

Phytosociological study of coastal flora of Devbhoomi Dwarka district and its islands in the Gulf of Kachchh, Gujarat

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Abstract- The study described the diversity and phytosociological attributes of plant species (trees, shrubs and herbs) in coastal areas of Devbhoomi Dwarka District and its islands in the Gulf of Kachchh. A random sampling method was employed in this study. A total of 243 plant species were recorded of which trees and shrubs represented with 30 species each. Grasses & sedges were also represented by 30 species and 29 species were climbers. Among the tree and shrub species, *Prosopis juliflora* showed the highest density (373.51 ind./ha), frequency (63.50.67%), relative density (30.19.7%), relative frequency (24.41%) and relative abundance (7.68%). Regarding herb species, *Aristida redacta* represented the highest density (3.97 ind./sq.m) and frequency (39.02%). Moreover, the highest importance value index was measured in *Prosopis juliflora* (62.28) among trees & shrubs and *Aristida redacta* (31.51) among herbs. The Abundance/Frequency ratio of trees, shrubs and herb species showed contagious distribution pattern within the study area. The present study also includes α diversity (Shannon diversity index, Simpson's Index, species richness, evenness index) of the coastal terrestrial plants.

Keywords: Phytosociological, Abundance/Frequency, α diversity, Devbhoomi Dwarka, Gulf of Kachchh.

I. Introduction

Coastal landscapes and their typical ecosystems are highly dynamic and fragile which are characterized by steep environmental gradients and controlled by geomorphological, physical and biological processes. Despite several constraints, coastal areas are highly diversified offering a wide range of floral diversity. Apparently, the coastal flora is more influenced by the geological setting and climate of the region. Specificity of the flora along the coastline is attributed to the presence of sand dunes, rocky coasts, mud flats, marshlands and intertidal and tidal zone areas. In addition, coastal areas form a unique ecosystem owing to combined influence of both fresh and saline water. This interaction causes the coastal landforms to support large diversity of flora and fauna which are crucial to the ecosystem. Coastal vegetation provides habitats, food and fodder for fauna as well as protection from the wave action. Coastal sand is continually being eroded and deposited on the shore by wave action. Therefore, the role of vegetation in dune fixation is critical since, they serve as wind trappers, sand binders and dune stabilizers [1, 2]. Apart from natural events, coastal areas are subjected to constant anthropogenic pressure which disturbs the coastal ecosystem. Therefore, it is a subject of prime importance to study the coastal areas in their natural state.

II. Related Work

With variant geological setting, the coastline of Devbhoomi Dwarka District and its islands in the Gulf of Kachchh (GoK) harbour different types of vegetation which include mangrove and their associates, scrub jungles, grassland, aquatic, and sand dune vegetation. In past, different aspects of Coastal flora have been studied by many researchers [3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16 and 17].

Though several reports on coastal flora are available but the entire floristic composition and quantification has not been alone. The species diversity may change with time and locations due to many existing factors. Therefore seasonal assessment is essential. The present study aims to generate such information of coastal terrestrial flora of Devbhoomi Dwarka District and its islands in GoK.

III. METHODOLOGY

Study area

Devbhoomi Dwarka district of India is located on the southern coast of the GoK, in Gujarat state. It extends between 21.42° to 22.58°N Latitude and 68.58° to 70.40° E Longitude [18]. Coastal areas of the district are distributed in three Talukas which are Okhamandal, Kalyanpur and Khambhaliya. Nine Islands viz., Ajad, Beyt Dwarka, Bhaidar, Dabdaba, Dhani, Gadu, Leffa, Kalubhar and Panero have been covered in this district. The soil of Devbhoomi Dwarka district is calcareous and alkaline in nature with grain size varying from silty loam to clay [19]. The district receives average rainfall of 596 mm [20].

Field Data collection

The present work is based on the survey of vegetation occurring in coastal areas and its 9 islands of Devbhoomi Dwarka district during 2011-2015. The area was surveyed on foot and random sampling method was followed. In the coastal area, line transects of 500 m were laid perpendicular to HTL (High Tide Line to landward side) by using 5km×5km grid laid over land use/land cover maps. Distance of 5 km between two subsequent line intersects was maintained using Global Positioning System (GPS). Within each transect, quadrates were laid at an interval of 20 m, 5m ×5m for trees and shrubs and 1m×1m for herbs, grasses and climbers [21, 22, 23]. However, to enrich the species inventory the opportunistic coastal area at each site (areas falling out side of the quadrates) were also explored and monsoon data for herbaceous plants were also recorded in the same sampling plots. The coastal areas of Devbhoomi Dwarka District and its Islands were explored by laying a total of 46 transacts comprising of 915 quadrates (1m×1m size) and 589 quadrates (5m×5m size), respectively. Within each sampling plot the number and name of all the trees, shrubs and herbs were counted and recorded. The plants were collected in the flowering and fruiting stages and were identified by using different available floristic keys [24, 25, 26, 27, 28]. Documentation was done in the form of photographs as well as plant specimen were preserved by preparing herbarium and deposited in the GEER Foundation, Gandhinagar, Gujarat for future reference.

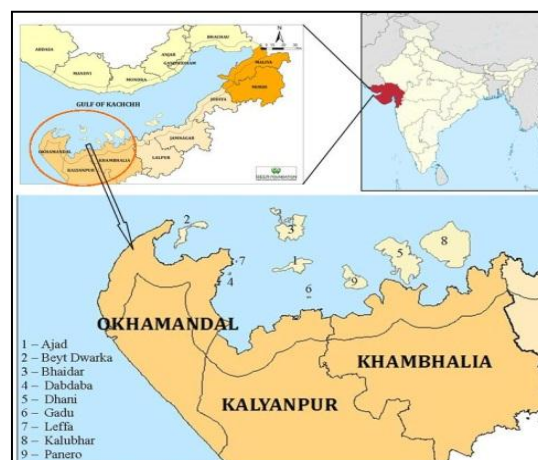


Figure 1. Study area (Coastal areas and 9 islands of Devbhoomi Dwarka district)

Data Analysis:

Phytosociological characters like Density (D), relative density (RD), frequency (F), relative frequency (RF), abundance (A), relative abundance (RA) and Importance Value Index (IVI) were calculated by using different formulas [29] and abundance frequency ratio (A/F) for Tree, shrub and herb species were also calculated through distribution patterns of Whitford [30]. Plant biodiversity was calculated by using different standard equations such as Shannon- Wiener diversity index [31], Simpson's index [32], Evenness index [33] and Species richness index [34].

IV. RESULTS AND DISCUSSION

Qualitative analysis

The coastal areas and 9 islands of Devbhoomi Dwarka district were found predominantly covered with shrubby and herbaceous species including grasses. A total 242 Angiosperm and 1 Gymnosperm species belonging to 177 Genera and 61 Families were recorded (Table 1, Annexure 1). Angiosperm plant diversity includes 202 Dicot and 40 Monocot species. The ratio of Monocots to Dicots was 1:9.0 Families, 1: 5 Genera and 1:5.1 Species. The ratio of Family to Genera and Species was 1: 2.9: 4.

Table 1. Floral richness in Coastal areas of Devbhoomi Dwarka District

	Family	Genera	Species
A. Angiosperm			
Dicotyledons	54	144	202
Monocotyledons	6	32	40
B. Gymnosperm	1	1	1
Total	61	177	243

Among 202 dicot species sub-class Polypetalae exhibited the highest no of species (97 species), followed by Gamopetalae (74 species) and Monochlamydeae (31 species). Within Polypetalae, Calyciflorae group was represented with the maximum number of species (52), followed by Thalamiflorae and Disciflorae. Ratio of subclasses, Polypetalae to Gamopetalae to Monochlamydeae was 1:0.8:0.3 and in the subclass Polypetalae, ratio of groups Thalamiflorae to Disciflorae to Calyciflorae was 1:0.45:1.58 (Figure 2).

During study, it was revealed that Poaceae was the largest family in Monocotyledons represented by 23 species and 20 Genera, whereas Fabaceae was the largest family among Dicotyledons represented by 20 species and 12 Genera. Out of 61 families, only 11 families were represented with more than half of the species recorded and 22 families were represented with single species. The genera *Ipomoea* had the highest number of species *i.e.* 8 followed by *Cassia* and *Euphorbia* genera both represented with 6 species. Among recorded 177 genera, 28 genera were represented by two species and 137 genera were represented with a single species (Annexure 1).

Habit wise distribution of angiosperms is illustrated in Figure 3. Among 243 recorded species, herbs were represented by the highest number of species (124), followed by trees, shrubs and grasses & sedges represented with 30 species each and climber (29 species).

Among 3 talukas, the highest species diversity was found in Khambaliya taluka (207 species) followed by Okhamandal (192 species) and Kalyanpur (169 species). Among islands, Beyt Dwarka showed the maximum species diversity (166 species) followed by Azad (120 species) and Gadu (118 species). The lowest species diversity was found in Kalubhar island with 24 species (Figure 4). High floral diversity in Beyt Dwarka may be due to its proximity to coast and human interference due to tourist influx as well as fishermen. It was observed that, the islands near to the coast have high floral diversity, which is similar to the adjoining coastal area. Human beings, winds and water current help to disperse the seeds of various species in such islands and after that great struggle for survival of the plant species acclimate to island conditions ensues. Other islands were with less floral diversity and one of the reasons may be isolation and distance from coastal area. It was reported that a total of 127 vascular plants and a species of Gymnosperm recorded from Beyt Dwarka Island [16]. In that study, the dicotyledonous plant included 45 families, 91 genera and 113 species, and the monocotyledonous plant included 3 families, 11 genera and 13 species [16].

Quantitative analysis of trees and Shrubs:

During the quadrat sampling, a total of 17 species of trees and shrub were recorded. Among the 17 species, *Prosopis juliflora* habited the highest density (373.51 ind./ha), followed by *Capparis decidua* (135.82 ind./ha), *Zizyphus nummularia* (112.73 ind./ha) and *Salvadora persica* (112.73 ind./ha). On the other hand, the lowest density (3.40 ind/ha) was observed in *Acacia senegal*. The highest frequency (63.50%) was measured in *Prosopis juliflora* followed by *Zizyphus nummularia* (32.94%) and *Capparis decidua* (26.99%). The lowest frequency was recorded in *Acacia senegal* (0.85%). (Table 2)

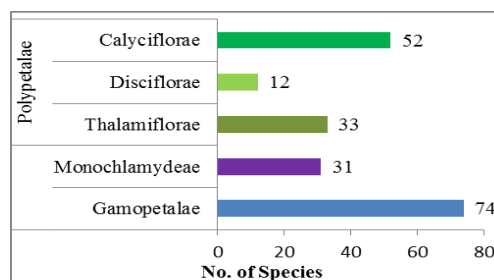


Figure 2. Distribution of classes and groups within dicotyledons

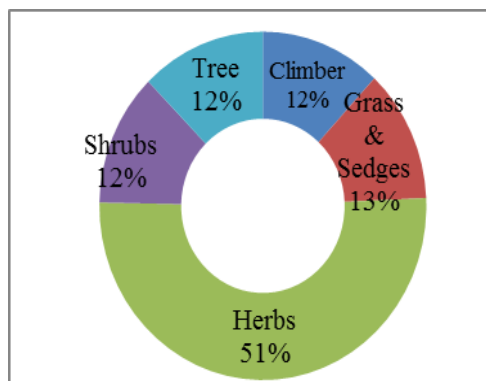


Figure 3. Habit Distribution

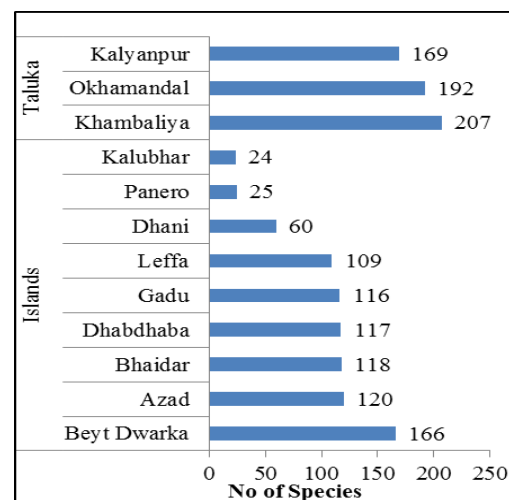


Figure 4. Taluka and Island wise species richness of Devbhoomi Dwarka District.

Distribution of species is one of the important aspects of ecological studies, which has previously attracted attention of a number of ecologists [30, 35, 36, 37]. A value of abundance and frequency ratio below 0.025 was considered as regular distribution, between 0.025 to 0.050 as random and more than 0.050 as contagious distribution pattern [38]. In the present study, A/F values for different tree and shrub species revealed that all the species had contagious distribution pattern in the district (Table 2). It has been stated that the A/F ratio as a measure of contagiousness among plant population was widely accepted [30].

Important Value Index determines the extent of dominance of a species in the structure of a forest stand [39]. It is said that species with the greatest importance value are the leading dominant of the particular vegetation. Accordingly the leading dominant tree and shrub species of coastal areas of Devbhoomi Dwarka district was *Prosopis juliflora* (62.28) followed by *Capparis deciduas* (27.93) and *Zizyphus nummularia* (26.24). On the other hand, the least dominant species was *Acacia Senegal* (5.82) (Table 2).

Table 2. Phytosociological attributes of tree and shrub species in coastal areas and its islands of Devbhoomi Dwarka district in GoK

No.	Botanical name	D (ind./ha)	F (%)	A	A/F	RD (%)	RF (%)	RA (%)	IVI
1	<i>Prosopis juliflora</i>	373.51	63.50	588.24	9.26	30.19	24.41	7.68	62.28
2	<i>Capparis decidua</i>	135.82	26.99	503.14	18.64	10.98	10.38	6.57	27.93
3	<i>Zizyphus nummularia</i>	112.73	32.94	342.27	10.39	9.11	12.66	4.47	26.24
4	<i>Salvadora persica</i>	112.73	16.13	698.95	43.33	9.11	6.20	9.13	24.44
5	<i>Euphorbia nivulia</i>	83.53	26.32	317.42	12.06	6.75	10.12	4.15	21.01
6	<i>Acacia nilotica</i>	83.53	18.85	443.24	23.52	6.75	7.25	5.79	19.79
7	<i>Grewia tanex</i>	80.14	18.68	429.09	22.98	6.48	7.18	5.60	19.26
8	<i>Grewia villosa</i>	76.06	16.81	452.53	26.92	6.15	6.46	5.91	18.52
9	<i>Commiphora wightii</i>	59.08	13.58	435.00	32.03	4.77	5.22	5.68	15.68
10	<i>Cassia auriculata</i>	58.40	12.56	464.86	37.00	4.72	4.83	6.07	15.62
11	<i>Calotropis procera</i>	19.02	3.90	486.96	124.70	1.54	1.50	6.36	9.40
12	<i>Salvadora oleoides</i>	17.66	3.57	495.24	138.90	1.43	1.37	6.47	9.27
13	<i>prosopis cineraria</i>	8.15	2.04	400.00	196.33	0.66	0.78	5.22	6.67
14	<i>Cadaba fruticosa</i>	5.43	1.36	400.00	294.50	0.44	0.52	5.22	6.19
15	<i>Ephedra foliata</i>	4.07	1.02	400.00	392.67	0.33	0.39	5.22	5.94
16	<i>Mimosa hamata</i>	4.07	1.02	400.00	392.67	0.33	0.39	5.22	5.94
17	<i>Acacia senegal</i>	3.40	0.85	400.00	471.20	0.27	0.33	5.22	5.82
		100.0	100.0	100.0	300.0				
D (ind./ha)= Density (Individual/hector), F (%)= Frequency (Percent); A= Abundance, A/F= Abundance/Frequency, RD (%)= Relative Density (Percent) , RF(%)= Relative Frequency (Percent), RA (%)= Relative Abundance (Percent) , IVI= Important Value Index.									

Quantitative analysis of Herbs:

With respect to the herb species, a total of 93 species were enumerated during quadrat study. The highest density was measured in *Aristida redacta* (3.97 ind./sq.m.), followed by *Aeluropus lagopoides* (3.81 ind./sq.m.) and *Halopyrum mucronatum* (2.43 ind./sq.m). On the other hand, the lowest density (0.001 ind./sq. m.) was calculated in *Vigna radiata*, *Striga gesneriodes*, *Ruellia tuberosa*, *Peristrophe bicalyculata*, *Leucas cephalotes*, *Indigofera linnaei*, *Glinus lotoides* and *Aristolochia bracteolata*. However, the highest frequency was measured in *Aristida redacta* (39.02%), followed by *Aeluropus lagopoides* (35.96%) and *Sporobolus maderaspatana* (33.77%). The lowest frequency 0.11% was measured in *Vigna radiata*, *Striga gesneriodes*, *Ruellia tuberosa*, *Peristrophe bicalyculata*, *Leucas cephalotes*, *Indigofera linnaei*, *Glinus lotoides* and *Aristolochia bracteolata*, *Grangea maderaspatana* and *Tinospora cordifolia* (Table 3).

The A/F ratio of herb species in the coastal areas of Devbhoomi Dwarka district and its islands indicated contagious distribution pattern as ratio is higher than 0.05 (Table 3). A similar observation was found for herb species of a deforested area

in Bangladesh which showed contagious distribution [40]. The present work reveals that, the study area was not completely uniform because several species showed contagious distribution [41] (Table 3). As a general rule, higher frequency and lower abundance indicates regular distribution pattern whereas the reverse indicates the contagious distribution. In general, regular distribution occurs where severe competition exists between individuals; random distribution is found in very uniform environment and contagious distribution is common in nature [41]. Contagious distribution depends on local habitat, seasonal weather changes and reproductive processes.

Based on IVI, *Aristida redacta* was the most dominant species followed by *Aeluropus lagopoides*, *Halopyrum mucronatum*, *Sporobolus maderaspatana*, *Salicornia brachiata*, *Cyperus conglomeratus*. On the other hand, the least dominant species were *Vigna radiata*, *Striga gesneriodes*, *Ruellia tuberosa*, *Peristrophe bicalyculata*, *Leucas cephalotes*, *Indigofera linnaei*, *Glinus lotoides* and *Aristolochia bracteolata* (Table 3).

Table 3. Phytosociological attributes of herb species in coastal areas and its islands of Devbhoomi Dwarka district in GoK

No.	Botanical name	D (ind./m ²)	F (%)	A	A/F	RD (%)	RF (%)	RA (%)	IVI
1	<i>Aristida redacta</i>	3.97	39.02	10.18	0.26	18.75	9.07	3.69	31.51
2	<i>Aeluropus lagopoides</i>	3.81	35.96	10.60	0.29	18.00	8.36	3.85	30.21
3	<i>Halopyrum mucronatum</i>	2.43	14.43	16.83	1.17	11.47	3.35	6.11	20.93
4	<i>Sporobolus maderaspatana</i>	1.94	33.77	5.75	0.17	9.17	7.85	2.09	19.11
5	<i>Cyperus conglomeratus</i>	1.04	17.60	5.94	0.34	4.93	4.09	2.16	11.18
6	<i>Salicornia brachiata</i>	1.00	5.79	17.26	2.98	4.72	1.35	6.27	12.34
7	<i>Indigofera cordifolia</i>	0.76	20.87	3.65	0.17	3.60	4.85	1.32	9.77
8	<i>Pulicaria wightiana</i>	0.71	16.72	4.27	0.26	3.37	3.89	1.55	8.81
9	<i>Goniogyna hirta</i>	0.44	15.30	2.89	0.19	2.09	3.56	1.05	6.70
10	<i>Cressa cretica</i>	0.42	11.37	3.73	0.33	2.00	2.64	1.35	6.00
11	<i>Lepidagathis trinervis</i>	0.39	16.28	2.41	0.15	1.85	3.79	0.87	6.51
12	<i>Boerhavia chinensis</i>	0.39	18.36	2.10	0.11	1.82	4.27	0.76	6.85
13	<i>Barleria prionitis</i>	0.35	16.07	2.16	0.13	1.64	3.73	0.79	6.16
14	<i>Aerva lanata</i>	0.31	13.33	2.34	0.18	1.48	3.10	0.85	5.43
15	<i>Cyperus pangorei</i>	0.31	10.27	2.99	0.29	1.45	2.39	1.09	4.92
16	<i>Abutilon glaucum</i>	0.29	12.46	2.32	0.19	1.36	2.90	0.84	5.10
17	<i>Fimbristylis cymosa</i>	0.28	9.29	3.01	0.32	1.32	2.16	1.09	4.57
18	<i>Achyranthes aspera</i>	0.24	10.16	2.41	0.24	1.16	2.36	0.87	4.39
19	<i>Aloe barbadensis</i>	0.15	7.21	2.03	0.28	0.69	1.68	0.74	3.11
20	<i>Juncus maritimus</i>	0.12	5.14	2.26	0.44	0.55	1.19	0.82	2.56
21	<i>Apluda mutica</i>	0.11	0.55	20.40	37.33	0.53	0.13	7.41	8.06
22	<i>Boerhavia diffusa</i>	0.10	6.12	1.68	0.27	0.49	1.42	0.61	2.52
23	<i>Celosia argentea</i>	0.10	5.57	1.84	0.33	0.49	1.30	0.67	2.45
24	<i>Alysicarpus longifolius</i>	0.09	0.66	13.50	20.59	0.42	0.15	4.90	5.47
25	<i>Clitoria ternatea</i>	0.09	5.90	1.50	0.25	0.42	1.37	0.54	2.33
26	<i>Asparagus recemosus</i>	0.09	7.65	1.14	0.15	0.41	1.78	0.41	2.61
27	<i>Echinops echinatus</i>	0.07	3.83	1.94	0.51	0.35	0.89	0.71	1.95
28	<i>Suaeda fruticosa</i>	0.07	0.66	10.33	15.76	0.32	0.15	3.75	4.22
29	<i>Launaea procumbens</i>	0.07	4.48	1.49	0.33	0.31	1.04	0.54	1.90
30	<i>Sida cordifolia</i>	0.07	5.14	1.30	0.25	0.31	1.19	0.47	1.98
31	<i>Fagonia cretica</i>	0.06	4.04	1.38	0.34	0.26	0.94	0.50	1.70
32	<i>Argemone maxicana</i>	0.05	3.72	1.44	0.39	0.25	0.86	0.52	1.64
33	<i>Heliotropium curassavicum</i>	0.05	3.06	1.68	0.55	0.24	0.71	0.61	1.56
34	<i>Cleome viscosa</i>	0.05	3.93	1.25	0.32	0.23	0.91	0.45	1.60
35	<i>Commelina benghalensis</i>	0.05	1.86	2.53	1.36	0.22	0.43	0.92	1.57
36	<i>Enicostema hyssopifolium</i>	0.04	2.51	1.78	0.71	0.21	0.58	0.65	1.44
37	<i>Acanthospermum hispidum</i>	0.04	0.87	4.63	5.29	0.19	0.20	1.68	2.07
38	<i>Coculus hirsutus</i>	0.04	2.51	1.43	0.57	0.17	0.58	0.52	1.28
39	<i>Polycarpha corymbosa</i>	0.04	0.22	16.50	75.49	0.17	0.05	5.99	6.21

No.	Botanical name	D (ind./m ²)	F (%)	A	A/F	RD (%)	RF (%)	RA (%)	IVI
40	<i>Solanum indicum</i>	0.03	2.62	1.33	0.51	0.17	0.61	0.48	1.26
41	<i>Tridax procumbens</i>	0.03	0.77	4.57	5.98	0.17	0.18	1.66	2.00
42	<i>Cucumis propheratum</i>	0.03	3.06	1.04	0.34	0.15	0.71	0.38	1.24
43	<i>Coldenia procumbens</i>	0.03	2.30	1.33	0.58	0.14	0.53	0.48	1.16
44	<i>Convolvulus microphyllus</i>	0.03	1.97	1.44	0.73	0.13	0.46	0.52	1.12
45	<i>Coccinia grandis</i>	0.03	1.64	1.53	0.94	0.12	0.38	0.56	1.06
46	<i>Solanum surattense</i>	0.02	1.97	1.22	0.62	0.11	0.46	0.44	1.01
47	<i>Justisia procumbens</i>	0.02	0.66	3.50	5.34	0.11	0.15	1.27	1.53
48	<i>Heliotropium ovalifolium</i>	0.02	1.42	1.54	1.08	0.10	0.33	0.56	0.99
49	<i>Limonium stocksii</i>	0.02	1.09	1.60	1.46	0.08	0.25	0.58	0.92
50	<i>Pentatropis spiralis</i>	0.02	1.31	1.33	1.02	0.08	0.30	0.48	0.87
51	<i>Dactyloctenium aegyptium</i>	0.02	0.22	7.50	34.31	0.08	0.05	2.72	2.85
52	<i>Euphorbia hirta</i>	0.02	1.20	1.27	1.06	0.07	0.28	0.46	0.81
53	<i>Sericostoma pauciflorum</i>	0.02	0.98	1.56	1.58	0.07	0.23	0.56	0.87
54	<i>Citrullus colocynthis</i>	0.01	0.77	1.71	2.24	0.06	0.18	0.62	0.86
55	<i>Ipomoea obscura</i>	0.01	0.87	1.50	1.72	0.06	0.20	0.54	0.81
56	<i>Rhynchosia minima</i>	0.01	0.87	1.50	1.72	0.06	0.20	0.54	0.81
57	<i>Ipomoea eriocarpa</i>	0.01	1.09	1.10	1.01	0.06	0.25	0.40	0.71
58	<i>Cucumis callosus</i>	0.01	1.09	1.00	0.92	0.05	0.25	0.36	0.67
59	<i>Sesuvium portulacastrum</i>	0.01	0.87	1.13	1.29	0.05	0.20	0.41	0.66
60	<i>Cistanche tubulosa</i>	0.01	0.66	1.33	2.03	0.04	0.15	0.48	0.68
61	<i>Vernonia cinerea</i>	0.01	0.77	1.14	1.49	0.04	0.18	0.41	0.63
62	<i>Cardiospermum halicacabum</i>	0.01	0.44	1.75	4.00	0.04	0.10	0.64	0.77
63	<i>Ipomoea pes-carpa</i>	0.01	0.55	1.40	2.56	0.04	0.13	0.51	0.67
64	<i>Pedaliu murex</i>	0.01	0.55	1.20	2.20	0.03	0.13	0.44	0.59
65	<i>Physalis minima</i>	0.01	0.33	2.00	6.10	0.03	0.08	0.73	0.83
66	<i>Abutilon indicum</i>	0.01	0.55	1.00	1.83	0.03	0.13	0.36	0.52
67	<i>Cassia pumila</i>	0.01	0.33	1.67	5.08	0.03	0.08	0.61	0.71
68	<i>Commelina forskalaei</i>	0.01	0.33	1.67	5.08	0.03	0.08	0.61	0.71
69	<i>Corchorus depressus</i>	0.01	0.55	1.00	1.83	0.03	0.13	0.36	0.52
70	<i>Dactyloctenium sindicum</i>	0.01	0.55	1.00	1.83	0.03	0.13	0.36	0.52
71	<i>Eclipta prostrata</i>	0.01	0.22	2.50	11.44	0.03	0.05	0.91	0.98
72	<i>Rungia repens</i>	0.01	0.55	1.00	1.83	0.03	0.13	0.36	0.52
73	<i>Desmostachya bipinnata</i>	0.004	0.33	1.33	4.07	0.02	0.08	0.48	0.58
74	<i>Leucas aspera</i>	0.004	0.33	1.33	4.07	0.02	0.08	0.48	0.58
75	<i>Polygala erioptera</i>	0.004	0.44	1.00	2.29	0.02	0.10	0.36	0.49
76	<i>Alysicarpus procumbens</i>	0.003	0.22	1.50	6.86	0.02	0.05	0.54	0.61
77	<i>Ipomoea coptica</i>	0.003	0.33	1.00	3.05	0.02	0.08	0.36	0.45
78	<i>Ocimum basilicum</i>	0.003	0.33	1.00	3.05	0.02	0.08	0.36	0.45
79	<i>Pergularia daemia</i>	0.003	0.33	1.00	3.05	0.02	0.08	0.36	0.45
80	<i>Polycarpaea spicata</i>	0.003	0.33	1.00	3.05	0.02	0.08	0.36	0.45
81	<i>Tinospora cordifolia</i>	0.003	0.11	3.00	27.45	0.02	0.03	1.09	1.13
82	<i>Aerva l javanica</i>	0.002	0.22	1.00	4.58	0.01	0.05	0.36	0.42
83	<i>Amberboa ramosa</i>	0.002	0.22	1.00	4.58	0.01	0.05	0.36	0.42
84	<i>Chrozophora rottleri</i>	0.002	0.22	1.00	4.58	0.01	0.05	0.36	0.42
85	<i>Grangea maderaspatana</i>	0.002	0.11	2.00	18.30	0.01	0.03	0.73	0.76
86	<i>Aristolochia bracteolata</i>	0.001	0.11	1.00	9.15	0.01	0.03	0.36	0.39
87	<i>Glinus lotoides</i>	0.001	0.11	1.00	9.15	0.01	0.03	0.36	0.39
88	<i>Indigofera linnaei</i>	0.001	0.11	1.00	9.15	0.01	0.03	0.36	0.39
89	<i>Leucas cephalotes</i>	0.001	0.11	1.00	9.15	0.01	0.03	0.36	0.39
90	<i>Peristrophe bicalyculata</i>	0.001	0.11	1.00	9.15	0.01	0.03	0.36	0.39

No.	Botanical name	D (ind./m ²)	F (%)	A	A/F	RD (%)	RF (%)	RA (%)	IVI
91	<i>Ruellia tuberosa</i>	0.001	0.11	1.00	9.15	0.01	0.03	0.36	0.39
92	<i>Striga gesnerioides</i>	0.001	0.11	1.00	9.15	0.01	0.03	0.36	0.39
93	<i>Vigna radiata</i>	0.001	0.11	1.00	9.15	0.01	0.03	0.36	0.39
						100.0	100.0	100.0	300.0
D (ind./m ²)= Density (Individual/Square meter), F (%)= Frequency (Percent); A= Abundance, A/F= Abundance/Frequency, RD (%)= Relative Density (Percent) , RF(%)= Relative Frequency (Percent), RA (%)= Relative Abundance (Percent) , IVI= Important Value Index.									

Plant Species Diversity:

Measurement of biodiversity concentrates on the species level and species diversity is one of the most important indices which are used for the evaluation of ecosystems at different scales [42]. The Shannon-Wiener Index (H') and Simpson's index (c) were used to determine which community is more diverse. A large value of H' Index indicates rich ecosystem with high species diversity, whereas a low value of H' Index represents an ecosystem with little diversity [43]. An ecosystem with H' value greater than 2 has been regarded as medium to high diverse in terms of species [44]. The probability that two individuals chosen at random will be the same species is measured by The Simpson's Index. Because of this, the range for the Simpson's Index (c) is from Zero to One. Zero is the least diverse and one is the highest level of diversity attainable with this index [43]. In the present study Shannon-Wiener diversity (H') index and Simpson's index (c) was 3.113 and 0.916, respectively. Thus the coastal area of Devbhoomi Dwarka District and its islands has rationally high species diversity.

The study came with index of dominance of 1.190 for the coastal area of Devbhoomi Dwarka District and its islands. The greater value of index of dominance exhibits the lower species diversity and vice versa in the scale of 0 to 1 [45].

Species richness and evenness are the two separate ideas of heterogeneity— it is only natural to try to measure the evenness component separately. In 1964, Lloyd and Ghelardi [46] were the first who came with idea to measure the evenness component of diversity separately [47]. Evenness describes how equally individuals are distributed amongst the species. Pielou's evenness index (e) was 0.794 and Margalef species richness index (d) was 10.87 in the study area.

V. CONCLUSION

Floristic diversity assessment at local and regional levels is required to understand the present status and to make effective management strategies for conservation. The results in the present study clearly show that, the Coastal areas of Devbhoomi Dwarka district and its islands are rich in phytodiversity. A record of 243 species during the study period reflects that the coastal areas of Devbhoomi Dwarka district and its islands have the potential to harbour rich species diversity with various ecological services. The present finding provides an assessment on floral diversity, density, frequency and important value index which will be helpful for preparing a sustainable management plan. Moreover the study results will serve as a primary input towards monitoring and sustaining the phytodiversity of the coastal areas of Devbhoomi Dwarka district and its islands in the Gulf of Kachhh.

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Annexure 1. Checklist of Coastal Terrestrial Plants of Devbhoomi Dwarka District and its islands

No.	Botanical Name	Family	Habit	No.	Botanical Name	Family	Habit
1	<i>Abelmoschus moschatus</i> Medic.	Malvaceae	Herb	123	<i>Haloxylon salicornicum</i> (Moq.) Bunge ex Boiss.	Chenopodiaceae	Shrub
2	<i>Abrus precatorius</i> L.	Fabaceae	Herb	124	<i>Helichrysum cutchicum</i> (C.B.Clarke) R.S.Rao & Deshp.	Asteraceae	Herb
3	<i>Abutilon glaucum</i> (Cav.) Cav.	Malvaceae	Herb	125	<i>Heliotropium curassavica</i> L.	Boraginaceae	Herb
4	<i>Abutilon indicum</i> (L.) Sweet	Malvaceae	Herb	126	<i>Heliotropium ovalifolium</i> Forsk	Boraginaceae	Herb
5	<i>Acacia ferruginea</i> DC.	Mimosaceae	Tree	127	<i>Heliotropium strigosum</i> Willd.	Boraginaceae	Herb
6	<i>Acacia leucophloea</i> (Roxb.) Willd.	Mimosaceae	Tree	128	<i>Hewittia sublobata</i> (L. f.) Kuntze	Convolvulaceae	Herb
7	<i>Acacia nilotica</i> (L.) Delile	Mimosaceae	Tree	129	<i>Hibiscus ovalifolius</i> (Forssk.) Vahl	Malvaceae	Herb
8	<i>Acacia senegal</i> (L.) Willd	Mimosaceae	Tree	130	<i>Hibiscus palmatus</i> Forssk.	Malvaceae	Herb
9	<i>Acanthospermum hispidum</i> DC.	Asteraceae	Herb	131	<i>Hyphaene dichotoma</i> (White) Furtado	Arecaceae	Tree
10	<i>Achyranthes aspera</i> L.	Amaranthaceae	Herb	132	<i>Hyptis suaveolens</i> (L.) Poit.	Lamiaceae	Herb
11	<i>Aegiceras corniculatum</i> (L.) Blanco	Myrsinaceae	Tree	133	<i>Indigofera linifolia</i> var. <i>linifolia</i> Retz.	Fabaceae	Herb
12	<i>Aegle marmelos</i> (L.) Corrêa	Rutaceae	Tree	134	<i>Indigofera linnaei</i> Ali	Fabaceae	Climber
13	<i>Aeluropus lagopoides</i> (L.) Thwaites	Poaceae	Grass	135	<i>Indigofera cordifolia</i> Roth	Fabaceae	Herbs
14	<i>Aerva javanica</i> (Burm.f.) Juss. ex Schult	Amaranthaceae	Herb	136	<i>Ipomoea coptica</i> (L.) Roth ex Roem. & Schult	Convolvulaceae	Climber
15	<i>Aerva lanata</i> (L.) Juss.	Amaranthaceae	Herb	137	<i>Ipomoea sepiaria</i> var. <i>sepiaria</i>	Convolvulaceae	Climber
16	<i>Aloe barbadensis</i> Mill	Liliaceae	Shrub	138	<i>Ipomoea aquatica</i> Forssk.	Convolvulaceae	Climber
17	<i>Alternanthera sessilis</i> (L.) R.Br. ex DC	Amaranthaceae	Herbs	139	<i>Ipomoea eriocarpa</i> R. Br	Convolvulaceae	Climber
18	<i>Alysicarpus longifolius</i> (Spreng.) Wight & Arn.	Fabaceae	Herb	140	<i>Ipomoea fistulosa</i> Mart. ex Choisy	Convolvulaceae	Shrub
19	<i>Alysicarpus monilifer</i> (L.) DC.	Fabaceae	Herb	141	<i>Ipomoea obscura</i> (L.) Ker Gawl	Convolvulaceae	Climber
20	<i>Alysicarpus procumbens</i> (Roxb.) Schindl.	Fabaceae	Herb	142	<i>Ipomoea pes-caprae</i> (L.) R. Br.	Convolvulaceae	Climber
21	<i>Alysicarpus vaginalis</i> (L.) DC.	Fabaceae	Herb	143	<i>Ipomoea pes-tigridis</i> L	Convolvulaceae	Climber
22	<i>Amaranthus spinosus</i> L.	Amaranthaceae	Herb	144	<i>Isache dispar</i> Trin. Sp.	Poaceae	Grass
23	<i>Amberboa ramosa</i> (Roxb.) Jafri.	Asteraceae	Herb	145	<i>Juncus merittimus</i> Lam.	Juncaceae	Herb
24	<i>Apluda mutica</i> L.	Poaceae	Grass	146	<i>Justicia procumbens</i> L.	Acanthaceae	Herb
25	<i>Argemone mexicana</i> L	Papaveraceae	Herb	147	<i>Kickxia ramossissima</i> (Wall.) Janch.	Scrophulariaceae	Herb
26	<i>Aristida redacta</i> Stapf.	Poaceae	Grass	148	<i>Laggera aurita</i> Sch. Bip.	Asteraceae	Herb
27	<i>Aristolochia bracteolata</i> Lam.	Aristolochiaceae	Herb	149	<i>Launaea procumbens</i> (Roxb.) Ramayya & Rajagopal	Asteraceae	Herb
28	<i>Asparagus racemosus</i> Willd	Liliaceae	Climber	150	<i>Launaea resedifolia</i> Druce	Asteraceae	Herb
29	<i>Avicennia marina</i> (Forssk.) Vierh.	Avicenniaceae	Tree	151	<i>Lepidagathis trinervis</i> Nees	Acanthaceae	Herb
30	<i>Azadirachta indica</i> A.Juss.	Meliaceae	Tree	152	<i>Leucaena leucocephala</i> (Lam.) de Wit	Mimosaceae	Tree
31	<i>Balanites aegyptiaca</i> (L.) Delile	Balanitaceae	Shrub	153	<i>Leucas aspera</i> (Willd.) Link	Lamiaceae	Herb
32	<i>Barleria prionitis</i> L.	Acanthaceae	Herb	154	<i>Leucas cephalotes</i> (Roth) Spreng	Lamiaceae	Herb
33	<i>Bergia suffruticosa</i> (Delile) Fenzl	Elatinaceae	Herb	155	<i>Limonia acidissima</i> Groff	Rutaceae	Tree

No.	Botanical Name	Family	Habit	No.	Botanical Name	Family	Habit
34	<i>Bidens biternata</i> (Lour.) Merr. & Sherff	Asteraceae	Herb	156	<i>Limonium stocksii</i> Kuntze	Plumbaginaceae	Herb
35	<i>Boerhavia chinensis</i> (L.) Rottb.	Nyctaginaceae	Herb	157	<i>Luffa acutangula</i> var. <i>amara</i> (Lam.) Cl.	Cucurbitaceae	Climber
36	<i>Boerhavia diffusa</i> L.	Nyctaginaceae	Herb	158	<i>Maerua oblongifolia</i> (Forssk.) A. Rich.	Capparaceae	Shrub
37	<i>Boerhavia verticillata</i> Poir.	Nyctaginaceae	Herb	159	<i>Manilkara hexandra</i> (Roxb.) Dubard	Sapotaceae	Tree
38	<i>Bolboschoenus maritimus</i> (L.) Palla	Cyperaceae	Sedge	160	<i>Maytenus emarginata</i> (Willd.) Ding Hou	Celastraceae	Shrub
39	<i>Borreria articularis</i> (L.f.) F. N.	Rubiaceae	Herb	161	<i>Melanocentris jacquemontii</i> Jaub. & Spach	Poaceae	Grass
40	<i>Borreria stricta</i> (L.f.) Schum	Rubiaceae	Herb	162	<i>Melia azedarach</i> L.	Meliaceae	Tree
41	<i>Cadaba fruticosa</i> (L.) Druce	Capparaceae	Shrub	163	<i>Mimosa hamata</i> Willd.	Mimosaceae	Herb
42	<i>Calotropis gigantea</i> (L.) Dryand.	Asclepiadaceae	Shrub	164	<i>Mollugo pentaphylla</i> L.	Molluginaceae	Herb
43	<i>Calotropis procera</i> (Aiton) Dryand.	Asclepiadaceae	Shrub	165	<i>Momordica charantia</i> L.	Cucurbitaceae	Climber
44	<i>Canavalia cathartica</i> Thouars	Fabaceae	Climber	166	<i>Mucuna prurita</i> Hk. F.	Fabaceae	Herb
45	<i>Capparis cartilaginea</i> Decne	Capparaceae	Shrub	167	<i>Mukia maderaspatana</i> (L.) M. Roem.	Cucurbitaceae	Climber
46	<i>Capparis decidua</i> (Forssk.) Edgew.	Capparaceae	Shrub	168	<i>Nerium indicum</i> Mill.	Apocynaceae	Shrub
47	<i>Cardiospermum halicacabum</i> L.	Sapindaceae	Climber	169	<i>Ocimum basilicum</i> L.	Lamiaceae	Herb
48	<i>Cassia sophera</i> L. var. <i>sophera</i>	Caesalpiniaceae	Shrub	170	<i>Opuntia elatior</i> Mill.	Cactaceae	Shrub
49	<i>Cassia auriculata</i> L.	Caesalpiniaceae	Shrub	171	<i>Panicum psilopodium</i> Trin Var. <i>Psilopodium</i>	Poaceae	Grass
50	<i>Cassia italica</i> (Mill.) Spreng.	Caesalpiniaceae	Herb	172	<i>Parkinsonia aculeata</i> L.	Caesalpiniaceae	Tree
51	<i>Cassia occidentalis</i> L.	Caesalpiniaceae	Herb	173	<i>Parthenium hysterophorus</i> L.	Asteraceae	Herb
52	<i>Cassia pumila</i> Lam.	Caesalpiniaceae	Herb	174	<i>Pavonia arabica</i> Steud.	Malvaceae	Herb
53	<i>Cassia tora</i> L.	Caesalpiniaceae	Herb	175	<i>Pavonia zeylanica</i> Cav.	Malvaceae	Herb
54	<i>Casuarina equisetifolia</i> L.	Casuarinaceae	Tree	176	<i>Pedaliium murex</i> L.	Pedaliaceae	Herb
55	<i>Catharanthus roseus</i> (L.) G. Don.	Apocynaceae	Herb	177	<i>Peltophorum pterocarpum</i> (D C.) K. Heyne	Caesalpiniaceae	Tree
56	<i>Cayratia carnosa</i> (Lam.) Gagnep.	Vitaceae	Climber	178	<i>Pentstemon spiralis</i> (Forssk.) Decne.	Asclepiadaceae	Climber
57	<i>Celosia argentea</i> L.	Amaranthaceae	Herb	179	<i>Pergularia daemia</i> (Forssk.) Chiov.	Asclepiadaceae	Climber
58	<i>Cenchrus ciliaris</i> L.	Poaceae	Grass	180	<i>Peristrophe bicalyculata</i> (Retz.) Nees	Acanthaceae	Herb
59	<i>Ceriops tagal</i> (Perr.) C. B. Rob.	Rhizophoraceae	Shrub	181	<i>Phoenix sylvestris</i> (L.) Roxb.	Arecaceae	Tree
60	<i>Chenopodium album</i> L.	Chenopodiaceae	Herb	182	<i>Phyllanthus nodiflora</i> (L.) Greene	Verbenaceae	Herb
61	<i>Chloris barbata</i> Sw.	Poaceae	Grass	183	<i>Phyllanthus fraternus</i> G. L. Webster	Euphorbiaceae	Herb
62	<i>Chrozophora rotleri</i> (Geis.) Juss.	Euphorbiaceae	Herb	184	<i>Phyllanthus maderaspatensis</i> L.	Euphorbiaceae	Herb
63	<i>Cistanche tubulosa</i> (Schenk) Wight	Orobanchaceae	Herb	185	<i>Physalis minima</i> L.	Solanaceae	Herb
64	<i>Cleome viscosa</i> L.	Capparaceae	Herb	186	<i>Pluchea arguta</i> Boiss.	Asteraceae	Herb
65	<i>Clerodendrum inerme</i> (L.) Gaertn.	Verbenaceae	Shrub	187	<i>Polycarpaea corymbosa</i> (L.) Lam.	Caryophyllaceae	Herb
66	<i>Clerodendrum multiflorum</i> (Bur	Verbenaceae	Shrub	188	<i>Polycarpaea spicata</i> Wight ex	Caryophyllaceae	Herb

No.	Botanical Name	Family	Habit	No.	Botanical Name	Family	Habit
	m.f.) Kuntze				Arn.	e	
67	<i>Clitoria ternatea</i> L.	Fabaceae	Climber	189	<i>Polygala erioptera</i> DC.	Polygalaceae	Herb
68	<i>Coccinia grandis</i> (L.) Voigt	Cucurbitaceae	Climber	190	<i>Portulaca oleracea</i> L.	portulacaceae	Herb
69	<i>Cocculus hirsutus</i> (L.) Diels	Menispermaceae	Climber	191	<i>Premna resinosa</i> (Hochst.) Schauer	Verbenaceae	Shrub
70	<i>Cocos nucifera</i> L.	Arecaceae	Tree	192	<i>Prosopis cineraria</i> (L.) Druce	Mimosaceae	Tree
71	<i>Coldenia procumbens</i> L.	Boraginaceae	Herb	193	<i>Prosopis juliflora</i> (Sw.) DC.	Mimosaceae	Tree
72	<i>Commelina benghalensis</i> L.	Commelinaceae	Herb	194	<i>Pulicaria wightiana</i> (DC) C. B. Clark	Asteraceae	Herb
73	<i>Commelina erecta</i> L.	Commelinaceae	Herb	195	<i>Pupalia lappacea</i> (L.) Juss.	Amaranthaceae	Herb
74	<i>Commelina forskalaei</i> Vahl.	Commelinaceae	Herb	196	<i>Rhizophora mucronata</i> Lam.	Rhizophoraceae	Tree
75	<i>Commiphora wightii</i> (Arn.) Bhandari	Burseraceae	Shrub	197	<i>Rhynchosia minima</i> (L.) DC. var. <i>minima</i>	Fabaceae	Climber
76	<i>Convolvulus rotterianus</i> Choisy var. <i>rotterianus</i>	Convolvulaceae	Herb	198	<i>Rhynchosia minima</i> var. <i>laxiflora</i> (Cambess.) Baker	Fabaceae	Climber
77	<i>Convolvulus microphyllus</i> Sieber ex Spreng.	Convolvulaceae	Herb	199	<i>Ruellia tuberosa</i> L.	Acanthaceae	Herb
78	<i>Corchorus aestuans</i> L.	Tiliaceae	Herb	200	<i>Rungia repens</i> (L.) Nees	Acanthaceae	Herb
79	<i>Corchorus tridens</i> L.	Tiliaceae	Herb	201	<i>Salicornia brachiata</i> Miq.	Chenopodiaceae	Shrub
80	<i>Corchorus trilobularis</i> L.	Tiliaceae	Herb	202	<i>Salvadora oleoides</i> Decne.	Salvadoraceae	Tree
81	<i>Cordia gharaf</i> Ehrenb. ex Asch.	Boraginaceae	Tree	203	<i>Salvadora persica</i> L.	Salvadoraceae	Tree
82	<i>Cressa cretica</i> L.	Convolvulaceae	Herb	204	<i>Salvia santolinifolia</i> Boiss.	Lamiaceae	Herb
83	<i>Croton bonplandianum</i> Baill.	Euphorbiaceae	Herb	205	<i>Schoenoplectiella articulata</i> (L.) Lye	Cyperaceae	Sedge
84	<i>Cucumis callosus</i> (Rottler) Cogn.	Cucurbitaceae	Climber	206	<i>Senra incana</i> Cav.	Malvaceae	Herb
85	<i>Cucumis prophetarum</i> L.	Cucurbitaceae	Climber	207	<i>Sesuvium portulacastrum</i> (L.) L.	Aizoaceae	Herb
86	<i>Cymbopogon schoenanthus</i> (L.) Spreng.	Poaceae	Grass	208	<i>Setaria verticillata</i> (L.) P.Beauv.	Poaceae	Grass
87	<i>Cynodon dactylon</i> (L.) Pers.	Poaceae	Grass	209	<i>Seteria glauca</i> (L.) P. Beauv.	Poaceae	Grass
88	<i>Cyperus pangori</i> Rottb.	Cyperaceae	Sedge	210	<i>Sida cordifolia</i> L.	Malvaceae	Herb
89	<i>Cyperus bulbosus</i> Vahl	Cyperaceae	Sedge	211	<i>Sida spinosa</i> L.	Malvaceae	Herb
90	<i>Cyperus conglomeratus</i> Rottb.	Cyperaceae	Sedge	212	<i>Solanum indicum</i> L.	Solanaceae	Herb
91	<i>Cyperus rotundus</i> L.	Cyperaceae	Sedge	213	<i>Solanum surattense</i> Burm. f.	Solanaceae	Herb
92	<i>Dactyloctenium aegyptium</i> (L.) Willd.	Poaceae	Grass	214	<i>Sonchus brachyotus</i> DC.	Asteraceae	Herb
93	<i>Dactyloctenium scindicum</i> Boiss.	Poaceae	Grass	215	<i>Sporobolus coromandelianus</i> (Retz.) Kunth	Poaceae	Grass
94	<i>Dalechampia scandens</i> L.	Euphorbiaceae	Climber	216	<i>Sporobolus maderaspatanus</i> B or	Poaceae	Grass
95	<i>Datura metel</i> L.	Solanaceae	Herb	217	<i>Striga gesnerioides</i> (Willd.) Vatke.	Scrophulariaceae	Herb
96	<i>Desmostachya bipinnata</i> (L.) Stapf	Poaceae	Grass	218	<i>Suaeda fruticosa</i> Forssk. ex J.F.Gmel.	Chenopodiaceae	Shrub
97	<i>Dichanthium annulatum</i> (Forssk.) Stapf	Poaceae	Grass	219	<i>Suaeda nudiflora</i> Moq.	Chenopodiaceae	Herb
98	<i>Digera muricata</i> (L.) Mart.	Amaranthaceae	Herb	220	<i>Tamarindus indica</i> L.	Caesalpiniaceae	Tree
99	<i>Digitaria longiflora</i> (Retzius) Persoon	Poaceae	Grass	221	<i>Tamarix dioica</i> Roxb.	Tamaricaceae	Tree
100	<i>Dimeria orinthopoda</i> Trin.	Poaceae	Grass	222	<i>Tamarix ericoides</i> Rottler & Willd.	Tamaricaceae	Shrub
10	<i>Echinops echinatus</i> Roxb.	Asteraceae	Herb	223	<i>Taverniera cuneifolia</i> (Roth)	Fabaceae	Shrub

No.	Botanical Name	Family	Habit	No.	Botanical Name	Family	Habit
1					Ali		
102	<i>Enicostema hyssopifolium</i> (Willd.) Verd	Gentianaceae	Herb	224	<i>Tephrosia purpurea</i> (L.) Pers.	Fabaceae	Herb
103	<i>Ephedra foliata</i> Boiss. ex C.A.Mey.	Ephedraceae	Woody Climber	225	<i>Tephrosia strigosa</i> (Dalzell) Santapau & Maheshw.	Fabaceae	Herb
104	<i>Eragrostis ciliaris</i> (L.) R.Br.	Poaceae	Grass	226	<i>Terminalia catappa</i> L.	Combretaceae	Tree
105	<i>Euphorbia dracunculoides</i> Lam.	Euphorbiaceae	Herb	227	<i>Thespesia populnea</i> (L.) Sol. ex Corrêa	Malvaceae	Tree
106	<i>Euphorbia hirta</i> L.	Euphorbiaceae	Herb	228	<i>Tinospora cordifolia</i> (Willd.) Miers	Menispermaceae	Climber
107	<i>Euphorbia microphylla</i> B.Heyne ex Roth	Euphorbiaceae	Herb	229	<i>Trianthema portulacastrum</i> L.	Aizoaceae	Herb
108	<i>Euphorbia nivulia</i> Buch.-Ham.	Euphorbiaceae	Shrub	230	<i>Trianthema triquetra</i> Rottler & Willd.	Aizoaceae	Herb
109	<i>Euphorbia parviflora</i> L.	Euphorbiaceae	Herb	231	<i>Tribulus terrestris</i> L.	Zygophyllaceae	Herb
110	<i>Euphorbia tirucalli</i> L.	Euphorbiaceae	Shrub	232	<i>Trichodesma indicum</i> (L.) Lehm.	Boraginaceae	Herb
111	<i>Evolvulus alsinoides</i> (L.) L.	Convolvulaceae	Herb	233	<i>Tridax procumbens</i> (L.) L.	Asteraceae	Herb
112	<i>Fagonia cretica</i> L.	Zygophyllaceae	Herb	234	<i>Triumfetta rotundifolia</i> Lam.	Tiliaceae	Herb
113	<i>Ficus benghalensis</i> L.	Moraceae	Tree	235	<i>Urgenia indica</i> L.	Liliaceae	Herb
114	<i>Ficus religiosa</i> L.	Moraceae	Tree	236	<i>Urochondra setulosa</i> (Trin.) C.E.Hubb.	Poaceae	Grass
115	<i>Fimbristylis cymosa</i> R.Br.	Cyperaceae	Sedge	237	<i>Vernonia cinerea</i> (L.) Less.	Asteraceae	Herb
116	<i>Glinus lotoides</i> L.	Molluginaceae	Herb	238	<i>Vicoa indica</i> (L.) DC.	Asteraceae	Herb
117	<i>Goniogyna hirta</i> (Willd.) Ali	Fabaceae	Herb	239	<i>Vigna radita</i> (L.) Wilezek	Fabaceae	Climber
118	<i>Grangea maderaspatana</i> (L.) Poir.	Asteraceae	Herb	240	<i>Vigna unguiculata</i> (L.) Walp. sub sp. <i>Unguiculata</i>	Fabaceae	Climber
119	<i>Grewia damine</i> Gaertn.	Tiliaceae	Shrub	241	<i>Xanthium strumarium</i> L.	Asteraceae	Herb
120	<i>Grewia tenax</i> (Forssk.) Fiori	Tiliaceae	Shrub	242	<i>Ziziphus nummularia</i> (Burm. f.) Wight & Arn.	Rhamnaceae	Shrub
121	<i>Grewia villosa</i> Willd.	Tiliaceae	Shrub	243	<i>Zornia gibbosa</i> Span.	Fabaceae	Herb
122	<i>Halopyrum mucronatum</i> (L.) Stapf	Poaceae	Grass				