32	1.40	0.74	18.86	1.10	0.70	20.33	1.46	0.84
Oleaceae									
Nyctanthes arbor-tristis L.	19.86	0.99	0.25	13.71	0.56	0.12	7.29	0.36	0.08
Schrebera swietenioides Roxb.	3.24	0.21	0.11	10.00	0.37	0.24	4.76	0.76	0.32
Apocynaceae									
Holarrhena pubescens (Buch – Ham.) Wall. ex G. Don.	13.89	1.49	1.12	12.57	1.32	0.53	11.83	0.65	0.30
Plumeria alba L.	1.71	0.44	0.41	0.00	0.00	0.00	0.00	0.00	0.00
Plumeria rubra Linn.	2.29	0.64	0.44	0.00	0.00	0.00	0.00	0.00	0.00
Wrightia arborea (Dennst.) Mabb.	1.71	0.08	0.04	0.00	0.00	0.00	0.00	0.00	0.00
Wrightia tinctoria R.Br.	22.88	2.07	1.18	10.06	2.77	0.76	24.72	2.37	1.42
Loganiaceae									
Strychnos potatorum L.f.	1.71	0.44	0.22	0.00	0.00	0.00	0.00	0.00	0.00
Ehretiaceae									
Cordia dichotoma Forst.f.	6.86	0.57	0.10	7.00	0.40	0.22	11.43	1.20	0.16
Cordia gharaf (Forsk.) Ehrenb. & Asch.	7.11	0.58	0.17	5.14	0.60	0.17	12.86	0.80	0.26
Cordia monoica Roxb.	2.14	0.17	0.07	2.40	0.17	0.10	3.57	0.28	0.12
Ehretia laevis Roxb.	7.61	1.20	0.29	6.40	0.51	0.22	14.29	1.60	0.44
Bignoniaceae									
Haplophragma adenophyllum (Wall.) P.Dop.	0.57	0.08	0.02	0.00	0.00	0.00	0.00	0.00	0.00
Millingtonia hortensis L.f.	2.14	0.44	0.40	0.00	0.00	0.00	0.00	0.00	0.00
Oroxylum indicum (L.) Vent.	0.69	0.44	0.03	0.66	0.07	0.03	0.69	0.44	0.03
Spathodea campanulata Beauv.	0.63	0.52	0.03	6.91	5.28	0.35	0.63	0.52	0.03
Stereospermum colais (Buch – Ham. ex. Dillw.) Mabb.	0.29	0.52	0.03	0.00	0.00	0.00	0.00	0.00	0.00
Tecoma stanus (Linn.) H.B.& K.	1.43	0.26	0.24	0.00	0.00	0.00	0.46	0.10	0.14
Tecomella undulata (Sm.) Seem.	0.29	0.40	0.08	0.00	0.00	0.00	0.00	0.00	0.00
Verbenaceae									
Gmelina arborea Roxb.	18.63	1.73	1.16	10.29	1.26	1.44	12.57	0.99	0.26
Tectona grandis L.f.	31.73	3.34	2.76	9.32	0.85	0.45	31.61	3.07	2.43
Vitex negundo L.	5.77	0.38	0.51	6.63	0.35	0.62	1.71	0.12	0.19
Proteaceae									
Grewillea robusta A.Cunn.ex R.Br.	0.00	0.00	0.00	0.00	0.00	0.00	1.43	0.44	0.40
Santalaceae									
Santalum album L.	16.00	0.61	0.61	0.00	0.00	0.00	16.00	0.45	0.45
Euphorbiaceae									

Botanical Name	Sanctuary West			Sanctuary East			National Park		
	F	A	D	F	A	D	F	A	D
Bridelia retusa (L.) Spr.	9.86	0.75	0.28	6.00	0.46	0.19	12.86	0.92	0.36
Drypetes roxburghii (Wall.) Hurusawa.	0.00	0.00	0.00	0.00	0.00	0.00	1.43	0.44	0.26
Emblica officinalis Gaerth.	13.97	1.48	0.55	9.43	1.85	0.57	11.31	0.92	0.28
Mallotus philippensis (Lamk.) Muell.Arn.	10.23	0.68	0.46	3.31	0.25	0.17	5.14	0.26	0.22
Ulmaceae									
Holoptelea integrifolia (Roxb.) Planch.	10.57	0.76	0.40	14.14	0.68	0.65	15.43	0.90	0.54
Moraceae									
Artocarpus heterophyllus Lam.	0.00	0.00	0.00	0.00	0.00	0.00	1.86	0.39	0.26
Ficus amplissima Sm.	6.91	0.98	0.11	5.66	0.84	0.05	5.69	0.96	0.08
Ficus benghalensis L.	9.84	1.06	0.31	6.91	0.66	0.13	13.71	1.56	0.60
Ficus hispida L.f.	2.54	0.26	0.10	2.29	0.24	0.03	1.71	0.19	0.08
Ficus racemosa L.	4.66	0.76	0.26	4.71	0.79	0.26	3.43	0.72	0.24
Ficus religiosa L.	7.69	0.71	0.14	6.29	0.44	0.09	6.86	0.48	0.10
Ficus rumphii Bl.	1.66	0.17	0.04	2.57	0.30	0.10	0.00	0.00	0.00
Morus alba L.	4.06	0.56	0.22	2.74	0.32	0.64	2.40	0.48	0.02
Casuarinaceae									
Casuarina equisetifolia L.	9.46	0.40	0.34	9.60	0.53	0.42	3.86	0.06	0.11
Arecaceae (Palmae)									
Borassus flabellifer L.	1.00	0.04	0.02	0.00	0.00	0.00	0.00	0.00	0.00
Cocos nucifera L.	7.03	0.54	0.32	6.43	0.47	0.29	2.14	0.17	0.11
Phoenix sylvestris Roxb.	4.71	0.24	0.17	4.63	0.14	0.25	3.14	0.19	0.09
Roystonea regia (H.B. & K.) O.F.Cook.	3.29	0.15	0.12	0.00	0.00	0.00	0.00	0.00	0.00
Pandanaceae									
Pandanus fascicularis Lamk.	2.37	0.09	0.11	0.00	0.00	0.00	1.00	0.04	0.04

Ecological data for tree species in Gir National Park and Sanctuary demonstrated that, in Gir Sanctuary West the dominant tree species are – *Tectona grandis* L.f. (31.73%), *Aegle marmelos* (L.) Corr. (23.68), *Wrightia tinctoria* R. Br. (22.88%), *Nyctanthes arbor-tristis* L. (19.86%), *Acacia nilotica* (L.) Willd ex. Delile. (19.81%), *Diospyros melanoxylon* Roxb. (19.32%), *Ailanthus excelsa* Roxb. (19.23%), *Capparis grandis* L.f. (19.14%), *Terminalia elliptica* Willd. (18.65%) and *Gmelina arborea* Roxb. (18.63%).

In Gir Sanctuary East the dominant tree species are – *Anogeissus latifolia* (Roxb. ex. DC.) Wall. (25.14%), *Aegle marmelos* (L.) Corr. (18.86%), *Terminalia cuneata* Roth. (18.86%), *Soymida febrifuge* (roxb.) A. Juss. (18.86%), *Diospyros melanoxylon* Roxb. (18.86%), *Acacia catechu* (L. f.) Willd (17.79%), *Zizyphus mauritiana* Lam. (17.60%), *Flacourtia montana* Grah. (17.14%), *Acacia nilotica* (L.) Willd. ex. Delile. (16.75%), *Bombax ceiba* L. (15.71%) and *Terminalia elliptica* Willd. (15.71%).

In Gir National Park the dominant tree species are – *Tectona grandis* L.f. (31.61%), *Wrightia tinctoria* R. Br. (24.72%), *Zizyphus mauritiana* Lam. (21.15%), *Kydia calycina* Roxb. (20.57%), *Diospyros melanoxylon* Roxb. (20.33%), *Acacia catechu* (L.f.) Willd. (19.58%), *Hymenodictyon orixense* (Roxb.) Mabb. (18.23%), *Ailanthus excelsa* Roxb. (17.29%), *Grewia tiliaefolia* Vahl. (17.14%), *Azadirachta indica* A. Juss. (17.14%), *Butea monosperma* (Lamk.) Taubert. (17.14%) and *Terminalia elliptica* Willd. (17.14%).

In Gir National Park and Sanctuary the dominant tree species are - *Tectona grandis* L.f. (24.22%), *Zizyphus mauritiana* Lam. (20.42%), *Diospyros melanoxylon* Roxb. (19.50%), *Aegle marmelos* (L.) Corr. (19.47%), *Wrightia tinctoria* R. Br. (19.22%), *Acacia catechu* (L.f.) Willd. (18.36%), *Acacia nilotica* (L.) Willd. ex. Delile. (17.45%), *Terminalia elliptica* Willd. (17.17%), *Soymida febrifuge* (Roxb.) A. Juss. (16.64%), %) and *Butea monosperma* (Lamk.) Taubert. (16.12%).

On comparison with past records – Sharma and Johnsingh (1995) noted the most dominant important tree species in Gir National Park and Sanctuary in their descending order as - *Tectona grandis* (31.3%), *Wrightia tinctoria* (11.2%), *Acacia catachu* (9.2%), *Zizyphus mauritiana* (7.5%), *Acacia nilotica* (1.2%), *Anogeissius latifolia* (3.9%), *Acacia leucophloea* (3.4%), *Terminalia crenulata* (3.1%), *Diospyros melanoxylon* (2.4%), *Bauhinia purpurea* (2.4%), *Grewia coromandelica* (1.5%), *Butea monosperma* (1.3%).

Earlier, Menon and Shah (1981) has studied phytosociology of Gir forest in Saurashtra and compared density, frequency and abundance, IVI of ten dominat and ten rare or less abundant tree species. With reference to IVI the important trees are - *Acacia Senegal, Carissa congesta, Terminalia crenulata, Zizyphus rugusa, Butea monosperma, Acacia ferruginia, Tectona grandis* and *Boswellia serrata*. Among rare or less dominant tree species, *cordia dichotoma, Limonia acidissima* and *Xeromphis spinosa, Mangifera indica, Schrebera swietenioides,, Caesalpinia crista* and *Cassia siamea* showed decreasing trend for IVI respectively.

According to Pandey and Singh (1999) in Kumbhalgarh Wildlife Sanctuary of Rajasthan the dominant tree species are - *Acacia chundra, Acacia leucophloea, Acacia Senegal, Albizia odoratissima, Cassia fistula, Dalbergia lanceolaria, Ehretia laevis, Ficus racemosa,* and *Haldinia cordifolia.* This report is to some extent relates with the GNPS for some dominant trees.

According to Khan (1994) the results shows that the tree dominant species are- *Acacia nilotica, Xeromphis spinosa, Terminalia crenulata* and *Boswellia serrata* less similar with present study.

Berwick (1976) studied in Gir forest *Tectona grandis*, *Zizyphus mauritiana*, *Diospyros melanoxylon*, *Aegle marmelos*, *Wrightia tinctoria*, *Acacia catechu*, *Acacia nilotica*, *Terminalia elliptica* and *Soymida febrifuge* are the dominant tree species. This reports is to extent relates with the present study.

According to Patel (2002) worked on Rampara Wildlife Sanctuary forest and the dominant tree species are *Acacia Senegal* (15.3%), *Acacia nilotica* (12.6%), *Balanites aegyptica* (8.9%), *Prosopis juliflora* (8.7%), and *Acacia leucophloea* (4.6%). This result indicates that the present study is not similar with these results.

Table-18: Ecological data of different shrubs species in GNPS

Botanical Name	Sanctuary West			Sanctuary East			National Park		
	A	D	F	A	D	F	A	D	
Capparidaceae									
Cadaba fruticosa (L.) Druce.	8.20	0.62	0.32	3.89	0.48	0.29	10.29	0.53	0.14
Capparis decidua (Forssk.) Edgew.	21.37	1.15	0.56	18.23	0.66	0.79	17.14	0.62	0.38
Capparis sepiaria L.	20.29	1.25	0.69	20.43	1.10	0.79	22.29	1.20	0.72
Flacourtiaceae									
Flacourtia indica (Burm.f.) Merr.	1.43	0.10	0.02	4.29	0.26	0.18	14.29	0.96	0.20
Tamaricaceae									
Tamarix ericoides Rottl.	7.22	0.66	0.42	8.00	0.84	0.70	8.66	0.64	0.23
Malvaceae									
Gossypium herbaceum L.									
Hibiscus rosa- sinensis L.	11.94	0.46	0.16	11.60	0.28	0.14	5.14	0.18	0.06
Hibiscus schizopetalus (Mast.) Hook. f.	13.29	0.64	0.47	13.00	0.28	0.48	5.57	0.12	0.22
Thespesia lampus (Cav.) Dalz. & Gibs.	7.43	0.36	0.40	7.71	0.43	0.36	6.00	0.34	0.56
Sterculiaceae									
Helicteres isora L.	28.71	1.89	1.39	9.43	0.62	0.35	18.86	1.58	0.26
Tiliaceae									
Grewia hirsuta Vah.	3.43	0.24	0.05	6.43	0.20	0.16	17.14	0.76	0.24
Grewia tenex (Forssk.) Fiori.	7.43	0.48	0.21	7.20	0.37	0.19	17.14	1.12	0.60
Burseraceae									
Commiphora wightii (Arn.) Bhandari.	1.43	0.06	0.04	8.57	0.41	0.24	0.00	0.00	0.00
Celastraceae									
Maytenus senegalensis (Lam.) Excell.	13.83	0.70	0.47	15.43	1.01	0.65	3.03	0.14	0.12
Rhamnaceae									
Zizyphus nummulaia (Burm.f.) Wight & Arn.	20.91	0.87	0.84	18.86	1.14	0.70	5.71	0.40	0.08
Zizyphus xylopyra (Retz.) Willd.	15.29	1.34	0.52	13.51	0.92	0.37	8.80	0.59	0.22
Vitaceae									

Botanical Name	Sanctuary West			Sanctuary East			National Park		
	A	D	F	A	D	F	A	D	
Cissus quadrangularis L.	1.71	0.48	0.22	1.94	0.52	0.46	0.00	0.00	0.00
Fabaceae (Papilionaceae)									
Cajanus cajan (L.) Mill.	9.40	0.48	0.38	11.31	0.54	0.39	2.29	0.10	0.09
Sesbania bispinosa (Jacq.) W.F. Wight.	85.86	0.80	0.42	14.14	0.47	0.37	11.43	0.64	0.38
Caesalpiniaceae									
Cassia auriculata L.	14.86	1.52	0.71	17.29	1.14	0.70	12.00	0.62	0.58
Cassia surattensis ssp. *glauca* (Lam.) K. & S.	10.00	0.56	0.55	11.57	0.43	0.29	3.43	0.24	0.14
Mimosaceae									
Mimosa hamata Willd.	2.94	0.20	0.13	21.37	1.50	0.92	1.00	0.06	0.05
Rosaceae									
Rosa indica L.	9.20	0.50	0.52	8.00	0.58	0.48	6.00	0.24	0.43
Lythraceae									
Lawsonia inermis L.	12.80	0.49	0.27	9.14	0.48	0.22	11.57	0.36	0.29
Woodfordia fruticosa (L.) Kurz.	13.29	0.59	0.44	6.00	0.34	0.17	11.57	0.47	0.40
Punicaceae									
Punica granatum L.	8.46	0.56	0.35	6.86	0.58	0.35	4.29	0.24	0.16
Cactaceae									
Opuntia elatior Mill.	9.57	0.70	0.38	9.77	0.58	0.28	4.29	0.40	0.20
Apocynaceae									
Carissa congesta Wight.	18.41	1.01	0.44	18.86	1.32	0.53	18.86	0.96	0.43
Ervatamia divaricata (L.) Burkill.	12.20	0.92	0.52	8.46	0.32	0.32	7.00	0.70	0.42
Nerium indicum Mill.	10.09	0.35	0.29	7.77	0.29	0.29	6.00	0.14	0.14
Thevetia neriifolia Juss. ex. Steud.	17.06	0.80	0.66	12.57	0.54	0.48	12.00	0.42	0.28
Asclepiadaceae									
Calotropis gigantean (L.) Ait.	24.74	1.31	0.98	12.86	0.68	0.40	14.86	0.80	0.48
Calotropis procera (Ait.) R. Br.	5.54	0.22	0.10	4.29	0.20	0.16	6.80	0.22	0.06
Convolvulaceae									
Ipomoea carnea ssp. *fistulosa* (Mart. ex Choisy) Austin.	10.57	0.40	0.10	10.06	0.45	0.10	4.57	0.16	0.08
Solanaceae									
Cestrum diurnum L.	0.00	0.00	0.00	0.00	0.00	0.00	1.97	0.60	0.46
Cestrum nocturnum L.	14.09	0.99	0.43	4.57	0.32	0.03	10.00	0.67	0.34
Acanthaceae									
Adhatoda vasica Nees.	1.29	0.26	0.13	0.00	0.00	0.00	1.43	0.64	0.38
Barleria cuspidata Heyne. ex. Ness.	30.20	1.73	1.04	25.77	1.76	1.01	24.00	1.25	0.77
Verbenaceae									
Clerodendron inerme (L.) Gaertn.	8.14	0.96	0.64	5.66	0.68	0.72	5.14	0.68	0.36
Clerodendron multiflorum (Burm.f.) O.Ktze.	14.91	0.94	0.32	8.23	0.36	0.14	18.00	1.03	0.25

Botanical Name	Sanctuary West			Sanctuary East			National Park		
	A	D	F	A	D	F	A	D	
Duranta repens L.	18.00	0.60	0.36	10.97	0.24	0.29	18.00	0.36	0.36
Lantana camara L.	28.51	2.28	1.72	21.34	1.76	0.43	11.43	0.58	0.29
Lantana salvifolia Jacq.	17.00	1.12	1.21	12.57	0.67	0.80	8.57	0.56	0.60
Nyctaginaceae									
Bougainvillea spectabilis Willd.	1.57	0.44	0.22	0.00	0.00	0.00	1.86	0.44	0.26
Loranthaceae									
Dendrophthoe falcata (L.f) Etting.	1.57	0.64	0.48	1.86	0.44	0.22	2.40	0.64	0.60
Viscum articulatum Burm. f.	14.49	1.04	1.13	10.29	0.48	0.96	8.57	0.72	0.60
Euphorbiaceae									
Euphorbia ligularia Roxb.	13.00	0.82	0.74	8.00	0.70	0.31	5.71	0.34	0.20
Euphorbia tirucalli L.	5.37	0.36	0.37	8.49	0.54	0.68	0.86	0.06	0.04
Jatropha curcas L.	7.29	0.39	0.49	4.57	0.32	0.96	2.51	0.13	0.32
Jatropha gossypifolia L.	6.17	0.43	0.59	6.40	0.99	0.38	2.29	0.19	0.32
Kirganelia reticulata (Poir.) Baill.	9.43	0.66	0.52	6.40	0.32	0.13	13.71	0.64	0.38
Ricinus communis L.	10.26	0.81	0.49	9.14	0.64	0.29	2.17	0.22	0.14
Securinega leucopyrus (Willd.) Mauell-Arg.	20.27	1.28	0.57	9.43	1.32	0.44	22.83	1.20	0.53

Ecological data of Shrubs species in Gir National Park and Sanctuary demonstrated that, in Gir Sanctuary West the dominant Shrubs species are- *Sesbania bispinosa* (Jacq.) W.F. Wight. (85.86%), *Barleria cuspidate* Heyne. ex. Ness. (30.20%), *Helicteres isora* L. (28.71%), *Lantana camara* L. (28.51%), *Calotropis gigantea* (L.) Ait. (24.74%), *Capparis decidua* (Forssk.) Edgew. (21.37%), *Zizyphus nummulaia* (Burm.f.) Wight & Arn. (20.91%), *Capparis sepiaria* L. (20.29%), *Securinega leucopyrus* (Willd.) Mauell-Arg. (20.27%), *Carissa congesta* Wight. (18.41%) and *Duranta repens* L. (18.00%).

In Gir Sanctuary East the dominant shrub species are – *Barleria cuspidate* Heyne. ex. Ness. (25.77%), *Mimosa hamata* Willd. (21.37%), *Lantana camara* L. (21.34%), Capparis sepiaria L. (20.43%), *Zizyphus nummulaia* (Burm.f.) Wight & Arn. (18.86%), *Carissa congesta* Wight. (18.86%) *Capparis decidua* (Forssk.) Edgew. (18.23%), *Cassia auriculata* L. (17.29%), *Maytenus senegalensis* (Lam.) Excell. (15.43%) and *Sesbania bispinosa* (Jacq.) W.F. Wight. (14.14%).

In Gir National Park the dominant shrub species are- *Barleria cuspidate* Heyne. ex. Ness. (24.00%), *Securinega leucopyrus* (Willd.) Mauell-Arg. (22.83%), *Capparis sepiaria* L. (22.29%), *Helicteres isora* L. (18.86%), *Carissa congesta* Wight. (18.86%), *Clerodendron multiflorum* (Burm.f.) O.Ktze. (18.00%), *Duranta repens* L.

(18.00%), Capparis *decidua* (Forssk.) Edgew. (17.14%), *Grewia hirsuta* Vah. (17.14%) and *Grewia tenex* (Forssk.) Fiori. (17.14%).

In Gir National Park and Sanctuary the dominant shrub species are - *Barleria cuspidate* Heyne. ex. Ness. (26.66%), *Capparis sepiaria* L. (21.00%), *Lantana camara* L. (20.43%), *Helicteres isora* L. (19.00%), Capparis *decidua* (Forssk.) Edgew. (18.91%), *Carissa congesta* Wight. (18.71%), *Securinega leucopyrus* (Willd.) Mauell-Arg. (17.51%), *Calotropis gigantea* (L.) Ait. (17.49%), *Duranta repens* L. (15.66%) and *Zizyphus nummulaia* (Burm.f.) Wight & Arn. (15.16%).

According to Pandey and Singh (1999) studies on the vegetation of Kumbhalgarh Wildlife Sanctuary the dominant Shrubs species are - *Annona squamosa, Capparis separia, Commiphora wightii, Grewia damine, Grewia tenax, Helicteres isora, Spermadictyon suaveolens* and *Dyerophytum indicum* which is very similar with the present study.

Berwick (1976) and Khan (1994) the dominant shrubs species are- *Capparis sepiaria, Lantana camara, Helicteres isora*, Capparis *decidua, Carissa congesta, Calotropis gigantea, Duranta repens* and *Zizyphus nummulaia* This results to some extent relates with the present study for some dominant shrubs.

Table-19: Ecological data of different herbs species in GNPS

Botanical Name	Sanctuary West			Sanctuary East			National Park		
	F	A	D	F	A	D	F	A	D
Nymphaeaceae									
Nymphaea nouchali Burm.	2.86	0.21	0.43	1.14	0.23	0.05	8.57	0.62	1.30
Papaveraceae									
Argemone mexicana L.	18.29	2.17	2.70	12.57	2.99	0.92	6.86	1.54	0.67
Brassicaceae									
Brassica juncea (L.) Czern & Cros.	3.69	0.38	0.62	6.86	0.74	1.18	1.83	0.19	0.31
Brassica nigra (L.) Koch.	2.57	0.26	0.42	4.57	0.48	0.61	1.43	0.14	0.23
Brassica oleracea var. *capitata* L.	1.54	0.10	0.19	3.60	0.22	0.39	0.51	0.03	0.07
Raphanus sativus L.	3.57	0.49	0.14	9.00	1.51	0.34	1.14	0.14	0.05
Cleomeceae									
Cleome burmanni Wight & Arn.	9.57	1.84	0.58	7.20	1.51	0.64	6.29	1.76	0.53
Cleome gynandra L.	8.89	2.36	0.97	8.00	1.40	0.67	13.20	3.52	1.06
Cleome simplicifolia (Camb.) Hook.f. & Thoms.	4.43	1.80	1.04	0.00	0.00	0.00	3.14	3.52	0.90
Cleome viscosa L.	8.57	3.44	2.05	11.13	5.76	3.20	17.23	6.00	3.36
Polygalaceae									
Polygala arvensis Willd.	7.57	0.92	1.80	6.43	0.72	1.08	5.14	1.08	0.72
Polygala erioptera DC.	8.63	1.58	0.94	9.00	1.26	0.90	5.91	1.44	0.36
Polygala persicariifolia DC.	9.00	1.30	0.63	6.86	0.61	0.26	8.49	2.23	1.08

Botanical Name	Sanctuary West			Sanctuary East			National Park		
	F	A	D	F	A	D	F	A	D
Portulacaceae									
Portulaca oleracea L.	5.94	0.44	0.30	7.20	0.36	0.72	2.57	0.12	0.10
Portulaca pilosa ssp. *grandiflora* (Hook.) Geesink.	2.91	1.24	0.47	3.60	1.58	0.43	1.20	0.26	0.13
Portulaca quadrifolia L.	3.83	0.26	0.46	4.63	0.36	1.08	1.54	0.10	0.02
Elatinaceae									
Bergia ammannioides Roxb. Ex Roth.	7.17	1.30	0.60	7.09	1.73	0.38	7.61	1.92	0.74
Bergia suffruticosa (Del.) Fenzl.	7.24	1.77	0.58	6.40	0.45	0.61	7.31	1.73	0.35
Malvaceae									
Abelmoschus esculentus (L.) Moench.	7.66	0.98	0.66	4.29	0.53	0.41	3.57	0.24	0.30
Abelmoschus manihot (L.) Medik.	8.91	0.49	0.43	0.57	0.40	0.08	15.71	0.79	0.92
Abutilon indicum (L.) Sweet.	6.78	3.44	1.46	7.23	4.03	3.20	2.63	1.28	0.48
Abutilon pannosum (forst. F.) Schlect.	5.26	0.39	0.21	5.14	0.54	0.25	1.71	0.12	0.10
Hibiscus lobatus (J. A. Murr.) O. Ktze	4.96	2.00	1.02	8.23	3.23	2.18	4.29	1.34	0.58
Hibiscus trionum L.	5.03	1.84	1.20	0.00	0.00	0.00	0.00	0.00	0.00
Pavonia zeylanica (L.) Cav.	2.08	0.32	0.11	4.11	0.64	0.35	6.23	0.48	0.19
Sida acuta Burm. f.	29.14	7.48	5.12	18.86	4.40	3.78	27.43	5.28	2.98
Sida alba L.	3.71	2.16	0.76	4.00	2.80	2.00	0.00	0.00	0.00
Sida cordata (Burm.f.) Borss.	4.00	2.88	1.68	3.43	1.64	1.44	0.00	0.00	0.00
Sida rhombifolia L.	13.43	3.32	2.64	6.29	0.88	0.26	7.71	1.44	1.15
Sida rhombifolia ssp *retusa* (L.) Borss.	14.29	2.12	2.49	6.29	0.84	0.04	4.00	0.28	0.08
Sida veronicifolia Lam.	21.71	4.56	4.14	12.00	2.80	2.41	18.00	3.60	2.95
Sterculiaceae									
Melochia corchorifolia L.	12.00	2.32	2.52	4.29	0.82	0.64	4.57	0.96	0.67
Waltheria indica L.	12.51	2.28	1.41	7.60	1.43	0.90	12.57	0.66	1.41
Tiliaceae									
Corchorus aestuans L.	96.57	3.24	1.86	5.14	0.72	0.11	24.00	3.98	2.21
Corchorus fascicularis L.	14.09	3.00	2.20	15.71	0.40	0.32	14.29	1.72	0.84
Corchorus olitorius L.	20.86	4.07	1.83	17.14	1.20	0.32	17.14	4.48	1.52
Grewia damine Gaertn.	0.00	0.00	0.00	5.71	3.60	2.40	0.00	0.00	0.00
Triumfetta malabarica Koen.	16.22	2.77	1.45	18.86	1.14	1.85	20.57	7.78	4.13
Triumfetta rhomboidea Jacq.	10.43	1.91	1.26	15.71	1.06	1.41	15.43	2.93	1.63
Zygophyllaceae									
Tribulus terrestris L.	21.43	4.56	3.58	25.71	6.84	5.04	3.43	0.24	0.05
Oxalidaceae									
Biophytum candolleanum Wight.	24.71	6.93	5.62	12.57	3.65	0.92	27.43	7.68	6.14
Oxalis corniculata L.	9.80	3.76	3.34	9.77	2.88	3.06	8.00	3.20	2.72
Balsaminaceae									
Impatiens balsamina var. *cocciinea* HK.f.	27.23	4.76	3.81	24.51	4.40	2.20	27.43	3.84	2.40
Impatiens balsamina var. *rosea* (L.) Hook.f.	23.48	6.51	5.30	15.43	4.32	3.67	20.78	5.57	5.06
Leeaceae									

Botanical Name	Sanctuary West			Sanctuary East			National Park		
	F	A	D	F	A	D	F	A	D
Leea asiatica (L.) Ridsd.	5.66	0.67	0.30	8.00	0.99	0.42	9.77	0.63	0.54
Fabaceae (Papilionaceae)									
Aeschynomene indica L.	11.06	0.84	0.89	6.00	1.01	0.34	7.20	0.24	0.48
Alysicarpus hamosus Edgew.	14.89	0.91	0.51	8.00	1.22	0.51	12.00	0.40	0.32
Alysicarpus longifolius (Rottl. ex. Spreng.) Wight & Arn.	19.43	2.02	2.10	15.71	0.57	1.36	20.57	3.26	3.46
Alysicarpus monilifer (L.) DC.	14.57	0.89	0.60	10.29	0.94	0.29	13.89	0.65	0.36
Alysicarpus vaginalis (L.) DC.	11.66	1.56	0.84	8.00	0.32	0.64	12.00	1.96	0.90
Arachis hypogaea L.	8.60	1.47	0.48	9.00	1.80	0.54	2.40	0.14	0.13
Atylosia scarabaeoides (L.) Bth.	11.60	1.60	2.40	7.14	2.16	1.28	0.00	0.00	0.00
Cicer arietinum L.	9.57	1.22	0.59	8.49	1.12	0.40	3.00	0.25	0.14
Clitoria biflora Dalz.	0.00	0.00	0.00	5.43	1.12	1.08	0.00	0.00	0.00
Crotalaria juncea L.	5.94	0.42	0.70	6.60	0.31	0.62	8.00	0.35	0.70
Crotalaria leptostachya Bth.	16.86	2.87	1.52	6.29	0.53	0.48	13.71	1.49	1.01
Crotalaria linifolia L.f.	12.29	2.81	1.32	10.29	1.30	0.76	12.86	3.20	1.30
Crotalaria medicaginea Lam.	32.43	8.74	5.81	24.29	6.00	5.20	27.43	7.78	4.90
Crotalaria nana Burm.f.	0.00	0.00	0.00	12.29	2.60	2.20	4.57	3.20	1.80
Crotalaria retusa L.	8.57	2.38	0.95	6.86	1.47	0.67	4.57	0.64	0.10
Desmodium dichotomum (Willd) DC.	16.57	3.32	1.74	10.29	1.30	0.76	20.57	2.74	2.21
Desmodium gangeticum (L.) DC.	11.14	2.43	1.04	14.14	2.02	0.97	14.14	2.02	0.97
Desmodium neomexicanum A.Greay.	9.80	3.76	3.34	9.77	2.88	3.06	8.00	3.20	2.72
Desmodium repandum (Vahl.) DC.	20.00	5.35	3.38	20.57	5.40	4.68	22.86	3.56	1.44
Desmodium rotundifolium Baker.	13.31	2.58	0.80	15.43	3.67	1.30	9.14	1.20	0.32
Desmodium triflorum (L.) DC.	9.14	1.48	0.20	4.57	0.96	0.35	8.57	1.04	0.16
Dolichos trilobus L.	9.80	3.76	3.34	0.00	0.00	0.00	8.00	3.20	2.72
Heylandia latebrosa (Heyne. Ex. Roth) Neens.	14.27	7.20	3.13	9.43	0.92	0.26	6.86	1.68	0.34
Indigofera tinctoria L.	15.14	2.99	0.98	5.71	1.20	0.80	20.57	4.27	1.73
Indigofera trita L. F.	14.27	7.20	3.13	9.43	0.92	0.26	6.86	1.68	0.34
Indigofera astragallina DC.	9.29	4.80	3.48	5.71	3.60	2.40	4.29	3.64	2.00
Indigofera cordifolia Heyne. ex. Both.	16.29	2.90	1.13	10.29	0.83	0.40	13.71	2.98	1.49
Indigofera karnatakana Sanj.	5.71	2.40	2.20	0.00	0.00	0.00	8.57	0.80	0.40
Indigofera linifolia Retz.	4.86	0.56	0.14	4.29	0.24	0.19	5.14	0.48	0.24
Indigofera oblongifolia Forssk.	0.00	0.00	0.00	11.43	3.60	2.40	3.54	3.40	1.80
Pseudarthria viscida (L.) Wight.& Arn.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Psoralea corylifolia Linn.	6.00	0.68	0.16	4.80	0.62	0.19	6.86	0.32	0.16
Pueraria lobata (Willd.) Sanj.	16.08	6.61	2.60	10.00	2.42	0.44	18.69	13.58	7.39
Rhynchosia minima var. *laxiflora* (Camb.) Baker.	4.57	1.60	0.64	0.00	0.00	0.00	4.57	0.76	0.52
Smithia conferta J. E. Sm.	6.71	1.64	0.48	8.00	1.40	0.48	5.71	0.80	0.40
Tephrosia pumilia (Lam) Pers.	10.00	3.48	0.66	2.86	0.44	0.12	2.00	0.50	0.03
Tephrosia purpurea (L.) Pers.	16.08	6.61	2.80	12.57	2.42	0.44	18.69	13.58	7.39
Tephrosia senticosa (L.) Pers.	14.27	7.20	3.13	9.43	0.92	0.26	6.86	1.68	0.34

Botanical Name	Sanctuary West			Sanctuary East			National Park		
	F	A	D	F	A	D	F	A	D
Tephrosia strigosa (Dalz.) Sant. & Mahesh.	9.35	0.53	0.66	10.39	0.84	0.24	7.20	0.39	0.56
Tephrosia tinctoria (L.) Pers.	15.95	3.89	2.46	11.00	0.44	0.48	18.69	9.65	5.38
Tephrosia villosa (Linn) Pers.	10.86	1.38	0.90	15.43	3.96	1.30	5.71	0.44	0.32
Trigonella foenum-graecum L.									
Zornia diphylla Auct.	13.00	1.74	0.62	11.00	0.70	0.66	6.86	1.54	0.29
Caesalpiniaceae									
Cassia absus L.	10.10	0.58	1.04	6.00	0.84	0.59	6.00	0.29	0.48
Cassia occidentalis L.	21.14	1.91	1.15	18.00	6.52	5.11	8.57	0.26	0.19
Cassia pumila Lam.	10.86	3.24	1.46	17.14	5.24	4.48	12.57	2.42	1.06
Cassia tora L.	32.52	5.64	5.03	15.71	4.22	1.58	30.86	6.34	6.29
Lythraceae									
Ammannia baccifera L.	6.14	0.74	0.44	2.57	0.34	0.22	2.57	0.36	0.07
Ammannia senegalensis Lam.	14.27	7.20	3.13	9.43	0.92	0.26	6.86	1.68	0.34
Ammannia tenuifolia L.	5.14	0.66	0.32	3.57	0.28	0.24	5.14	0.47	0.29
Rotala serpyllifolia (Roth) Bremek.	3.54	0.56	0.41	5.14	0.72	0.50	0.40	0.28	0.31
Onagraceae									
Ludwigia perennis Roxb.	4.29	0.84	1.12	5.71	1.60	1.60	1.43	0.20	0.18
Cucurbitaceae									
Cucumis sativus L.									
Aizoaceae									
Trianthema portulacastrum L.	8.90	3.10	1.65	7.27	3.36	2.49	14.14	4.68	2.16
Zaleya decandra Burm.f.	5.14	0.80	0.39	7.14	1.06	0.64	2.29	0.64	0.06
Molluginaceae									
Glinus lotoides L.	7.54	0.98	1.18	8.00	1.34	0.90	3.43	0.48	0.07
Mollugo nudicaulis Lam.	10.97	3.48	1.46	7.54	3.60	1.68	12.00	1.06	0.62
Mollugo oppositifolia L.	9.11	3.76	1.52	6.69	3.60	1.92	9.14	2.56	0.96
Apiaceae (Umbelliferae)									
Anethum graveolens L.									
Centella asiatica (L.) Urban.	14.27	7.20	3.13	9.43	0.92	0.26	6.86	1.68	0.34
Coriandrum sativum L.	11.97	1.76	1.00	11.31	1.04	0.54	4.29	0.20	0.23
Daucas carota L.									
Rubiaceae									
Borreria articularis (L. f.) F. N. Will.	11.41	0.57	1.20	7.00	0.28	1.12	9.26	0.47	0.72
Borreria stricta (L. f.) Schym.	16.41	9.57	5.19	2.60	0.40	0.07	10.29	1.30	0.76
Dentella repens (L) J. R. & G. Forst.	10.07	3.06	1.57	5.45	7.17	1.96	17.14	1.72	2.48
Oldenlandia corymbosa L.	11.07	4.46	2.54	8.31	10.24	3.90	6.23	2.95	2.45
Oldenlandia herbacea (L.) Roxb.	9.03	3.28	1.45	6.29	3.00	1.18	12.86	4.40	2.00
Asteraceae (Compositae)									
Acanthospermum hispidum DC.	15.82	7.65	3.19	4.67	3.78	0.68	13.31	7.76	3.62
Ageratum conyzoides L.	22.86	4.76	3.40	6.29	0.88	0.47	27.43	10.80	8.68

Botanical Name	Sanctuary West			Sanctuary East			National Park		
	F	A	D	F	A	D	F	A	D
Bidens bipinnata L.	14.27	7.20	3.13	9.43	0.92	0.26	6.86	1.68	0.34
Bidens biternata (Lour.) Merr. & Sherff.	19.80	2.69	2.32	10.00	0.45	0.42	12.86	3.16	3.12
Blainvillea acmella (L.) Philip.	23.81	7.68	5.97	12.57	0.70	0.26	11.42	1.25	0.38
Blumea fistulosa (Roxb.) Kurz.	13.90	2.44	1.32	4.00	0.90	0.22	9.32	5.38	2.52
Blumea membranacea DC.	23.81	7.68	5.97	12.57	0.70	0.26	11.42	1.25	0.38
Blumea mollis (D. Don.) Merr.	19.80	2.69	2.32	10.00	0.45	0.42	12.86	3.16	3.12
Cyathocline purpurea (Ham. Ex D. Don) O. Ktze.	13.90	2.44	1.32	4.00	0.90	0.22	9.32	5.38	2.52
Echinops echinatus Roxb.	8.61	0.55	0.23	9.14	0.67	0.16	6.14	0.22	0.16
Eclipta prostrata (L.) L.	16.24	5.21	3.10	16.07	5.72	3.56	21.43	9.96	7.44
Elephantopus scaber L.	16.04	5.65	3.41	8.57	3.98	2.98	14.17	4.80	2.56
Emilia sonchifolia (L.) DC.	13.69	4.28	2.17	14.29	7.44	1.44	5.71	1.12	0.29
Glossocardia bosvallea (L.f.) DC.	6.42	1.96	1.10	9.63	2.35	1.32	14.14	4.32	1.80
Goniocaulon indicum (Klein. Ex. Willd.) C.B.Cl.	9.85	3.40	1.98	3.86	1.80	0.18	5.71	2.64	1.78
Helianthus annuus L.	1.85	0.23	0.08	2.60	0.28	0.06	0.69	0.08	0.04
Lactuca runcinata DC.	12.86	1.03	0.52	10.00	0.78	0.39	12.86	0.97	0.47
Laggeara aurita (L.f.) Bth.ex C.B.Cl.	14.27	7.20	3.13	9.43	0.92	0.26	6.86	1.68	0.34
Launaea glomerata (Jaub. & Spach.) HK. f.	16.01	1.94	1.33	11.00	1.68	1.09	14.40	0.86	0.61
Launaea procumbens (Roxb.) Ramayya & Rajagopal.	13.00	1.17	0.80	13.89	0.50	0.54	8.00	0.76	0.50
Parthenium hysterophorus L.	9.39	0.92	0.26	9.71	0.68	0.24	4.00	1.26	0.25
Pulicaria angustifolia DC.	9.03	3.28	1.45	6.29	3.00	1.18	12.86	4.40	2.00
Sclerocarpus africanus Jacq.	17.22	2.19	1.72	9.63	2.38	1.58	13.00	1.57	1.18
Sonchus brachyotus DC.	18.71	3.49	2.03	11.00	2.24	1.96	25.00	2.72	1.44
Sphaeranthus senegalensis DC.	11.26	4.32	2.68	5.00	3.14	0.78	5.00	1.46	0.36
Spilanthus calva DC.	9.03	3.28	1.45	0.00	0.00	0.00	12.86	4.40	2.00
Synedrella nodiflora (L.) Gaertn.	13.00	1.17	0.80	13.89	0.50	0.54	8.00	0.76	0.50
Tricholepis amplexicaulis C. B. Cl.	10.35	1.11	0.48	6.29	0.88	0.43	5.71	0.70	0.51
Tridax procumbens L.	28.21	5.70	4.73	21.61	8.84	6.07	14.98	1.01	0.43
Vernonia anthelmintica (L.) Willd.	14.75	4.30	1.36	12.34	2.88	1.80	5.71	8.22	2.05
Vernonia cinerea (L.) Less.	18.39	1.19	0.69	13.73	3.30	2.02	17.14	0.53	0.51
Vicoa indica (L.) DC.	10.81	1.81	1.35	27.50	5.68	5.10	7.54	0.58	0.53
Xanthium indicum Koen.	26.62	7.53	6.15	19.03	0.68	0.44	17.14	4.80	4.16
Plumbaginaceae									
Plumbago zeylanica L.	15.22	1.13	0.64	9.14	1.28	0.54	7.99	0.96	0.43
Apocynaceae									
Catharanthus roseus (L.) G.Don.	20.26	2.94	2.54	13.71	1.60	2.08	13.71	1.60	1.76
Asclepiadaceae									
Tylophora dalzellii Hook.f.	9.03	3.28	1.45	0.00	0.00	0.00	8.26	2.16	1.44
Gentianaceae									
Canscora diffusa (Vahl.) R.Br.	13.13	1.47	0.66	12.57	1.76	0.79	7.99	0.58	0.26
Enicostemma hyssopifolium (Lam.) Willd.	26.75	6.71	4.50	19.29	4.68	3.24	16.00	4.98	3.44

Botanical Name	Sanctuary West			Sanctuary East			National Park		
	F	A	D	F	A	D	F	A	D
Exacum pedunculatum L.	19.09	4.67	3.57	14.00	1.68	1.40	14.85	6.17	5.35
Exacum petiolare Griseb.	5.71	1.17	0.80	0.00	0.00	0.00	9.14	1.44	0.76
Exacum pumilum Griseb.	11.60	1.42	0.66	11.37	1.04	0.76	0.00	0.00	0.00
Exacum tetragonum Roxb.	13.00	1.17	0.80	7.14	0.50	0.54	5.14	0.76	0.50
Hoppea dichotoma Heyne. ex. Willd.	5.95	0.83	0.36	7.00	1.12	0.42	9.14	1.28	0.58
Boraginaceae									
Coldenia procumbens L.	13.43	8.14	6.45	8.00	4.10	3.01	8.91	5.44	4.00
Heliotropium bacciferum Forsk.	1.71	0.19	0.07	2.57	0.34	0.12	0.57	0.06	0.02
Heliotropium ovalifolium Forssk.	7.49	0.43	0.47	10.40	0.78	0.59	2.86	0.12	0.19
Heliotropium paniculatum R.Br.	5.60	1.20	0.48	4.11	0.60	0.24	2.74	0.56	0.16
Heliotropium subulatum Hochst. ex DC.	15.20	1.70	0.85	12.86	1.80	0.90	5.71	0.26	0.13
Heliotropium supinum Linn.	15.71	0.95	0.72	16.71	0.36	0.54	9.29	0.48	0.42
Trichodesma inaequale Edgew.	25.71	0.99	0.58	15.43	0.72	0.43	20.00	1.12	0.80
Trichodesma indicum (L.) Lehm.	13.71	0.68	0.64	7.71	0.50	0.46	11.57	0.36	0.54
Convolvulaceae									
Argyreia sericea Dalz. & Gibs.	17.77	5.01	3.93	14.00	0.45	0.22	16.00	9.97	7.98
Convolvulus prostrates Forssk.	19.71	1.52	1.55	12.00	0.78	4.73	18.00	0.61	0.43
Convolvulus rottlerianus Choisy.	1.71	0.19	0.07	2.57	0.34	0.12	0.57	0.06	0.02
Evolvulus alsinoides (L.) L.	19.71	1.19	0.76	14.86	0.51	0.54	22.00	1.32	0.92
Evolvulus nummularius (L.) L.	146.86	12.93	7.93	6.00	1.01	0.34	18.86	12.10	7.26
Ipomoea aquatica Forssk.	6.00	1.56	0.64	0.00	0.00	0.00	1.94	0.60	0.26
Ipomoea sinensis (Des.V.) Choisy.	5.60	1.56	0.76	4.29	0.76	0.44	3.14	0.56	0.16
Merremia aegyptia (L.) Urb.	16.14	1.62	1.12	17.14	0.96	0.48	16.00	3.74	2.62
Merremia gangetica (L.) Cufod.	16.57	1.18	0.65	6.86	0.72	0.29	13.71	0.70	0.32
Solanaceae									
Capsicum annum L.	3.54	0.54	0.14	2.31	0.65	0.18	0.57	0.12	0.02
Datura innoxia Mill.	1.71	0.19	0.07	2.57	0.34	0.12	0.57	0.06	0.02
Datura metel L.	15.14	4.11	1.90	6.86	1.74	0.70	9.14	2.56	0.96
Lycopersicon lycopersicum (L.) Karsten.	8.77	2.36	0.92	11.06	2.52	1.08	2.40	0.64	0.16
Nicotiana plumbaginifolia Viv.	7.49	0.43	0.47	10.40	0.78	0.59	2.86	0.12	0.19
Physalis minima L.	17.31	1.28	1.10	5.71	1.04	0.44	18.86	0.96	0.86
Solanum anguivi Lam.	18.74	1.63	0.98	6.86	0.77	0.58	8.29	0.56	0.26
Solanum melongena Linn.	8.83	2.21	0.59	6.40	1.60	0.29	1.60	0.48	0.08
Solanum nigrum Linn.	8.00	2.00	0.76	10.29	1.08	0.74	6.00	1.46	0.42
Solanum virginianum L.	5.60	1.20	0.48	4.11	0.60	0.24	2.74	0.56	0.16
Withania sominifera (L.) Dunal.	3.54	0.54	0.14	0.00	0.00	0.00	0.57	0.12	0.02
Scrophulariaceae									
Bacopa monnieri (L.) Wettst.	25.14	6.28	3.56	12.57	6.07	1.36	24.00	5.62	3.94
Kickxia ramosissima (Wall.) Janch.	15.09	1.32	1.00	16.57	0.88	1.20	14.14	0.79	0.72
Limnophila heterophylla (Roxb.) Bth.	12.86	1.43	0.60	10.00	0.77	0.36	8.57	1.44	0.50

Botanical Name	Sanctuary West			Sanctuary East			National Park		
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Limnophila indica (L.) Druce.	6.00	1.56	0.64	0.00	0.00	0.00	1.94	0.60	0.26
Lindenbergia muraria (Roxb.) Bruhl.	13.06	2.60	1.68	6.71	0.60	0.30	0.86	1.68	0.84
Lindenbergia urticaefolia (Roxb. ex D. Don.) p. Bruehl.	14.07	0.77	0.50	12.00	0.84	0.48	12.00	0.59	0.48
Lindernia crustacean (L.) F. Muell.	13.36	1.53	0.86	10.00	1.96	1.06	11.43	5.60	2.80
Lindernia multiflora (Roxb.) Mukerjee.	0.00	0.00	0.00	6.00	1.56	0.64	1.94	0.60	0.26
Striga angustifolia (D. Don.) Saldhana.	6.00	1.56	0.64	0.00	0.00	0.00	1.94	0.60	0.26
Striga gesneroides (Willd.) Vatke.	5.05	0.52	0.38	6.00	0.56	0.31	0.80	0.04	0.06
Pedaliaceae									
Sesamum orientale L.	10.20	4.58	3.56	5.49	2.85	0.35	6.43	2.99	2.70
Martyniaceae									
Martynia annua Linn.	7.03	3.18	1.21	7.00	3.00	1.40	8.23	3.60	0.67
Acanthaceae									
Andrographis paniculata (Burm.f.) Wall. ex. Nees.	13.29	1.62	1.12	8.57	0.96	0.48	12.97	3.74	2.62
Barleria gibsoni Dalz.	0.00	0.00	0.00	6.00	0.56	0.31	0.00	0.00	0.00
Barleria prionitis Linn.	23.71	3.41	1.72	27.50	6.64	1.72	20.57	6.05	3.65
Blepharis maderaspatensis (L.) Roth.	19.14	2.78	2.65	7.71	1.44	0.79	25.14	11.66	9.33
Blepharis repens (Vahl.) Roth.	20.43	3.50	2.61	6.86	2.98	0.90	21.43	9.60	7.20
Dipteracanthus prostrata (Poir.) Ness.	13.29	3.40	0.55	11.43	2.62	0.58	11.00	1.96	0.31
Eclipta prostrata (L.) L.	16.00	1.53	0.86	7.14	1.96	1.06	10.29	5.60	2.80
Eranthemum roseum (Vahl.) R.Br.	15.94	4.08	1.07	5.14	1.82	0.55	15.43	3.60	0.72
Haplanthus verticillata (Roxb.) R. Br. Majumdar.	15.29	4.28	1.76	13.71	1.76	1.06	12.00	3.17	2.23
Hemiadelphus polyspermus (Roxb.) Nees.	10.00	1.53	0.86	7.37	1.96	1.06	10.29	5.60	2.80
Hemigraphis latebrosa (Heyne ex. Roth.) Ness.	12.74	3.29	1.39	16.71	2.88	0.36	6.00	2.17	1.51
Hygrophila schulli (Buch-Ham.) M. R. & S. M. Almeida.	18.43	5.00	2.93	2.86	0.44	0.22	11.00	3.08	1.68
Hygrophila serphyllum (Ness.) T.Anders.	8.54	2.32	1.42	7.14	1.60	0.60	12.00	3.84	2.69
Indoneesiella echioides (L). Sreem.	22.43	7.42	3.42	12.86	2.16	1.30	20.00	6.30	5.50
Justicia bitonica L.	8.57	3.18	1.21	4.29	3.00	1.40	8.86	3.60	0.67
Justicia latispica (C.B.Cl.) Gamble.	14.00	3.23	1.30	15.71	0.97	0.48	13.71	2.64	1.06
Justicia nagpurensis A. V. W. Grah.	17.14	6.38	3.52	6.29	6.38	1.28	17.14	12.84	7.72
Lepidagathis cristata Willd.	7.03	3.18	1.21	7.00	3.00	1.40	8.23	3.60	0.67
Lepidagathis cuspidate Ness.	4.16	2.05	2.40	3.94	2.88	1.68	4.60	0.59	2.80
Neuracanthus nervius Wight.	13.14	3.85	2.34	14.63	4.80	2.50	25.71	4.62	2.72
Neuracanthus sphaerostachys (Ness.) Dalz.	16.79	14.20	6.65	6.29	1.54	0.31	27.43	12.77	10.66
Peristrophe paniculata (Forssk.) Brummitt.	8.80	3.43	1.34	8.00	1.88	0.59	4.80	1.90	0.62
Rungia parviflora (Ret) Ness.	7.86	3.14	0.86	4.00	1.01	0.36	9.00	2.16	0.79
Rungia pectinata (Linn) Ness.	6.00	1.52	0.63	6.29	2.00	0.76	11.43	0.67	0.19
Verbenaceae									
Phyla nodiflora (L.) Greene.	10.14	3.51	1.20	6.43	1.01	0.65	10.29	0.45	0.18
Lamiaceae									
Anisomeles indica (L.) O.Kuntze.	9.14	1.71	1.00	9.14	1.79	1.12	5.71	0.72	0.36

Botanical Name	Sanctuary West			Sanctuary East			National Park		
	F	A	D	F	A	D	F	A	D
Anisomeles malabarica R.Br.ex Sims.	7.86	0.76	0.44	0.00	0.00	0.00	3.20	2.32	1.80
Leucas aspera (Willd.) Linn.	26.68	3.88	3.52	22.63	3.74	4.27	14.40	0.62	1.44
Leucas biflora R.Br.	21.09	2.96	2.03	21.43	2.28	1.72	21.43	3.84	2.90
Leucas cephalotes (Koenig. ex. Roth) Spreng.	11.26	1.20	0.71	141.43	0.94	0.47	16.46	1.20	1.03
Leucas zeylanica (L). R.Br.	3.33	1.60	0.53	5.03	0.96	0.26	7.61	5.76	1.92
Ocimum americanum L.	6.96	0.69	1.93	6.45	0.58	1.66	5.14	0.48	1.25
Ocimum basilicum Linn.	6.86	1.63	0.62	11.43	4.03	3.58	3.57	0.30	0.24
Ocimum tenuiflorum Linn.	4.29	2.16	0.64	3.40	2.32	0.56	0.00	0.00	0.00
Pogostemon benghalensis (Burm. f.) O. Ktze.	7.43	4.64	2.57	6.03	1.99	1.27	12.17	1.29	1.20
Nyctaginaceae									
Boerhaavia chinensis (L.) Druce.	7.19	0.82	1.20	7.14	0.90	0.72	8.32	0.95	0.39
Boerhaavia diffusa L.	7.37	3.93	1.34	8.57	0.62	0.31	7.13	0.82	0.34
Boerhaavia verticillata Poir.	15.09	4.36	1.53	15.54	4.80	1.92	3.57	0.40	0.12
Amaranthaceae									
Achyranthes aspera Linn.	21.86	5.83	4.02	7.86	2.33	0.57	18.00	5.40	2.88
Aerva javanica (Burm.f.) Juss.ex Schult.	7.43	4.64	2.57	3.29	1.99	1.27	11.51	1.29	1.20
Aerva lanata (L.) Juss.	20.86	4.38	3.56	13.71	3.14	0.48	20.57	3.84	3.36
Aerva sanguinolenta (L.) Bl.	8.23	1.28	0.57	5.00	1.20	0.30	5.71	0.72	0.32
Amaranthus cruentus L.	9.88	0.22	0.64	8.80	0.20	0.42	10.00	0.22	0.42
Amaranthus spinosus L.	10.79	0.32	0.41	4.29	0.80	0.30	2.29	0.28	0.03
Amaranthus viridis L.	25.61	0.18	0.72	17.14	0.20	0.60	78.57	0.14	0.30
Celosia argentea L.	16.42	2.71	2.02	2.86	0.60	0.42	9.51	1.09	0.72
Digera muricata (L.) Mart.	8.17	2.83	1.68	4.29	2.40	0.86	5.60	2.24	1.20
Nothosaerva brachiata (L.) Wt.	12.97	4.64	2.57	6.00	1.99	1.27	15.00	1.29	1.20
Pupalia lappacea (L.) A. L. Juss.	6.77	2.20	0.72	4.29	1.08	0.05	2.85	0.18	0.07
Polygonaceae									
Polygonum barbata (L.) Hara.	3.14	0.76	0.44	0.00	0.00	0.00	6.09	3.40	2.60
Polygonum glabrum Willd.	4.97	2.96	0.73	3.77	1.92	0.42	6.17	2.88	0.63
Polygonum plebeium R.Br.	6.54	2.52	0.79	8.00	2.24	0.84	12.86	2.16	1.15
Euphorbiaceae									
Acalypha ciliata Firsk.	11.21	1.77	0.50	8.57	4.34	0.77	7.13	0.62	0.29
Acalypha indica L.	19.27	3.16	1.82	15.71	7.96	1.41	26.18	6.03	5.02
Euphorbia geniculata Ort.	8.29	0.64	0.41	5.14	0.36	0.04	2.57	0.12	0.14
Euphorbia hirta Linn.	4.57	0.71	0.15	5.14	0.58	0.29	6.86	0.77	0.24
Euphorbia nivulia Buch-Ham.	4.43	0.92	0.23	3.43	0.72	0.17	3.43	0.64	0.26
Euphorbia parviflora L.	5.71	1.00	0.26	3.43	0.48	0.14	3.43	0.24	0.07
Euphorbia prostrata Ait.	11.39	0.94	0.40	10.00	1.20	0.36	11.31	0.86	0.43
Euphorbia thymifolia L.	8.29	1.09	0.50	13.71	2.56	1.02	5.00	0.48	0.28
Phyllanthus fraternus Webster.	11.61	0.84	0.40	7.71	0.52	0.26	14.65	1.32	0.92
Hydrocharitaceae									

Botanical Name	Sanctuary West			Sanctuary East			National Park		
	F	A	D	F	A	D	F	A	D
Hydrilla verticillata (L.f.) Royle.	3.26	1.12	0.86	0.00	0.00	0.00	0.00	0.00	0.00
Ottelia alismoides (L.) Pers.	4.00	0.52	0.11	0.40	0.28	0.20	6.29	0.88	0.04
Orchidaceae									
Nervilia aragoana Gaud.	2.47	1.13	0.98	0.00	0.00	0.00	12.37	5.66	4.92
Nervilia plicata (Andr.) Schltr.	2.43	1.02	0.65	0.00	0.00	0.00	8.14	3.48	2.22
Vanda tesselata L.	8.87	2.20	1.00	10.29	2.72	2.16	5.17	2.32	1.36
Zingiberaceae									
Curcuma inodora Blatt.	31.26	8.48	3.50	12.57	1.67	1.14	31.41	4.08	3.65
Musaceae									
Musa paradisiaca L.	18.29	1.86	1.74	5.14	0.36	0.07	9.14	1.76	0.96
Cannaceae									
Canna indica L.	20.36	1.66	1.81	12.86	3.24	1.08	6.43	1.00	0.31
Amaryllidaceae									
Crinum viviparum (Lam) R. Ansari & V.J. Nair.	20.14	2.11	1.60	13.71	2.24	0.64	14.29	3.20	1.07
Hypoxidaceae									
Curculigo orchioides Gaertn.	18.09	2.41	1.02	10.47	1.58	0.53	27.43	0.72	0.58
Agavaceae									
Agave americana L.	6.80	1.12	0.51	5.14	0.40	0.60	3.43	0.24	0.19
Liliaceae									
Allium cepa L.									
Aloe benghalensis L.									
Chlorophytum tuberosum (Roxb.) Baker.	28.18	4.00	2.79	12.57	2.64	0.88	24.00	12.00	8.40
Urginea indica (Roxb.) Kuntn.	19.41	1.15	0.76	14.65	1.23	0.57	12.40	0.50	0.48
Commelinaceae									
Commelina benghalensis L.	21.71	2.40	1.43	12.57	1.43	0.57	18.86	0.92	0.57
Commelina diffusa Burm.f.	14.57	1.86	1.74	6.57	0.76	0.38	0.00	0.00	0.00
Commelina erecta L.	13.14	1.86	1.74	10.00	0.56	0.25	7.17	1.76	0.96
Commelina forskalaei Vahl.	19.03	2.98	2.46	10.29	0.72	0.84	30.86	7.01	6.34
Commelina nudiflora L.	14.14	3.97	1.21	9.00	1.12	0.79	14.29	5.68	2.72
Commelina suffruticosa Bl.	17.10	1.86	1.74	4.16	0.36	0.07	6.29	1.76	0.96
Cyanotis cristata (L.) Schult.f.	14.00	6.96	1.74	14.00	6.16	1.40	14.00	6.72	1.68
Cyanotis fasciculata (Heyne ex.Roth.)Schult.f.	12.75	3.95	1.11	7.71	2.64	0.53	8.00	1.32	0.50
Murdannia semiteres (Dalz.) Santapau.	7.85	0.78	0.29	8.00	0.84	0.62	3.57	0.34	0.10
Typhaceae									
Typha angustata Bory & Chaub.	6.57	1.21	0.56	7.00	0.78	0.36	8.00	1.01	0.34
Araceae									
Amorphophallus commutatus Engl.	7.57	2.72	1.52	0.00	0.00	0.00	0.00	0.00	0.00
Colocasia esculenta (L.) Schott.	6.86	0.77	0.36	6.86	0.86	0.62	4.00	0.42	0.14
Eriocaulaceae									
Eriocaulon sollyanum Royle.	9.71	1.24	0.54	10.00	1.57	0.84	6.86	0.86	0.50

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Eriocaulon truncatum Buch-Ham.	10.74	1.38	1.00	12.00	1.34	0.92	7.60	0.62	0.34
Cyperaceae									
Cyperus alulatus Kern.	7.43	0.87	0.38	6.86	0.62	0.46	4.00	0.45	0.25
Cyperus compressus L.	11.43	1.48	1.01	13.71	1.47	1.25	9.14	1.15	0.67
Cyperus triceps (Rottb.) Endl.	12.00	1.62	1.25	7.71	2.09	1.66	11.43	1.92	1.47

The ecological data for Herbs in Gir National Park and Sanctuary demonstrated that, in Gir Sanctuary West the dominant Herbs are – *Corchorus aestuans* L. (96.57%), *Evolvulus nummularius* (L.) L. (46.86%), *Cassia tora* L. (32.52%), *Crotalaria medicaginea* Lam. (32.43%), *Curcuma inodora* Blatt. (31.26%), *Sida acuta* Burm.f. (29.14%), *Tridax procumbens* L. (28.21%), *Chlorophytum tuberosum* (Roxb.) Baker. (28.18%), *Impatiens balsamina* L. var. *cocciinea* Hk.f. (27.23%) and *Enicostemma hyssopifolium* (Lam.) Willd. (26.75%).

In Gir Sanctuary East the dominant Herbs species are – *Leucas cephalotes* (Koenig. ex. Roth.) Spreng. (41.43%), *Barleria prionitis* Linn. (27.50%), *Vicoa indica* (L.) DC. (27.50%), *Tribulus terrestris* L. (25.71%), *Impatiens balsamina* L. var. *cocciinea* Hk.f. (24.51%), *Crotalaria medicaginea* Lam. (24.29%), *Leucas aspera* (Willd.) Linn. (22.63%), *Tridax procumbens* L. (21.61%), *Leucas biflora* R. Br. (21.43%) and *Desmodium repandum* (Vahl.) DC. (20.57%).

In Gir National Park the dominant Herbs species are – *Amaranthus viridis* L. (78.57%), *Curcuma inodora* Blatt. (31.41%), *Cassia tora* L. (30.86%), *Commelina forskalaei* Vahl. (30.86%), *Sida acuta* Burm.f. (27.43%), *Biophytum candolleanum* Wight. (27.43%), *Impatiens balsamina* L. var. *cocciinea* Hk.f. (27.43%), *Crotalaria medicaginea* Lam. (27.43%), *Ageratum conyzoides* L. (27.43%), *Neuracanthus sphaerostachys* (Ness.) Dalz. (27.43%) and *Curculigo orchioides* Gaertn. (27.43%).

In Gir National Park and Sanctuary the dominant Herbs species are – *Pavonia zeylanica* (L.) Cav. (75.43%), *Evolvulus nummularius* (L.) L. (57.24%), *Leucas cephalotes* (Koenig. ex. Roth.) Spreng. (56.38%), *Crotalaria medicaginea* Lam. (28.05%), *Impatiens balsamina* L. var. *cocciinea* Hk.f. (26.39%), *Cassia tora* L. (26.36%), *Curcuma inodora* Blatt. (25.08%), *Barleria prionitis* Linn. (23.93%), *Biophytum candolleanum* Wight. (21.57%) and *Desmodium repandum* (Vahl.) DC. (21.14%).

According ot Verma et al (2001) the dominant species are - *Oplismenus burmannii* (70%), *Sida acuta* (70%), *Evolvulus nummularius* (100%), *Desmodium triflorum* (70%), *Rungia pectinata* (60%), *Sida cordata* (70%), and *Hyptis suaveolens* (50%).

Pandey and Singh (1999) studied on Kumbalgarh Wildlife Sanctuary in Rajasthan the ground flora and noted - *Abutilon racemosum, Acanthospermum hispidum, Anisomeles indica, Barleria prionitis, Bidens biternata, Blainvillea acmella, Boerhavia diffusa, Cassia absus, Crotolaria hirsute, Didiptera verticillata, Evolvulus alsinoides, Indigofera cordifolia, Leueas cephalotes, Plambago Zeylanica, Sida cordata,* and *Tephrosia purpurea* as the major herbaceous forms.

Earlier, Khan (1994) and Berwick (1976) worked on Gir forest and reported – *Evolvulus nummularius, Leucas cephalotes, Impatiens balsamina* var. *cocciinea, Pavonia zeylanica, Crotalaria medicaginea, Cassia tora, Curcuma inodora, Barleria prionitis,* Biophytum *candolleanum* and *Desmodium repandum* as the major herbs.

Table-20: Ecological data of different climbers species in GNPS

Botanical Name	Sanctuary West			Sanctuary East			National Park		
	F	A	D	F	A	D	F	A	D
Menispermaceae									
Cissampelos pareira L.	18.37	5.25	0.88	15.54	3.84	0.58	14.00	3.92	0.50
Cocculus hirsutus (L.) Theob.	31.94	8.16	3.16	21.37	5.81	4.97	27.43	7.20	5.38
Cocculus pendulus (J.R. & G. Forst.) Diels.	23.23	4.38	1.91	8.36	0.75	0.18	28.15	3.84	1.54
Cyclea peltata (Lam.) Hook. f. & Thoms.	6.20	0.77	0.59	8.91	0.70	0.79	2.86	0.23	0.18
Tinospora cordifolia (Willd.) Miers ex Hook. and Thoms.	15.43	1.99	1.14	10.29	0.79	3.24	4.57	0.35	0.06
Capparidaceae									
Maerua oblongifolia (Forssk) A.Rich.	16.57	7.88	5.42	6.00	0.87	0.17	3.71	1.76	1.20
Malpighiaceae									
Hiptage benghalensis (L.) Kurz.	4.57	0.96	0.46	5.71	1.12	0.48	9.14	1.79	1.02
Celastraceae									
Celastrus paniculata Willd.	24.47	4.89	1.91	13.31	1.12	0.64	18.86	2.99	2.02
Rhamnaceae									
Zizyphus oenoplia (L.) Mill.	16.76	2.76	1.55	11.42	3.53	0.38	5.14	1.44	0.07
Vitaceae									
Ampelocissus latifolia (Roxb.) Planch.	8.00	1.16	0.58	6.86	0.67	0.74	8.00	0.64	0.28
Cayratia auriculata (Roxb.) Gamble.	10.86	1.30	0.57	8.00	0.95	0.39	10.00	1.68	0.90
Cayratia carnosa (Lam.) Gagnep.	10.00	1.81	0.98	5.14	1.01	0.50	6.86	1.32	0.53
Cissus repanda Vahl.	21.14	4.76	2.70	14.29	1.84	1.28	24.00	7.68	4.51
Sapindaceae									
Cardiospermum halicocabum L.	17.43	3.64	2.82	20.57	5.47	4.03	4.57	0.32	0.06
Fabaceae (Papilionaceae)									
Abrus precatorius L.	31.14	11.97	8.27	12.57	1.76	0.70	27.43	14.69	8.93
Butea superba Roxb.	13.14	1.01	0.66	9.14	1.15	0.70	11.14	0.62	0.58
Canavalia gladiata (Jacq.) DC.	9.83	0.67	0.34	8.80	0.95	0.42	10.00	0.70	0.35
Clitoria ternatea L.	9.95	0.69	0.46	11.60	0.78	0.50	11.66	0.70	0.50
Lablab purpureus (L.) Sweet.	13.58	1.96	0.74	20.06	1.80	0.72	3.81	0.64	0.34
Mucuna prurita Hook.	17.86	4.38	2.52	12.86	0.90	0.43	25.71	7.82	3.26

Phaseolus radiatus L.	11.46	2.12	1.15	11.89	2.24	1.04	3.31	0.40	0.18
Pueraria thunbergiana Benth.	10.00	4.00	0.93	6.86	0.86	0.53	14.14	6.48	1.44
Pueraria tuberosa (Roxb. ex. Willd.) DC.	10.14	3.78	1.78	7.00	1.40	1.96	6.86	3.17	1.01
Rhynchosia minima (L.) DC.	10.71	2.19	0.86	7.43	1.31	0.21	8.57	1.92	0.86
Rhynchosia rothii Benth. ex. Ait.	5.71	0.86	0.42	0.00	0.00	0.00	0.57	0.12	0.01
Teramnus labialis (L.f.) Spreng.	5.71	0.62	0.22	5.71	0.32	0.06	4.00	0.42	0.08
Vigna radiate (L.) R.Wilczek.									
Vigna trilobata (L.) Verdcourt.	17.94	1.22	0.83	17.49	1.94	1.26	4.00	0.19	0.11
Caesalpiniaceae									
Caesalpinia bonduc (L.) Roxb.	6.63	0.48	0.32	6.66	0.43	0.24	0.00	0.00	0.00
Mimosaceae									
Acacia pennata (L.) Willd.	31.90	12.76	6.64	20.93	2.58	1.72	27.43	6.05	1.73
Combretaceae									
Combretum albidum G. Don.	18.57	1.87	1.19	8.00	0.59	0.08	20.00	3.56	2.52
Quisqualis indica L.	14.00	0.79	0.51	7.31	0.30	0.08	7.43	0.30	0.22
Passifloraceae									
Passifiora edulis Sims.	7.57	1.08	0.76	5.14	0.30	0.27	2.57	0.18	0.17
Cucurbitaceae									
Cetenolepis cerasiformis (stocks.) HK.	10.26	1.48	0.56	5.71	0.64	0.24	7.20	0.58	0.40
Citrullus colocynthis (L.) Schrad.	5.86	1.21	0.52	7.09	1.79	0.61	1.43	0.21	0.12
Coccinia grandis (L.) Voigt.	3.66	0.59	0.26	2.57	0.36	0.22	3.00	0.42	0.25
Corallocarpus conocarpus (Dalz. &Gibs.)Hook.f.	0.00	0.00	0.00	2.80	0.53	0.14	0.00	0.00	0.00
Corallocarpus epigaeus (Rottl.) C.B.Cl.	7.09	1.57	0.85	5.66	0.58	0.54	3.77	0.62	0.34
Diplocyclos palmatus (L.) Jeffrey.	9.20	0.48	0.18	10.29	0.58	0.11	3.43	0.14	0.06
Luffa acutangula (L.) Roxb.	7.57	1.03	0.72	9.00	0.58	0.83	3.43	0.43	0.25
Luffa echinata Roxb.	8.41	0.79	0.41	8.57	2.16	1.26	4.76	0.29	0.12
Melothria maderaspatana Cogn.	5.14	0.48	0.07	3.77	0.24	0.19	4.29	0.40	0.06
Momordica charantia L.	8.86	1.38	0.27	9.00	6.84	0.18	4.63	0.27	0.08
Momordica dioica Roxb. ex Willd.	7.43	0.47	0.23	9.14	0.26	0.08	4.00	0.14	0.03
Trichosanthes cucumerina L.	3.71	0.31	0.03	4.29	0.80	0.46	3.43	0.35	0.03
Oleaceae									
Jasminum azoricum L.	2.91	0.29	0.06	1.71	0.24	0.02	0.69	0.06	0.04
Jasminum multiflorum (Burm.f.) Andr.	17.29	0.70	0.56	13.71	0.32	0.58	6.86	0.16	0.19
Asclepiadaceae									
Ceropegia bulbosa Roxb.	19.31	1.88	0.99	20.74	0.79	0.13	20.57	6.14	3.70
Holostemma annulare (Roxb.) K.Schum.	2.57	0.34	0.22	11.43	1.84	1.28	2.57	0.26	0.14
Leptadenia pyrotechnica (Forsk.) Decne.	6.86	0.81	0.56	10.00	1.01	0.59	7.00	0.56	0.28
Leptadenia reticulata (Retz.) Wight & Arn.	8.57	0.91	0.61	9.00	0.56	0.28	8.57	0.86	0.50
Marsdenia tenacissima (Roxb.) Moon.	8.57	1.21	0.52	8.43	1.79	0.61	4.29	2.32	0.76
Pergularia daemia (Forsk.) Chiov.	17.69	0.82	0.70	10.63	0.31	0.29	17.14	0.48	0.40
Telosma pallida (Roxb.) Craib.	11.43	0.72	0.58	18.29	1.86	1.15	12.00	1.06	0.84
Periplocaceae									
Hemidesmus indicus (L.) Schult.	26.27	3.68	0.99	15.71	1.10	0.55	30.86	2.78	1.87
Convolvulaceae									
Ipomoea coptica (L.) Roth. ex R. & S.	15.17	2.28	0.45	13.20	1.96	0.45	7.86	1.00	0.24

Ipomoea dichroa (R. & S.) Choisy.	9.29	1.48	0.26	10.97	1.60	0.29	9.14	0.96	0.22
Ipomoea muricata (L.) Jacq.	7.29	0.36	0.22	9.43	0.24	0.26	8.57	0.24	0.26
Ipomoea nil Linn.	10.97	0.88	0.35	8.91	0.32	0.06	10.29	0.48	0.38
Ipomoea pes-tigridis Linn.	8.00	0.54	1.07	6.29	0.70	2.20	4.00	0.28	0.56
Ipomoea quamoclit Linn.	13.83	1.03	1.09	7.54	0.36	0.41	6.86	0.60	0.60
Rivea hypocrateriformis Choisy.	5.43	0.94	0.66	5.00	0.32	0.54	7.14	1.26	0.86
Cuscutaceae									
Cuscuta chinensis Lam.	7.86	1.06	0.52	8.57	0.91	0.29	2.86	0.36	0.16
Cuscuta reflexa Roxb.	6.00	0.64	0.24	7.43	0.48	0.16	0.00	0.00	0.00
Polygonaceae									
Antigonum leptopus Hook. & Arn.									
Euphorbiaceae									
Dalechampia scandens var. *cordofona* (Hochst. ex A. Rich.) Muell-Arg.	4.57	1.00	0.44	3.71	0.80	0.46	4.42	0.45	0.38
Dioscoreaceae									
Dioscorea bulbifera Linn.	21.28	3.96	2.07	9.43	1.89	0.92	19.99	5.95	3.48
Dioscorea daemona Roxb.	11.42	1.27	0.72	8.33	1.01	0.42	19.03	1.12	0.56
Dioscorea hispida Dennst.	7.26	0.91	0.61	8.26	1.16	0.72	6.03	1.16	0.76
Dioscorea pentaphylla L.	4.17	14.72	1.68	14.29	1.16	0.52	13.07	2.64	3.17
Dioscorea wallichii Hook.f.	0.00	0.00	0.00	0.00	0.00	0.00	7.31	2.17	1.04
Liliaceae									
Asparagus gonoclados Baker.	17.61	5.12	2.99	13.71	1.73	0.72	11.66	7.50	4.37
Asparagus racemosus Willd.	24.86	9.67	7.12	23.57	1.45	1.14	13.71	1.44	0.58
Gloriosa superba L.	7.05	1.49	0.62	8.00	1.01	0.81	4.57	0.96	0.32

The ecological data of Climber species in Gir National Park and Sanctuary demonstrated that, in Gir Sanctuary West the dominant Climber species (Table-20) are – *Cocculus hirsutus* (L.) Theob. (31.94%), *Acacia pennata* (L.) Willd. (31.90%), *Abrus precatorius* L. (31.14%), *Hemidesmus indicus* (L.) Schult. (26.27%), *Asparagus racemosus* Willd. (24.86%), *Celastrus paniculata* Willd. (24.47%), *Cocculus pendulus* (J.R. & G. Forst.) Diels. (23.23%), *Dioscorea bulbifera* Linn. (21.28%), *Cissus repanda* Vahl. (21.14%) and *Ceropegia bulbosa* Roxb. (19.31%).

In Gir Sanctuary East, the dominant Climber species (Table-20) are – *Asparagus racemosus* Willd. (23.57%), *Cocculus hirsutus* (L.) Theob. (21.37%), *Acacia pennata* (L.) Willd. (20.93%), *Ceropegia bulbosa* Roxb. (20.74%), *Cardiospermum halicocabum* L. (20.57%), *Lablab purpureus* (L.) Sweet. (20.06%), *Telosma pallida* (Roxb.) Craib. (18.29%), *Vigna trilobata* (L.) Verdcourt. (17.49%) and *Cissampelos pareira* L. (15.54%).

In Gir National Park (Table-20) the dominant Climber species are - *Hemidesmus indicus* (L.) Schult. (30.86%), *Cocculus pendulus* (J.R. & G. Forst.) Diels. (28.15%), *Cocculus hirsutus* (L.) Theob. (27.43%), *Abrus precatorius* L. (27.43%), *Acacia pennata* (L.) Willd. (27.43%), *Mucuna prurita* Hook. (25.71%), *Cissus repanda* Vahl.

(24.00%), *Ceropegia bulbosa* Roxb. (20.57%), *Combretum albidum* G. Don. (20.00%) and *Dioscorea bulbifera* Linn. (19.99%).

In Gir National Park and Sanctuary the dominant Climber species are - *Cocculus hirsutus* (L.) Theob. (80.74%), *Acacia pennata* (L.) Willd. (80.26%), *Hemidesmus indicus* (L.) Schult. (72.84%), *Abrus precatorius* L. (71.14%), *Asparagus racemosus* Willd. (62.14%), *Ceropegia bulbosa* Roxb. (60.63%), *Cocculus pendulus* (J.R. & G. Forst.) Diels. (59.73%), *Cissus repanda* Vahl. (59.43%), *Celastrus paniculata* Willd. (56.65%) and *Mucuna prurita* Hook. (56.43%).

Pandey and Singh (1999) in Kumbhalgarh Wildlife Sanctuary, Rajasthan encountered common climbers as - *Abrus precatorius, Ampelocissus latifolia, Asparagus racemosus, Cissampelos pareira, Cocculus hirsutus, Gloriosa superba, Leptadenia reticulata* and *Rivea hypocrateriformia* were found.

Table-21: Ecological data of different grasses species in GNPS

Botanical Name	Sanctuary West			Sanctuary East			National Park		
	F	A	D	F	A	D	F	A	D
Poaceae									
Alloteropsis cimicina (L.) Stapf.	7.49	0.96	0.43	8.40	0.64	0.28	5.71	0.48	0.40
Andropogon pumilus Roxb.	19.71	1.48	2.01	12.00	0.90	0.62	11.43	0.70	0.35
Apluda mutica Linn.	17.14	3.22	1.59	18.86	4.05	0.88	20.57	3.94	1.44
Aristida adscensionis L.	25.71	4.24	1.29	11.43	1.15	0.67	22.00	3.74	1.14
Arundinella pumila (Hochst.) Steud.	9.43	1.39	0.69	17.29	2.42	1.41	6.86	0.70	0.42
Bambusa arundinacea Willd.									
Cenchrus ciliaris L.	17.43	3.32	1.64	18.29	3.10	1.15	15.71	2.99	1.54
Chloris barbata Sw.	27.14	9.38	3.61	25.14	5.41	3.70	27.43	7.34	3.31
Chloris dolichostachya Lagasca.	27.43	3.76	1.88	18.86	1.58	0.53	20.57	3.07	2.45
Coix gigantean Koen.	10.86	0.90	0.41	5.71	0.70	0.44	12.57	1.41	0.92
Cymbopogon martinii (Roxb.) Wats.	8.57	0.96	0.43	3.37	0.64	0.28	8.09	0.48	0.40
Cynodon dactylon Pers.	16.86	1.41	0.60	13.71	2.08	0.83	13.71	1.15	0.48
Dactyloctenium aegyptium (L.) P.Beauv.	9.86	1.16	0.64	10.09	1.00	0.44	7.43	0.48	0.40
Dactyloctnium sindicum Boiss.	14.57	1.16	0.50	16.00	1.25	0.51	6.00	0.64	0.36
Dendrocalamus strictus (Roxb.) Ness.	15.57	1.32	0.32	18.00	2.59	0.36	18.57	3.00	0.40
Dimeria orinthopoda Trin.	27.71	4.78	2.98	22.00	2.24	1.58	20.57	4.61	2.69
Dinebra retroflexa (Vahl.) Panz.	11.14	0.75	0.47	8.00	0.59	0.42	10.00	0.87	0.59
Echinochloa colonum (L.) Link.	12.46	0.92	0.49	23.73	4.22	2.82	12.71	0.96	0.67
Eragrostis ciliaris Link.	28.63	5.78	3.33	22.16	4.22	1.28	24.17	7.78	5.38
Eragrostis japonica (Thunb.) Trin.	23.45	2.82	1.54	25.30	2.60	0.57	27.43	1.68	0.91
Heteropogon contorutus (L.) P.Beauv.ex. R. & S.	31.00	9.06	1.98	23.73	3.04	1.58	27.43	7.49	1.73

Botanical Name	Sanctuary West			Sanctuary East			National Park		
	F	A	D	F	A	D	F	A	D
Oplismenus burmannii (Retz.) P.Beauv.	52.57	1.80	0.79	12.00	1.65	1.15	85.71	0.94	0.36
Oryza sativa L.	5.43	0.94	0.48	25.71	6.76	3.88	1.14	0.12	0.04
Paspalidium flavidum (Retz.) A.	12.29	1.19	0.40	9.43	0.84	0.35	10.29	0.43	0.29
Pennisetum americanum (L.) K. Schum.	13.71	1.31	0.89	25.71	6.76	3.88	4.29	0.20	0.15
Saccharum officinarum L.	8.00	0.54	1.07	6.29	0.70	2.20	0.00	0.00	0.00
Saccharum spontaneum L.	13.43	2.06	1.02	18.00	4.43	2.02	2.86	0.15	0.20
Sorghum bicolour Moench.									
Sorghum halepense (L.) Pers.	22.57	3.19	1.37	8.00	0.84	0.45	24.00	4.51	2.06
Themeda cymbaria Hack.	32.29	6.11	7.79	25.14	5.41	2.95	27.43	8.06	5.90
Triticum aestivum L.									
Zea mays L.	18.43	4.80	3.50	20.57	5.04	2.88	4.46	1.12	0.64

The ecological data of Grasses in Gir National Park and Sanctuary demonstrated that in Gir Sanctuary West the dominant Grass species are – *Oplismenus burmannii* (Retz.) P. Beauv. (52.57%), *Themeda cymbaria* Hack. (32.29%), *Heteropogon contorutus* (L.) P. Beauv. ex. R. & S. (31.00%), *Eragrostis ciliaris* Link. (28.63%), *Dimeria orinthopoda* Trin. (27.71%), *Chloris dolichostachya* Lagasca. (27.43%), *Chloris barbata* Sw. (27.14%), *Aristida adscensionis* L. (25.71%), *Eragrostis japonica* (Thunb.) Trin. (23.45%) and *Sorghum halepense* (L.) Pers. (22.57%).

In Gir Sanctuary East the dominant Grass species are – *Oryza sativa* L. (25.71%), *Pennisetum americanum* (L.) K. Schum. (25.71%), *Eragrostis japonica* (Thunb.) Trin. (25.30%), *Chloris barbata* Sw. (25.14%), *Themeda cymbaria* Hack. (25.14%), *Echinochloa colonum* (L.) Link. (23.73%), *Heteropogon contorutus* (L.) P. Beauv. ex. R. & S. (23.73%), *Eragrostis ciliaris* Link. (22.16%), *Dimeria orinthopoda* Trin. (22.00%) and *Zea mays* L. (20.57%).

In Gir National Park the dominant Grass species are – *Oplismenus burmannii* (Retz.) P. Beauv. (85.71%), *Chloris barbata* Sw. (27.43%), *Eragrostis japonica* (Thunb.) Trin. (27.43%), *Heteropogon contorutus* (L.) P. Beauv. ex. R. & S. (27.43%), *Themeda cymbaria* Hack. (27.43%), *Eragrostis ciliaris* Link. (24.17%), *Sorghum halepense* (L.) Pers. (24.00%), *Aristida adscensionis* L. (22.00%), *Apluda mutica* Linn. (20.57%), *Chloris dolichostachya* Lagasca. (20.57%) and *Dimeria orinthopoda* Trin. (20.57%).

In Gir National Park and Sanctuary the dominant Grass species are - *Themeda cymbaria* Hack. (84.86%), *Heteropogon contorutus* (L.) P. Beauv. ex. R. & S. (82.16%), *Chloris barbata* Sw. (79.71%), *Eragrostis japonica* (Thunb.) Trin. (76.18%), *Eragrostis ciliaris* Link. (74.96%), *Dimeria orinthopoda* Trin. (70.29%), *Chloris*

dolichostachya Lagasca. (66.86%), *Aristida adscensionis* L. (59.14%), *Apluda mutica* Linn. (56.57%) and *Sorghum halepense* (L.) Pers. (54.57%).

Pandey and Singh (1999) studied the Kumbhalgarh Wildlife Sanctuary, Rajasthan and Encountered the dominant grass species are - Apluda mutica, Acrachne racemosa, Aristida adscensionis, Brachiaria ramose, Cymbopogon martini, Dichanthium annulatum, Digitaria ciliaris, Iseilema prostratum, Perotis hordeiformis and Tetrapogon tenellus.

Table-22: Diversity indices in various zones of GNPS

Zone No.	Zone	Shanon Wiever	Shimpsons D	Species Number	Margalef D	Equitability J	Berger Parker Dominance Index	McIntosh	Brillouin	Fisher Alpha	Q Static	Diversity Ordering
1	Devalia	1.387	0.001	3.349	5	0.695	0.862	0.464	0.478	1.353	0.843	2.671
2	Suraj Gadh	1.292	0.002	2.848	5	0.686	0.803	0.541	0.429	1.261	0.831	3.498
3	Raidi	1.344	0.001	3.124	5	0.663	0.835	0.498	0.455	1.317	0.800	3.098
4	Dhudhala	1.310	0.001	2.923	5	0.670	0.814	0.531	0.436	1.282	0.810	3.726
5	Alawani	1.240	0.002	2.669	5	0.690	0.770	0.564	0.409	1.209	0.838	1.876
6	Sasan	1.376	0.001	3.362	5	0.644	0.855	0.443	0.475	1.353	0.773	2.055
7	Amla	1.269	0.002	2.823	5	0.687	0.789	0.534	0.426	1.238	0.832	1.821
8	Barwania	1.253	0.002	2.681	5	0.672	0.779	0.566	0.409	1.225	0.812	3.456
9	Kasagola	1.272	0.002	2.762	5	0.683	0.790	0.553	0.419	1.242	0.826	2.701
10	Khokhara	1.343	0.001	3.127	5	0.657	0.835	0.493	0.455	1.318	0.791	2.428
11	Kansoria	1.316	0.001	2.980	5	0.662	0.818	0.517	0.441	1.290	0.798	2.537
12	Vankidas	1.230	0.002	2.664	5	0.701	0.764	0.560	0.409	1.196	0.853	1.743
13	Kankai	1.350	0.001	3.196	5	0.680	0.839	0.478	0.463	1.320	0.822	2.415
14	Rampari	1.257	0.002	2.732	5	0.693	0.781	0.553	0.417	1.225	0.842	2.007
15	Kachigadh	1.233	0.002	2.600	5	0.689	0.766	0.578	0.400	1.201	0.836	2.441
16	Malpara	1.314	0.002	2.946	5	0.673	0.816	0.528	0.438	1.285	0.814	3.274
17	Sapnes	1.331	0.002	3.087	5	0.693	0.827	0.497	0.454	1.298	0.842	2.249
18	Chhodavadi	1.327	0.002	3.062	5	0.692	0.824	0.502	0.452	1.294	0.840	2.118
19	Khodiyar	1.234	0.002	2.674	5	0.691	0.767	0.556	0.410	1.203	0.839	1.615
20	Janwadla	1.267	0.002	2.786	5	0.694	0.787	0.544	0.423	1.235	0.843	2.007
21	Rasulgadh	1.331	0.001	3.054	5	0.668	0.827	0.506	0.449	1.303	0.807	2.740
22	Jamwala	1.284	0.002	2.855	5	0.676	0.798	0.535	0.429	1.255	0.818	2.721
24	Babaria	1.338	0.001	3.078	5	0.660	0.831	0.505	0.450	1.312	0.795	2.984
25	Banej	1.315	0.001	3.026	5	0.678	0.817	0.501	0.447	1.285	0.820	2.339
26	Bismal	1.293	0.002	2.893	5	0.686	0.803	0.527	0.434	1.262	0.834	2.425
27	Vanrajambu	1.276	0.002	2.828	5	0.692	0.793	0.536	0.427	1.244	0.840	1.868
28	Shemardi	1.348	0.001	3.128	5	0.668	0.838	0.499	0.456	1.320	0.807	3.417
29	Hadala	1.358	0.001	3.184	5	0.682	0.844	0.489	0.462	1.328	0.825	2.940
30	Kardapan	1.272	0.002	2.821	5	0.689	0.790	0.536	0.426	1.240	0.836	2.052
31	Tulsishyam	1.343	0.001	3.123	5	0.664	0.834	0.496	0.455	1.316	0.801	3.088
32	Jasadhar	1.355	0.001	3.177	5	0.660	0.842	0.487	0.460	1.329	0.795	2.677
33	Vejalkotha	1.338	0.001	3.052	5	0.675	0.832	0.513	0.449	1.310	0.815	4.282
34	Timberwa	1.314	0.002	2.935	5	0.676	0.816	0.528	0.437	1.285	0.818	2.555
35	Kotharia	1.333	0.001	3.093	5	0.655	0.828	0.498	0.451	1.308	0.789	2.929
36	Pipalwa	1.284	0.002	2.867	5	0.672	0.798	0.531	0.430	1.256	0.811	1.821
37	Bhania	1.364	0.001	3.219	5	0.676	0.847	0.485	0.465	1.335	0.817	3.300

In Gir National Park and Sanctuary based on Shannon Wiener diversity index the maximum diversity is found in the zone 1 (Devalia) and least diversity index is found

in the zone 15 (Kachigadh). As per the Shimpsons diversity index the maximum diversity is found in the zone 12 (Vankidas) and minimum diversity index is found in the zone 32 (Jasadhar). On comparison of species number diversity index the maximum diversity is found in the zone 6 (Sasan) and minimum diversity index is found in the zone 12 (Vankidas). However, for Margalef diversity index the maximum diversity and minimum diversity index is same in all the zones. Diversity index is found in the zone 6 (Sasan). With reference to Berger Parker dominance diversity index the maximum diversity is found in the zone 37 (Bhania) and minimum diversity index is found in the zone 12 (Vankidas). For McIntosh diversity index, the maximum diversity is found in the zone 15 (Kachigadh) and minimum diversity index is found in the zone 6 (Sasan). In contrast, Brilouin diversity index, the maximum diversity was noted in the zone 1 (Devalia) and minimum diversity index in the zone 15 (Kachigadh). For Fisher Alpha diversity index, the maximum diversity is found in the zone 1 (Devalia) and minimum diversity index is found in the zone 15 (Kachigadh).

Salvi (2006) reported very less in number of diversity. The Shannon-Wiever index, indicate that almost 15 zones give these forms are with diversity. According to Simpson (1949) as diversity increases, diversity actually decreases and vice-versa. Results show that the more diversity is found in zone 32 (Jasadhar). The distanvantage of Simpson index is that it is heavily weighted towards the most abundant and common species (Odum, 1971). Hence, species diversity not only increases with additional species but also with increasing quality and equality of importance of the species and this is one of the major reasons for the contradictions of results of Species Richness and Simpson Diversity index.

Species number diversity index or species richness the maximum diversity is found in zone 6 (Sasan). One of the major disadvantages of Species Richness is that it treats, both rare and common species equally and focuses mainly on the total number. However, in order to get a whole design of the community, apart from total number the relative importance of the species is also significantly important. These two measures, Species Richness and Relative importance have been combined into a concept known as species diversity (Krebs, 1998).

Table-23: Important value index of the important tree species in GNPS

BOTANICAL NAME	RD	RF	RDO	IVI
Miliusa tomentosa (Roxb.) Sinclair.	0.27	0.46	30.6	31.33
Crataeva magna (Lour.) DC	0.27	0.55	25.6	26.42
Flacourtia montana Grah.	0.90	1.14	20.2	22.24
Kydia calycina Roxb.	1.29	1.25	31.5	34.05

BOTANICAL NAME	RD	RF	RDO	IVI
Bombax ceiba L.	0.88	1.46	32.5	34.84
Sterculia urens Roxb.	0.79	1.19	38.5	40.48
Grewia tiliaefolia Vahl.	0.56	1.15	21.1	22.81
Aegle marmelos (L.) Corr.	1.59	1.82	20.9	24.31
Ailanthus excelsa Roxb.	0.93	1.45	35.6	37.99
Balanites aegyptiaca (L.) Del.	0.59	1.06	22.6	24.24
Boswellia serrata Roxb. ex Colebr.	0.91	1.12	34.5	36.52
Azadirachta indica A.Juss.	1.04	1.03	38.4	40.47
Soymida febrifuge (Roxb.) A.Juss.	1.09	1.56	32.5	35.14
Zizyphus mauritiana Lam.	1.77	1.91	38.8	42.48
Sapindus emarginatus Vahl.	1.46	0.77	25.8	28.03
Sapindus laurifolius Vahl.	0.71	0.84	24.6	26.16
Schleichera oleosa (Lour.) Oken.	0.56	0.72	27.9	29.18
Lannea coromandelica (Houtt.) Merr.	0.61	1.08	32.8	34.49
Butea monosperma (Lamk.) Taubert.	1.19	1.51	35.8	38.50
Dalbergia lanceolaria SPS. *paniculata* Roxb.	0.53	0.82	36.5	37.85
Dalbergia latifolia Roxb.	0.51	0.95	34.8	36.26
Dalbergia sissoo Roxb.	0.62	0.63	37.5	38.76
Erythrina suberosa Roxb.	0.39	0.78	21.5	22.67
Erythrina variegata L.	0.70	0.14	21.7	22.54
Pongamia pinnata L.	0.63	1.08	33.1	34.80
Pterocarpus marsupium Roxb.	0.39	0.70	31.1	32.18
Bauhinia purpurea L.	0.61	1.03	24.6	26.24
Bauhinia tomentosa L.	0.38	0.84	23.8	25.02
Cassia fistula L.	0.59	1.11	18.9	20.59
Tamarindus indica L.	0.97	1.45	37.6	40.02
Acacia catechu (L.f.) Willd.	1.59	1.72	35.4	38.71
Acacia ferruginea DC.	0.88	1.32	31.9	34.10
Acacia leucophloea (Roxb.) Willd.	0.85	1.32	33.6	35.77
Acacia nilotica (L.) Willd ex. Delile.	1.76	1.63	32.8	36.19
Acacia senegal (L.) Willd.	2.71	1.14	28.9	32.75
Albizzia lebbeck (L.) Benth.	0.37	0.66	28.6	29.63
Dichrosachys cinerea var. *indica* Brenen.	1.09	1.08	21.2	23.37
Anogeissus latifolia (Roxb. ex DC.) Wall.	1.86	0.92	39.6	42.38
Terminalia cuneata Roth.	0.97	0.72	27.6	29.29
Terminalia elliptica Willd.	1.87	1.61	27.5	30.98
Syzygium heyneanum (Duthie) Wall. ex Gamble.	1.51	0.91	27.9	30.32
Alangium salvifolium (L.f.) Wang.	0.69	1.06	24.6	26.34
Catunaregam spinosa (Thunb.) Tirvengadum.	1.35	1.14	28.6	31.09
Hymenodictyon orixense (Roxb.) Mabb.	1.69	1.03	37.6	40.32
Ixora brachiata Roxb.	0.35	0.80	38.6	39.75

BOTANICAL NAME	RD	RF	RDO	IVI
Mitragyna parvifolia (Roxb.) Korth.	0.94	0.93	35.4	37.27
Morinda pubescens J. E. Sm.	0.55	1.15	22.6	24.30
Tamilnadia uliginosa (Retz.) Tirveng. & Sastre.	0.37	0.63	21.6	22.60
Manilkara hexandra (Roxb.) Dubard.	0.29	0.76	38.8	39.85
Mimusops elengi L.	0.33	0.70	34.8	35.84
Diospyros melanoxylon Roxb.	2.03	1.83	21.2	25.06
Schrebera swietenioides Roxb.	0.59	0.56	25.3	26.45
Holarrhena pubescens (Buch – Ham.) Wall. Ex G. Don.	1.73	1.19	26.7	29.62
Wrightia tinctoria R.Br.	2.98	1.80	28.9	33.68
Cordia dichotoma Forst.f.	0.43	0.79	24.3	25.52
Cordia gharaf (Forsk.) Ehrenb.& Asch.	0.53	0.78	23.5	24.81
Ehretia laevis Roxb.	0.85	0.88	24.9	26.63
Gmelina arborea Roxb.	2.54	1.29	25.8	29.63
Tectona grandis L.f.	5.01	2.27	40.3	47.58
Santalum album L.	0.94	1.00	21.3	23.24
Bridelia retusa (L.) Spr.	0.73	0.90	22.5	24.13
Emblica officinalis Gaerth.	1.25	1.08	21.9	24.23
Mallotus philippensis (Lamk.) Muell.Arn.	0.75	0.58	22.5	23.83
Holoptelea integrifolia (Roxb.) Planch.	1.41	1.25	25.6	28.26
Ficus benghalensis L.	0.92	0.95	38.9	40.78
Ficus racemosa L.	0.67	0.40	37.8	38.87
Ficus religiosa L.	0.29	0.65	36.8	37.74
Pandanus fascicularis Lamk.	0.14	0.11	22.9	23.14

The table-23 shows the IVI data for tree species in GNPS demonstrated that, in GNPS the dominant tree species with reference to IVI are - *Tectona grandis* L.f. (47.58), *Zizyphus mauritiana* Lam. (42.48), *Anugeissus latifolia* (Roxb. ex. DC.) *Wall* (42.38), *Ficus benghalensis* L. (40.78), *Sterculia urens* Roxb. (40.48), *Azadirachta indica* A. Juss (40.47), *Hymenodictyon orixense* (Roxb.), *Mabb* (40.32), *Ramarindus indica* L. (40.02), *Manilkara hexandra* (Roxb.) *Dubard* (39.85), *Ixora brachiata* Roxb. (39.75) and *Dalbergia sissoo* Roxb. (38.76) respectively.

According to Salvi (2006) the dominant tree and shrubs with respective to IVI value are - *Prosopis chilensis* (70.53), *Euphorbia nivulia* (48.38), *Grewia ternex* (27.72), *Capparis decidua* (21.76), *Commiphora wightii* (19.26). This reports is to some extent relates with the GNPS for few dominant trees.

Earlier, Menon and Shah (1981) has studied phytosociology of Gir forest in Saurashtra and compared density, frequency and abundance. IVI of ten dominat and ten rare or less abundant tree species. With reference to IVI the important trees are - *Acacia Senegal, Carissa congesta, Terminalia crenulata, Zizyphus rugusa, Butea*

monosperma, Acacia ferruginia, Tectona grandis and *Boswellia serrata.* Among rare or less dominant tree species, *Cordia dichotoma, Limonia acidissima* and *Xeromphis spinosa, Mangifera indica, Schrebera swietenioides, Caesalpinia crista* and *Cassia siamea* showed decreasing trend for IVI respectively.

Comparison of plant inventory with past records

This information gives the real picture of forest since 1962 to 2003. In the past Gir National Park and Forest comprised of a total of 5000 sq km but now reduced to 1412.1 sq km because of biotic pressure, drought as well as natural calamitis that have taken place in the forest there is a change in the forest flora. Moreover, some plants have been introduced in the area.

Table-24: Comparison of plant inventory (tree) with past records

Botanical name	SBP	SAC	SA	OSK	JAS
Acacia auriculifororis					+
Acacia catechu	+	+	+	+	+
Acacia ferruginea	+	+	+	+	+
Acacia leucophloea	+	+	+	+	+
Acacia nilotica	+	+	+	+	+
Acacia planifrons		+		+	
Acacia senegal		+	+	+	+
Adansonia digitata			+		+
Adina cordifolia	+	+	+	+	+
Aegle marmelos	+	+	+	+	+
Ailanthus excelsa	+	+	+	+	+
Alangium salvifolium	+		+	+	+
Albizzia lebbeck	+	+	+	+	+
Albizzia odoratissima		+	+	+	+
Albizzia procera		+	+	+	
Anacardium occidentale					+
Annona reticulata				+	+
Annona squamosa					+
Anogeissus latifolia	+	+	+	+	+
Anthocephalus indicus					+
Artocarpus heterophyllus					+
Azadirachta indica	+	+	+	+	+
Balanites aegyptiaca	+	+	+	+	+
Bauhinia purpurea	+		+		+
Bauhinia racemosa	+	+	+	+	+
Bauhinia tomentosa			+		+
Bombax ceiba	+	+	+		+
Borassus flabellifer					+
Boswellia serrata	+	+	+	+	+
Bridelia retusa	+	+	+	+	+
Buchanania cochinchinensis			+		+
Butea momosperma					+
Butea momosperma var. *lutia*	+	+	+	+	+
Capparis grandis		+	+		+
Carica papaya	+		+		+

Botanical name	SBP	SAC	SA	OSK	JAS
Casearia elliptica		+	+		+
Cassia fistula	+	+	+	+	+
Cassia siamea	+		+	+	+
Casuarina equisetifolia	+		+	+	+
Catunaregam spinosa	+	+	+	+	+
Ceiba pentandra				+	+
Citrus limon	+		+		+
Cocos nucifera					+
Cordia dichotoma	+	+	+	+	+
Cordia gharaf			+	+	+
Cordia monoica			+		+
Couroupita guianerisis					+
Crataeva magna		+	+		+
Dabergia sisoo	+		+		+
Dalbergia latifolia	+	+	+	+	+
Dalbergia paniculata		+	+		+
Delonix elata					+
Delonix regia.					+
Dichrostachys cinerea var. *indica*	+	+	+	+	+
Diospyros melanoxylon	+	+	+	+	+
Drypetes roxburghii	+	+	+	+	+
Ehretia laevis	+	+	+	+	+
Erythrina suberosa	+		+	+	+
Erythrina variegata					+
Eucalyptus globules					+
Feronia limonia	+				+
Ficus amplissima			+		+
Ficus benghlensis		+	+	+	+
Ficus hispida			+	+	+
Ficus racemosa		+	+	+	+
Ficus religiosa		+	+	+	+
Ficus rumphii		+			+
Firmiana colorata			+		+
Flacourtia montana					+
Gardenia resinifera			+		+

Botanical name	SBP	SAC	SA	OSK	JAS
Garuga pinnata	+	+	+	+	+
Gmelina arborea		+	+	+	+
Grewia tiliaefolia	+	+	+		+
Grewillea robusta			+	+	+
Guazuma ulmifolia					+
Haplophragma adenophyllum			+		+
Hardwickia binata	+		+		+
Holarrhena pubescens	+	+		+	+
Holoptelea integrifolia	+	+	+	+	+
Hymenodictyon orixense		+			+
Ixora brachiata	+		+	+	+
Ixora pavetta		+		+	+
Kydia calycina	+	+	+	+	+
Lannea coromandelica	+	+	+	+	+
Leucaena leucocephala	+		+	+	+
Madhuca indica	+		+	+	+
Mallotus philippensis			+		+
Mangifera indica	+	+	+	+	+
Manilkara hexandra	+	+	+	+	+
Manilkara zapota				+	+
Melia azedarach	+		+	+	+
Meyna laxiflora	+		+		
Miliusa tomentosa					+
Millingtonia hortensis					+
Mimusops elengi				+	+
Mitragyna parvifolia	+	+	+	+	+
Morinda citrifolia					+
Morinda pubescens	+		+	+	+
Moringa concanensis				+	+
Moringa oleifera	+	+	+	+	+
Morus alba			+	+	+
Murraya koenigii	+		+	+	+
Nyctanthes arbor-tristis				+	+
Oroxylum indicum			+		+
Ougienia oojeinensis		+			
Pandanus odoratissimus					+
Parkinsonia aculeata				+	+
Peltophorum pterocarpum					+
Phoenix sylvestris	+		+	+	+
Piliostigma malabaricum			+		+
Pithecellobium dulce				+	+
Polyalthia longifolia					+

Botanical name	SBP	SAC	SA	OSK	JAS
Pongamia pinnata	+	+	+	+	+
Prosopis cineraria		+	+		+
Prosopis juliflora	+		+		+
Psidium guajava					+
Pterocarpus marsupium				+	+
Roystonea regia					+
Salvadora persica	+				
Samanea saman	+		+	+	+
Sapindus emarginatus	+		+		+
Sapindus laurifolius	+	+		+	+
Schleichera oleosa	+	+	+	+	+
Schrebera swietenioides	+		+		+
Soymida febrifuga	+	+	+	+	+
Spathodea campanulata					+
Spondias pinnata			+	+	+
Sterculia foetida					+
Sterculia urens	+		+	+	+
Sterculia villosa	+		+		
Stereospermum colais					+
Syzygium cumini	+	+	+	+	+
Syzygium heyneanum					+
Syzygium rubicandum		+	+		+
Tamarindus indica	+	+	+	+	+
Tamilnadia uliginosa	+	+	+	+	+
Tecoma stanus					+
Tecomella undulata					+
Tecomella undulata.					+
Tectona grandis	+	+	+	+	+
Terminalia bellirica	+	+	+	+	+
Terminalia catappa					+
Terminalia chebula	+		+		+
Terminalia cuneata		+	+		+
Terminalia elliptica	+	+	+	+	+
Thespesia populnea			+	+	+
Vitex negundo				+	+
Wrightia arborea					+
Wrightia tinctoria	+	+	+	+	+
Zizyphus glabrata	+	+			
Zizyphus mauritiana	+	+	+	+	+

Table-25: Comparison of plant inventory (shrubs) with past records

Botanical name	SBP	SAC	HSK	OSK	JAS
Adhatoda vasica				+	+
Aerva javanica			+	+	
Barleria cuspidate					+
Bougainvillea spectabilis					+
Cadaba fruticosa		+	+	+	+
Cajanus cajan		+			+
Calotropis gigantean	+		+	+	+
Calotropis procera				+	+
Capparis deciduas		+	+	+	+
Capparis sepiaria		+	+	+	+

Botanical name	SBP	SAC	HSK	OSK	JAS
Carissa congesta	+	+	+	+	+
Cassia auriculata	+		+	+	+
Cassia surattensis	+		+		+
Cestrum diurnum					+
Cestrum nocturnum					+
Cissus repanda					+
Clerodendron inerme			+	+	+
Clerodendron phlomidis	+				+
Commiphora wightii					+
Dendrophthose falcata					+

Botanical name	SBP	SAC	HSK	OSK	JAS
Duranta repens					+
Ervatamia divaricata					+
Euphorbia neriifolia	+		+	+	+
Euphorbia tirucalli			+	+	+
Flacourtia indica	+	+	+	+	+
Gossypium herbaceum			+		+
Grewia abutilifolia		+			
Grewia hirsute		+	+	+	+
Grewia tenex			+	+	+
Grewia villosa		+			
Helicteres isora	+	+	+	+	+
Hibiscus rosa-sinensis			+		+
Hibiscus schizopetalus					+
Ipomoea fistulosa	+		+	+	+
Jatropha curcas					+
Jatropha gossypifolia				+	+
Kirganelia reticulate	+		+	+	+
Lantana camara		+	+	+	+
Lantana salvifolium					+
Lawsonia inermis	+		+	+	+
Maytenus senegalensis		+	+	+	+
Microcos paniculata	+				

Botanical name	SBP	SAC	HSK	OSK	JAS
Mimosa hamata	+	+	+	+	+
Nerium indicum	+		+		+
Opuntia elatior				+	+
Punica granatum					+
Ricinus communis	+		+	+	+
Rosa sp.	+				+
Securinega leucopyrus	+	+	+	+	+
Securinega virosa		+			
Sesbania bispinosa	+	+	+	+	+
Sesbania sesban var. picta	+		+		
Solanum incanum	+			+	
Tamarix ericoides				+	+
Thespesia lampus		+	+		+
Thevetia peruviana					+
Viscum articulatum					+
Woodfordia fruticosa	+	+	+	+	+
Zizyphus glberrima	+	+			
Zizyphus nummularia	+	+	+		+
Zizyphus xylopyra	+		+	+	+

Table-26: Comparison of plant inventory (herbs) with past records

Botanical name	SBP	SAC	HSK	OSK	JAS
Abelmoschus angulosus			+		
Abelmoschus esculentus	+	+		+	+
Abelmoschus ficulneus	+				
Abelmoschus manihot	+	+	+	+	+
Abelmoschus moschatus	+			+	
Abutilon indicum	+		+	+	+
Abutilon pannosum	+			+	+
Acalypha ciliate	+	+	+	+	+
Acalypha indica	+	+	+	+	+
Acalypha malabarica	+		+		
Acanthospermum hispidum	+		+	+	+
Achyranthes aspera	+	+	+	+	+
Aerva javanica					+
Aerva lanata	+			+	+
Aerva sanguinolenta	+		+		+
Aeschynomene indica	+	+	+		+
Agave americana	+		+	+	+
Ageratum conyzoides	+	+	+	+	+
Alhagi pseudalhagi		+	+		
Allium cepa					+
Aloe benghalensis					+
Alysicarpus bupleurifolius		+			
Alysicarpus hamosus	+	+	+	+	+
Alysicarpus heyneanus		+			
Alysicarpus longifolius	+	+	+	+	+
Alysicarpus monilifer	+	+		+	+
Alysicarpus pubescens		+			
Alysicarpus racemosus		+			
Alysicarpus rugosus		+			
Alysicarpus styracifolius	+			+	
Alysicarpus tetragonolobus	+	+	+		
Alysicarpus vaginalis	+	+	+		+
Alysicarpus violaceus	+			+	
Amaranthus cruentus			+	+	+
Amaranthus gracilis			+		+
Amaranthus spinosus			+	+	+
Amaranthus tricolor	+	+	+	+	
Amischocephalus axillaris		+			
Amischocephalus cucullata		+			
Ammannia baccifera	+		+	+	+

Botanical name	SBP	SAC	HSK	OSK	JAS
Ammannia multifora	+		+	+	
Ammannia senegalevsis					+
Ammannia tenuifolia					+
Andrographis paniculata		+		+	+
Anethum graveolens	+				+
Anisomeles indica			+	+	+
Anisomeles malabarica					+
Arachis hypogaea		+			+
Argemone mexicana	+	+	+	+	+
Argyreia sericea	+		+	+	+
Aristolochia bracteolata	+				
Arrurphophallus.					+
Artemisia parviflora		+			
Atylosia platycarpa	+		+		
Atylosia scaraba					+
Bacopa monnieri	+	+	+	+	+
Barleria gibsoni					+
Barleria prattensis	+	+	+	+	
Barleria prionitis		+	+	+	+
Bergia ammanniodes	+		+	+	+
Bergia suffruticosa					+
Bidens bitemata	+	+	+	+	+
Biophytum candolleanum	+	+	+	+	+
Blainvillea acmella	+	+	+		+
Blepharis maderaspatensis	+		+	+	+
Blepharis repens	+		+	+	+
Blumea bovei	+	+			
Blumea fistulosa	+	+	+		+
Blumea lacera	+			+	
Blumea malcolmii		+			
Blumea membranacea	+	+			+
Blumea mollis	+	+	+	+	+
Blumea oblique		+			
Boerhaavia chinensis		+		+	+
Boerhaavia diffusa		+	+	+	+
Boerhaavia verticillata				+	+
Borreria articularis					+
Borreria stricta	+		+	+	+
Brassica juncea	+				+
Brassica nigra	+		+	+	+

Botanical name	SBP	SAC	HSK	OSK	JAS
Brassica oleracea var. capitata			+		+
Canavalia ensiformis			+		
Canavalia martima		+	+		
Canna indica					+
Cannabis sativa	+		+		
Canscora diffusa	+		+		+
Capsicum annuum			+		+
Capsicum annuum var. acuminatum	+				
Cassia absus	+		+	+	+
Cassia occidentalis	+	+	+	+	+
Cassia pumila	+	+	+	+	+
Cassia tora	+	+	+	+	+
Catharanthus roseus	+		+		+
Celosia argentea	+		+	+	+
Chlorophytum tuberosum					+
Cicer arietinum					+
Cleome burmanni					+
Cleome chelidonii		+	+		
Cleome gynandra	+	+	+	+	+
Cleome Simplicifolia					+
Cleome viscosa	+	+	+	+	+
Clitoria biflora	+		+		+
Coldenia procumbens.	+			+	+
Colocasia esculenta	+		+	+	+
Commelina benghalensis	+	+	+	+	+
Commelina diffusa	+	+		+	+
Commelina erecta					+
Commelina forskalaei	+		+	+	+
Commelina hasskarlii	+	+			
Commelina nudiflora			+		+
Commelina oblique			+		
Commelina paludosa		+			
Commelina suffruticosa		+			+
Commelina undulate	+				
Convolvulus prostrates			+	+	+
Convolvulus rottleri					+
Corchorus aestuans	+	+	+	+	+
Corchorus capsularis		+	+		
Corchorus depressus		+	+	+	
Corchorus fascicularis		+	+		+
Corchorus olitorius	+	+	+	+	+
Corchorus trilocularis		+	+	+	
Coriandrum cucurris					+
Coriandrum sativum					+
Coronopus didymus		+	+		
Cosmos spp.			+		
Cosmos sulphureus	+				
Crinum viviparum					+
Crotalaria burhia		+			
Crotalaria evolvuloides		+			
Crotalaria filipes		+	+	+	
Crotalaria filipes var.trichophora	+				
Crotalaria juncea	+	+	+	+	+
Crotalaria leptostachya	+	+	+	+	+
Crotalaria linifolia	+	+	+		+
Crotalaria medicaginea	+	+	+	+	+
Crotalaria nana					
Crotalaria notonii		+			
Crotalaria orixensis	+	+	+	+	
Crotalaria prostrate		+			
Crotalaria retusa		+	+	+	+
Crotalaria triquetra		+			
Crotalaria vestita		+			
Curculigo orchioides	+		+	+	+
Curcuma amda			+		

Botanical name	SBP	SAC	HSK	OSK	JAS
Curcuma inodora	+		+	+	+
Cyamopsis tetragonoloba		+			
Cyanotis albescens		+			
Cyanotis axillaries		+			
Cyanotis cristata	+	+	+	+	+
Cyanotis fasiculata	+	+	+		+
Cyathocline purpurea	+		+	+	+
Cynoctonum mitreola	+		+		
Cyperus alulatus					+
Cyperus arenarius		+			
Cyperus compressus	+				+
Cyperus conglomerates		+		+	
Cyperus difformis	+	+		+	
Cyperus exaltatus		+			
Cyperus haspan		+			
Cyperus iria		+			
Cyperus kyllinga		+			
Cyperus michelianus		+			
Cyperus pumilus		+			
Cyperus rotundus		+		+	
Cyperus triceps					+
Datura innoxia	+		+	+	+
Datura metel	+		+	+	+
Dentella repens					+
Desmodium dichotomum	+	+	+		+
Desmodium gangeticum	+	+			+
Desmodium laxiflorum		+			
Desmodium neomexicanum					+
Desmodium renifolium		+			
Desmodium repandum	+	+			+
Desmodium rotundifolium			+	+	+
Desmodium triflorum	+	+	+	+	+
Desmodium triquetrum		+			
Desmodium velutrinum		+			+
Dicliptera verticillata	+		+	+	+
Digera muricata			+	+	+
Dipteracanthus patulus	+		+		
Dipteracanthus prostratus		+	+	+	+
Dolichos trilobus		+			
Echinops echinatus	+		+	+	+
Eclipta prostrate	+	+	+	+	+
Eleocharis atropurpurea	+		+	+	
Elephantopus scaber					+
Emilia sonchifolia	+		+	+	+
Enicostemma hyssopifolium			+	+	+
Enicostemma tratra gorium					
Eranthemum purpurascens	+		+		
Eranthemum roseum				+	+
Eriocaulon dianae	+		+		
Eriocaulon sollyanum	+		+		+
Eriocaulon truncatum	+		+	+	+
Euphorbia geniculata	+		+	+	+
Euphorbia hirta	+		+	+	+
Euphorbia microphylla	+				+
Euphorbia nivulia			+	+	+
Euphorbia parviflora	+		+	+	+
Euphorbia prostrate	+		+	+	+
Euphorbia thymifolia	+		+		+
Evolvulus alsinoides	+		+	+	+
Evolvulus nummularius					+
Exacum petiolare	+				+
Exacum pumilum					
Fagonia cretica		+	+		
Glinus lotoides	+		+	+	+
Glossocardia bosvallea	+		+	+	+

Botanical name	SBP	SAC	HSK	OSK	JAS
Goniocaulon indicum	+		+		+
Grewia damine	+	+	+	+	+
Haplanthus tentaculatus	+		+		
Haplanthus verticillatus	+		+	+	+
Helianthus annus	+		+		+
Heliotropium bacciferum					+
Heliotropium subulatum					+
Heliotropium supinum				+	+
Hemigraphis latebrosa	+		+	+	+
Heriadelphus polyspermus					+
Heylandia latebrosa	+		+		+
Hibiscus cannabinus	+				
Hibiscus lobatus	+		+	+	+
Hibiscus ovalifolius			+	+	
Hibiscus sabdariffa			+		
Hibiscus triorium					+
Hibiscus vitifolius	+	+			
Hoppea dichotoma	+		+	+	+
Hydrilla verticillata					+
Hygrophila salicifolia	+		+		
Hygrophila schulli				+	+
Hygrophila serphyllum					+
Impatiens balsamina var.coccinea	+	+		+	+
Impatiens balsamina var.rosea		+	+	+	+
Indigofera astragallina					+
Indigofera colutea		+			
Indigofera constricta		+			
Indigofera cordifolia	+	+	+	+	+
Indigofera glandulosa	+	+	+	+	
Indigofera hirsute	+		+		
Indigofera hochstetteri		+			
Indigofera karnatakana	+	+	+		+
Indigofera linifolia		+	+	+	+
Indigofera linnaei		+		+	
Indigofera oblongifolia		+			+
Indigofera tinctoria	+	+			+
Indigofera trifoliate		+			
Indigofera trita	+	+	+		+
Indoneesiella echioides	+		+	+	+
Ipomoea sinensis					+
Justicia bitorica					+
Justicia diffusa		+			
Justicia latispica	+	+		+	+
Justicia micrantha		+		+	
Justicia nagpurensis					+
Kickxia incana		+			
Kickxia ramosissima	+		+	+	+
Lactuca runcinata	+		+		+
Lagascea mollis	+		+		
Laggeara aurita					+
Launaea glomerata					+
Launaea procumbens			+	+	+
Launaea residifolia	+			+	
Lavandula bipinnata			+		
Leea asiatica	+				+
Lepidagathis cuspidata			+		+
Lepidagathis oristata					
Lepidagathis trinervis	+		+	+	
Lepidium sativum		+	+		
Leucas aspera			+	+	+
Leucas biflora					+
Leucas cephalotes			+	+	+
Leucas lavandulaefolia		+			
Leucas longifolia		+			
Leucas urticaefolia		+		+	

Botanical name	SBP	SAC	HSK	OSK	JAS
Leucas zeylanica	+		+	+	+
Limnophila heterophylla					+
Limnophila indica	+		+		+
Lindenbergia urticaefolia	+		+		+
Lindernia bergia					
Lindernia crustacean	+		+		+
Lindernia crustacean	+				+
Lindernia parviflora	+				
Ludwigia perennis	+		+	+	+
Lycopersicon lycopersicum	+		+		+
Martynia annua			+	+	+
Melochia corchorifolia					+
Merremia aegyptia.	+		+	+	+
Merremia gangetica	+		+	+	+
Merremia tridentate		+			
Mollugo nudicaulis					+
Mollugo oppositifolia					+
Mollugo pentaphylla	+		+	+	
Murdannia semiteres					+
Musa paradisiaca	+		+		+
Myriophyllum intermedium			+		
Najas marina			+		
Najas minor	+		+		
Nervilia aragoana	+			+	+
Nervilia plicata			+		+
Neuracanthus sphaerostachys	+	+	+	+	+
Neurancanthus nervius					+
Nicotiana plumbaginifolia					+
Nothosaerva brachiata	+		+	+	+
Nymphaea nouchali					+
Ocimum americanum			+	+	+
Ocimum basilicum	+		+	+	+
Ocimum basilicum					+
Ocimum tenuiflorum					+
Oldenlandia corymbosa				+	+
Oldenlandia herbacea					+
Oligochaeta ramose	+				
Ottelia alismoides	+		+	+	+
Oxalis corniculata				+	+
Parthenium hysterophorus				+	+
Pavonia zeylanica					+
Pedilanthus tithymaloides			+		
Peganum harmala		+	+		
Peristrophe paniculata	+	+	+	+	+
Phyla nodiflora	+		+	+	+
Phyllanthus fraternus			+	+	+
Physalis longifolia	+				
Physalis minima		+	+	+	+
Physalis peruviana			+		
Pluchea lanceolata	+		+		
Plumbago zeylanica	+		+	+	+
Pogostemon benghalensis					+
Polgala erioptera	+			+	+
Polygala arvensis	+		+	+	+
Polygala persicariaefolia			+	+	+
Polygonum glabrum					+
Polygonum plebeium				+	+
Portulaca oleracea		+	+	+	+
Portulaca pilosa					+
Portulaca quadrifolia	+		+	+	+
Pouzolzia zeylanica	+		+		
Pseudarthria viscida			+		+
Psoralea corylifolia	+	+	+	+	+
Pueraria lobata					+
Pueraria thunbergiana					+

Botanical name	SBP	SAC	HSK	OSK	JAS
Pulicaria angustifolia	+		+		
Puppalia barbata					+
Puppalia lappacea		+		+	+
Pycreus pumilus	+				
Raphanus sativus					+
Rhynchosia mirima var. *laxiflora*					+
Rotala ocultiflora	+				
Rotala serpyllifolia	+		+	+	+
Rungia elegans		+			
Rungia parviflora	+	+	+		+
Rungia pectinata	+	+	+	+	+
Scelrocarpus africanus	+		+		+
Sesamum orientale			+	+	+
Sida acuta	+	+	+	+	+
Sida alba	+				
Sida cordata		+		+	
Sida glutinosa		+	+		
Sida orientalis			+		
Sida ovata		+			
Sida rhombifolia	+				+
Sida rhombifolia var. retusa	+			+	+
Sida spinosa			+		
Sida veronicifolia	+		+		+
Smithia conferta	+		+		+
Smithia conferta Var. geminiflora	+				
Smithia sensitive		+	+		
Solanum anguivi			+		+
Solanum melongena			+		+
Solanum nigrum	+	+	+	+	+
Solanum virginianum	+		+	+	+
Sonchus brachyotus					+
Sphaeranthus senegalensis	+		+	+	+
Spilanthus calva					
Striga angustifolia	+		+	+	+
Striga gesneroides					+
Taveriera cunefolia	+		+	+	
Tephrosia candida		+			

Botanical name	SBP	SAC	HSK	OSK	JAS
Tephrosia hamiltonii		+			
Tephrosia labialis			+		
Tephrosia pumila		+	+		+
Tephrosia purpurea	+	+	+	+	+
Tephrosia senticosa		+		+	+
Tephrosia strigosa		+		+	+
Tephrosia tinctoria		+	+	+	+
Tephrosia villosa	+	+	+		+
Trianthema decandra	+		+		
Trianthema portulacastrum	+			+	+
Tribulus terrestris	+	+	+		+
Trichodesma inaequale				+	+
Trichodesma indicum			+		+
Tricholepis amplexicaulis					+
Tricholepis glaberrima	+		+		
Tridax procumbens			+	+	+
Trigonella foenum-graecum					+
Triumfetta malbarica					+
Triumfetta rhomboidea	+	+	+	+	+
Tylophora dalzellii					+
Typha angustate				+	+
Urena lobata	+	+	+		
Urginea indica	+		+	+	+
Vernonia anthelmintica	+	+	+	+	+
Vernonia cinerea	+	+	+	+	+
Vicoa indica	+		+		+
Volutarella ramose			+		
Waltheria indica		+	+		+
Withania sominifera					+
Xanthium indicum	+		+	+	+
Zaleya decandra					+
Zornia diphylla	+	+	+	+	+

Table-27: Comparison of plant inventory (climbers) with past records

Boatanical name	SBP	SAC	HSK	OSK	JAS
Abrus precatorius	+	+	+	+	+
Acacia pennata	+			+	+
Ampelocissus latifolia	+		+	+	+
Antigonum leptopus					+
Asparagus gonoclados					+
Asparagus racemosus var.javanicus	+				+
Blastania fimbristipula	+		+		
Bryonopsis laciniosa	+		+		
Butea superba	+	+	+		+
Caesalpinia bonduc				+	+
Canavalia ensiformis			+		
Canavalia gladiata	+		+		+
Canavalia maritime		+	+		
Cardiospermum halicocabum	+	+	+	+	+
Cayratia auriculata	+		+	+	+
Cayratia camosa	+		+	+	+
Celastrus paniculata	+	+	+		+
Ceropegia bulbosa					+
Cissampelos pariera	+	+	+	+	+
Cissus repanda	+		+	+	+
Citrullus colocynthis					+
Clitoria biflora	+		+		
Clitoria ternatea	+	+	+	+	+
Coccinia grandis	+			+	+

Boatanical name	SBP	SAC	HSK	OSK	JAS
Coccinia indica			+		
Cocculus hirsutus	+	+	+	+	+
Cocculus pendulus	+		+		+
Combretum albidum	+		+	+	+
Corollocarpus conocarpus					+
Corollocarpus epigynes	+				+
Cosmostigma racemosum	+		+		
Ctenolepis cerasiformis				+	+
Cucumis callosus	+		+	+	+
Cuscuta chinensis					+
Cuscuta reflexa				+	+
Cyclea peltata					+
Dalechampia scandens var. *cordofona*					+
Dioscorea bulbifera	+		+	+	+
Dioscorea daemona	+		+		+
Dioscorea hispida					+
Dioscorea pentaphylla	+		+		+
Dioscorea walliechii.			+	+	+
Diplocyclos palmatus				+	+
Gloriosa superba				+	+
Hemidesmus indicus	+		+	+	+
Hewittia sublobata			+		
Hiptage benghalensis				+	+
Holostemma annularium				+	+

Boatanical name	SBP	SAC	HSK	OSK	JAS
Ipomoea alba		+			
Ipomoea coptica					+
Ipomoea dichroa	+		+		+
Ipomoea eriocarpa	+				
Ipomoea illustris			+		
Ipomoea muricata			+		+
Ipomoea nil	+	+	+	+	+
Ipomoea pes-tigridis		+		+	+
Ipomoea quamoclit				+	+
Ipomoea sindica		+		+	
Ipomoea sinensis	+	+	+		+
Ipomoea turbinate	+				
Jasminum azoricum					+
Jasminum multiflorum	+				+
Lablab purpureus		+			+
Leptadenia pyrotechnica					+
Leptadenia reticulata	+	+	+	+	+
Luffa acutangula			+		+
Luffa acutangula var. amara	+				
Luffa echinata	+		+		+
Maerua arenaria Var. glabra	+		+		
Maerua oblongifolia		+		+	+
Marsdenia tenacissima					+
Melothria maderaspatana	+		+		+
Merremia aegyptia	+		+		+
Merremia gangetica	+		+		+
Merremia hederacea	+		+		
Merremia quinquefolia	+				
Merremia rhynchorhiza	+		+		
Merremia tridentate		+			
Merremia turpethum	+		+		
Momordica charantia				+	+
Momordica dioica				+	+

Boatanical name	SBP	SAC	HSK	OSK	JAS
Mucuna prurita	+		+	+	+
Oxystelma esculentum	+		+	+	
Passiflora edulis	+		+	+	+
Pergularia daemia	+	+	+	+	+
Phaseolus aconitifolius	+				
Phaseolus radiatus	+		+		+
Pueraria thunbergiana	+		+		+
Pueraria tuberose	+		+	+	+
Quisqualis indica					+
Rhynchosia bracteata			+	+	
Rhynchosia minima	+	+	+	+	+
Rhynchosia minima Var.laxiflora	+				
Rhynchosia rothii	+				+
Rhynchosia viscose		+			
Rivea hypocrateriformis	+	+	+	+	+
Rivea ornate	+				
Telosma pallida					+
Teramnus labialis	+	+	+	+	+
Teramnus mollis		+			
Tinospora cordifolia		+	+	+	+
Trichosanthes bracteata	+		+	+	
Trichosanthes cucumerina					+
Uraria picta		+			
Vigna aconitifolia		+			
Vigna angularis		+			
Vigna dazelliana		+			
Vigna radiate		+			+
Vigna trilobata		+		+	+
Vigna vulagaris		+			
Zizyphus oenoplia	+	+	+	+	+

Table-28: Comparison of plant inventory (grasses) with past records

Botanical name	SBP	SAC	HSK	OSK	JAS
Alloteropsis cimina	+	+	+	+	+
Andropogon pumilus		+			+
Apluda mutica	+	+	+		+
Aristida adscenscionis		+		+	+
Aristida funiculata	+				
Aristida funiculata			+	+	
Aristida redacta		+			
Aritida histricula		+			
Aritida setacea		+			
Arthraxon lanceolatus		+			
Arthraxon serrulatus	+		+		
Arundinella pumila.	+		+		+
Bambusa arundinacea					+
Bothriochloa intermedia		+			
Bothriochloa ischaemum		+			
Bothriochloa pertusa		+			
Brachiaria eruciformis		+			
Brachiaria ramose	+	+	+	+	
Cenchrus biflorus		+		+	
Cenchrus ciliaris		+		+	+
Chloris barbata		+		+	+
Chloris dolichostachyos	+		+		+
Chloris montana	+	+	+		
Chloris virgata	+	+			
Chrysopogon aucheri		+		+	
Chrysopogon fulvus		+			
Chysopogon polyphyllus		+			
Coix gigantean	+	+	+	+	+

Cymbopogon dactylon		+			
Cymbopogon martini	+	+	+		+
Cymbopogon parkeri		+			
Cynodon dactylon					+
Dactyloctenium aegyptiacum	+	+	+	+	+
Dactyloctenium sindicum					+
Dendrocalamus strictus		+	+	+	+
Desmostachya bipinnata		+			
Dichanthium annulatum		+		+	
Dichanthium caricosum		+		+	
Digitaria adscendens	+	+	+	+	
Digitaria michrobachne	+	+	+		
Dimeria orinthopoda	+		+		+
Dinebra retroflexa	+		+		+
Echinochloa colonum	+	+	+	+	+
Eleusine compressa		+			
Eleusine indica		+			
Eragrostis cilianensis		+			
Eragrostis ciliaris		+			+
Eragrostis japonica	+		+	+	+
Eragrostis pilosa	+	+	+	+	
Eragrostis tenella		+			
Eragrostis unioloides		+			
Eragrostis viscosa	+	+	+		
Hackelochloa granularis	+		+	+	
Heteropogon contorutus	+	+	+	+	+
Heteropogon richiei	+				
Imperata cylindrica		+			
Isachne dispar	+		+		

Ischaemum molle	+		+	+	
Ischaemum rugosum		+			
Melanocenchrus jacquemontii			+	+	
Oplismenus burmannii	+		+		+
Oryza sativa	+		+		+
Panicum antidotale		+			
Panicum isachene		+			
Panicum ramosum		+			
Paspalidium flavidum	+	+	+	+	+
Paspalidium geminatum	+		+		
Pennisetum americanum					+
Pseudanthistiria heteroclita	+				
Rottboellia exaltata	+		+		
Saccharum officinarum					+
Saccharum spontaneum.	+		+		+
Sehima ischaemoides		+			
Sehima nervosum		+			
Sehima sulcatum		+			

Setaria glauca		+			
Setaria tomentosa	+		+		
Setaria verticillata	+		+	+	
Sorghum bicolor	+		+		+
Sorghum halepense	+	+		+	+
Spodiopogon rhizophorus	+		+		
Sporobolus diander		+			
Sporobolus fertilis		+			
Sporobolus marginatus	+		+		
Themeda cymbaria			+		+
Themeda quadrivalvis	+	+			
Themeda triandra		+		+	
Triticum aestivum					+
Urochloa panicoides	+		+		
Vetiveria panicoides			+		
Zea mays		+			+

Table- 29: Lifeform diversity of past records

	SBP	SAC	HSK	OSK	JAS
Tree	73	66	99	82	148
Shrubs	24	20	32	31	53
Herbs	199	154	222	171	288
Climbers	60	32	57	44	74
Grasses	40	58	39	25	32
Total	396	330	449	431	595

SBP: Santapau, Bole and Pathak, SAC: Sanat Chavan, HSK: Singh and Kamboj, OSK: Kotiwar, JAS: Jasrai and Sisodia

Table-29 shows inventory of Trees, Shrubs, Herbs and Climbers noted in present study (JAS) is more, but Grasses were found more in number in earlier reports (Chavan, 1993). The table-29 indicates the total life from diversity available in the present and past. Out of total 396 plant species available (Santapau, 1962, Bole and Pathak, 1988) dominant forms are Herbs with 50.25 % composition whereas Tree represents 18.43 %. Because of the heavy anthropogenic pressure (domesticated animals-cattle) the grass species demonstrated declined trend. Out of total 330 plant species (Chavan, 1993) dominant are Herbs with 46.67 % composition. Tree 20 %, Shrubs 6.06 %, Climbers 9.7 % and Grasses 17.58 % comparatively. Earlier, Singh and Kamboj, (1995) total 449 plant species were noted and dominant forms were Herbs with 49.44 % composition, Tree 22.05 %, Shrubs 7.13 %, Climbers 12.69 % and Grasses 8.69 % only. Similarly, Kotiwar (1995) reported total 431 plant species with Herbs 39.68 %, Tree 19.03 %, Shrubs 7.19 %, Climbers 10.21 % and Grasses represents 5.80 % respectively in Gir forests. In present study reports total 595 plant

Pressure on Gir National Park and Sanctuary :
1) Agricultural activity (Mitiyala Range), 2) Nes and its inhabitants (Lokines),
3) Over exploitation of natural forest (Timberva Range)

species in GNPS. The life form comprised of Herbs 48.40 %, Tree 24.87 %, Shrubs 8.57 %, Climbers 12.61 % and Grasses 5.21% respectively.

Various factors to affecting plant biodiversity in GNPS

The rich flora of Gir National Park and Sanctuary is being continuously over exploited for medicinal, non-timber forest products such as fodder grasses, gums, resine, etc. The forestland is being converted into agricultural lands. Thus, in recent times, overexploitation as well as other factors such as over population, over grazing, Socio-economic status and political status have disturbed the entire Gir ecosystem. The pressure caused to the forests of various rare and endangered species of flora and fauna due to habitat destruction (Mahesh Singh, 2001). Some of the main parameters affecting the biodiversity of the Gir national park and sanctuary are listed below.

1. **Grazing:** The maldharies domesticate cows, gots and buffaloes. Presently, there are about 54 maldhari nesses in the sanctuary having about 361 families. On the fringes of the sanctuary, there are 14 in forest settlement with total human population of about 4500 and that of livestock about 4250. There are 97 villages located within a periphery of 6 kms. All around the sanctuary with human population of 1,36,000 and that of domestic livestock is about 1,00,000 (Pati, 2001). These livestock graze in the sanctuary area by paying nominal grazing fee. However, presently when the livestock population has increased and forest area has been reduced the livestock grazing effects not only forest areas but also caused habitat destruction for wild ungulates. Due to heavy grazing in the sanctuary area many of unwanted weeds *Lantana camara* and *Parthenium hysterophorus* has spread. The grazing by livestock not only deprive the wild herbivores of their food but also cause soil erosion and degradation of habitat, it also affects the natural regeneration of plants. Excessive grazing in the sanctuary also leads to retrogression of the ecosystem resulting in replacement of palatable grasses with unwanted, unpalatable and hardly weeds like *Cassia tora* and *Lantana camara* etc. thus the excessively grazed areas are rendered un production from the wild herbivores point of view. Natural regeneration of valuable species also became the first hand casualty due to excessive grazing. Therefore, the effect is quite serious and damaging to the ecosystem as a whole.
2. **Water scarcity in dry season:** In Gir, 7 main rivers and 4 major dams occur of which many are non-perennial. During summer, month's water scarcity is a

major problem, which affects the flora and fauna. This greatly affects the natural regeneration of plants also.

3. **Non-timber forest products (NTFP):** In Gir, There are 54 nesses and 97 villages located mostly in the peripheral areas of the Sanctuary. The indiscriminate and improper collection of NTFP causes serious threat to various plant species. Maldharies lope the trees every summer months for feeding their cattle. This also affects the growth of various plant species.

4. **Transports:** There are 7 state highways passing through the sanctuary and national park areas. State transport buses, light and heavy vehicles passing through these roads disturb the normal animal behaviors and also affect the plants growing near to the roads. These vehicles cause air pollution as well as sound pollution in the Gir forest area. Railways: Visavadhar - Delwada railway line passes through, western and southern portions of forest. Other railway lines are Visavadha - Amreli, Talala - Prachi and talala - Delwada. The railway line of, Talala - Prachi and Jamwala - Kodinar bear significance in respect of their closeness to the forest. The locomotives running on these railway lines are mainly steam engines which have always posed a potential fire hazard. It is also pertinent to note that during 1981 to 1995 as many as 10 lions were killed by trains plying on talala - Visavadhar railway line. These trains always remained a main source of disturbance for the wildlife. At present the length of railway line passing through the sanctuary is 15 Kms. It is a meter gauge line connecting visavdhar. Existing frequency of trains running on this route is 6 passengers daily (Singh and Kamboj, 1996).

5. **Pilgrimage:** There are four main temples, namely Kankai, Banej, Tulsishyam and Hanuman gathia located in the national park and sanctuary. These temples attract large number of pilgrims. Every year approximately 90 thousand pilgrims visit these temples. Since the pilgrims are from far off places they need accommodation for their stay. They through the plastic bags and other unwanted non-degradable materials in the forest areas. This is a major threat to the plant diversity in the areas. In addition there are 10 to 15 small temples in Gir forest areas. These small temples also exert pressure on flora and fauna.

6. **Tourism:** The Gir national park and sanctuary is known for the last keystone species Lion. Not only Indian visitor but also the foreigners come every year in very large number increasing the traffic including illegal tourism in Gir national park and sanctuary.

7. **Mining:** Large-scale industrial development has taken place during last two decades. On the costal area near the Gir there are nearly 30 small and big industries. The industrial development and mining activities destroy the grazing land and the domesticated animals enter the forest areas for grazing. This is an indirect impact on flora. Unless the there activities are controlled the problem of encroachment will take place in the peripheral areas of the sanctuary and ultimately to the core areas for grazing.
8. **Forest fire:** The Gir national park and sanctuary is dry deciduous forest and most common type of fire seen is the surface fire. Routinely the forest fire on the either side of forest roads and state highways is undertaken which affects the natural vegetation. It causes the reduction in standing biomass as well as the regeneration of plants because of that the habitat destruction of flora. It also causes the fire susceptible species to decline and saving conditions for other species to establish.
9. **Lack of biodiversity awareness:** Not only the local people but also many of the people involved in forest operation are often not well aware of the importance of biodiversity. The forest officer, NGOs and academic institutions must undertake the biodiversity awareness program regularly.

Grazing

In GNPS one of the main factor affecting the plant biodiversity is over-grazing. This exercise was undertaken in Summer (June 2002) when there is scarcity of fodder. Out of 54 nesses in the Sanctuary, 8 nesses were selected to study anthropogenic pressure. For the studies, 4 nesses on both West and East side in GNPS were selected from western side and 4 nes from eastern side. Line transects were laid (50 X 5 m^2) for calculating the distance covered by the domesticated animals (cattle) for grazing by scoring the number of the dung pies.

Table-30: Occurrence of dung pies around the selected nesses of GNPS

Nesses	50m*	100m	500m	1km	2km	3km
West						
Dhudhala	3	4	8	10.5	2	0.75
Barwania	6.25	7.5	9.5	13	3.75	2
Sapnes	7.5	7	12.5	17.25	5.25	2.75
Jambuthala	4	6.5	10.25	13.25	2.25	1.5

Nesses	50m*	100m	500m	1km	2km	3km
East						
Aral	7.5	8.25	17	18.25	5	3.75
Mindha	8.75	9.5	18	19.75	6.25	4.5
Loki	10.5	11.5	21.5	22.5	7.75	7
Ghodavadi	7	8	22.25	23.5	4.5	5.25

* Average of 4 readings, 50 x 5 m^2 transect in four directions

Study of the grazing pressure on one of the important parameter to indicate the status of anthropogenic pressure in GNPS. During this study comparatively very less dung pies were seen in the monsoon season compared to the summer. In GNPS the longest season is summer. The west side of the area has more natural water-holes with moist patches as compared to east side with more thorny-open patch types of forest. The dung pies were seen more in east side of the GNPS as compared to the west side. From the data compiled it is very clear that cattle traveled as far as 3 km in the sanctuary area for grazing, though maximum dung pies were seen in 2 km radius around the nesses. Further, the movement of cattle for grazing is also dependent as the topography (Table-30 compare Jambuthala and Sapnes nesses).

Table-31: Occurrence of abnoxies weeds around the nesses of GNPS

Nesses	50m*	100m	500m	1km	2km	3km
West						
Dhudhala	7.5	7	15.5	19	4	4.5
Barwania	5.5	4.75	14.75	17	4.5	2.25
Sapnes	5.25	4.5	14.5	17.5	4.25	1.5
Jambuthala	8.75	5.25	18.25	20.5	5.25	2.75
East						
Aral	12	7.5	17.25	11	4	2.25
Mindha	12.5	7.25	15.75	15.25	3	2
Loki	14.5	8	18	19.75	4.5	1.75
Ghodavadi	15.5	9.5	19.75	20.5	5.25	2.75

* Average of 4 readings, Weed species 2 x 2 m^2 on four sides

For the occurrences of abnoxies weed species, the transects were laid (2 X 2 m^2) in the four directions around the selected neses in the GNPS. The results clearly demarcated that the weed species were more in east side as compared to the west side. The presence of more in east sides the abnoxies weeds are more this indicate the heavy grazing pressure, if any possible action not take in to the area the whole

area were cover by The abnoxies weeds noted in the study are *Parthenium hysterophorus* L., *Lantana camara* L., *Xanthium indicum* Koen., *Argemone maxicana* L., *Achyranthus aspera* Linn. and *Ageratum conyzoides* L. Compare with the west sides were less grazing pressures exception in the surrounding area or nes. In the west sides the grazing were more in near nes area compare to the inner forest area.

Table-32: Regeneration survey of browsable species in GNPS

Nesses	50m*	100m	500m	1km	2km	3km
West						
Dhudhala	4	5	11.25	13.75	14	21.5
Barwania	4.5	5.25	12	14.75	13.5	21.75
Sapnes	-	6.25	7	13.5	17.25	18.25
Jambuthala	4.25	7	14.5	18	19	20
East						
Aral	-	2	4	5	5.5	3.75
Mindha	-	2.75	4.5	5.25	6	4
Loki	-	3	5.75	6.5	7	4.75
Ghodavadi	4	6.75	6.25	7.5	3.25	5

* Average of 4 readings, regeneration of palatable sp. 2 m x 2 m on four sides

For regeneration survey of browsable species, the saplings (upto 1 feet long) were scored around the selected nesses (June, 2002) for regeneration survey, the species which were scored includes *Zizyphus mauritiana* Lam., *Zizyphus nummulaia* (Burm. f.) Wight & Arn., *Zizyphus xylopyra* (Retz.) Willd., *Butea monosperma* (Lamk.) Taubert., *Acacia ferruginea* DC., *Acacia leucophloea* (Roxb.) Willd., *Acacia nilotica* (L.) Willd ex. Delile., *Acacia Senegal* (L.) Willd., *Bauhinia purpurea* L., *Bauhinia racemosa* Lam., *Capparis sepiaria* L., *Carissa congesta* Wight., *Holarrhena pubescens* (Buch - Ham.) Wall. ex G. Don., *Weightia tinctoria* R.Br. and *Tectona grandis* L.f. In total 8 nesses (four nesses in west side and four nes in east side) were selected. Transects (2 X 2 m^2) were laid in the four directions around the nesses. During this study very less browsable species were scored in the summer season compared to the monsoon. In Gir National Park and Sanctuary the longest season is summer. The west side of the area has more natural water-holes with moist patches as compared to east side with more thorny-open patch types of forest.

Based on the studies undertaken and data generated following points were seemed important for maintenance of biodiversity and its management.

1. Complete protection to plant species in order to conserve indigenous genetic diversity.
2. Restricting the grazing land for cattle by creation of special grazing land areas. These areas must be sufficient so that grazing can be allowed in rotation to allow regeneration of palatable species including grasses.
3. More detailed studies on the habitat preferences and their management for lion and ungulates.
4. Protection and sustainable use of genetic resources/germplasm through strict implementation of appropriate laws and practices.
5. Establishment of database at various levels support for protecting traditional skills and knowledge for conservation and management of forest flora and fauna.
6. Efforts for multiplication of rare species through conventional approaches and may be even through tissue culture methods.
7. These need to be restriction on introduction of exotic species, the natural floristic elements must be encouraged.
8. Some concerted studies and efforts on the plant pathology for maintenance of good plant health.
9. Efforts are needed to develop of electronic herbarium of all the plant species recorded in GNPS.
10. There is a need to develop seed bank and a botanical garden. This would also help generating awareness among the forest staff and tourists.
11. Studies must be initiated to document ethnobotanical data of various plant species in GNPS specifically with reference to Maldharis.
12. Some studies may be undertaken for seed viability of various problematic tree species and their regeneration (for rare plants).
13. We may encourage development of peripheral forests including good buffer zone to reduce biotic pressure.
14. There must be complete demarcation of forest land from adjoining revenue land to avoid through fare.
15. The obnoxious weeds from the forest areas need to be eradicated.
16. Industrial activities including mining around the forest areas must not be allowed and efforts needed for revegetating the already degraded lands.
17. There must be strict implementation of laws to stop activities like soil removal, MFP collection, fodder and fuel wood collection from GNPS.

18. Removel of cattle dung as compost from nesses for commercial use need to be discourged.
19. Concerted efforts is required to reduce the human and vehicular traffic in GNPS.
20. Development of eco-tourism in the allotted demarcated area only without disturbing the routine habitat so that illegal / Night Safari can be curbed.
21. Generating awareness on the importance of biodiversity and its conservation among the local people and tourist as well as the forest staff.
22. Developing a programme for a special plantation and biodiversity week for the positive involvement of staff, people and tourist.
23. Efforts can be initiated to develop a research center on Gir eco-system and constituent biodiversity for better management of GNPS.
24. Preservation plots for rare and endangered plant species must be developed.
25. Sufficient enrichment of palatable species must be undertaken for ungulates.
26. There is a need of starting a Magazine or a Newsletter for generating awareness on biodiversity among the masses including associated staff.