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STATUS, DIVERSITY AND CONSERVATION OF PLANTS IN GUGARIYANA RESERVE FOREST, KACHCHH DISTRICT, GUJARAT

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Abstract: Kachchh has unique biogeography and floral diversity due to its geographical location and its climatic features. Gugariyana Reserve Forest is located in the western part of Kachchh district. A study was conducted to document the floral diversity and phyto-sociology of the area. The survey was made by using line transect method and quadrate method to analyse the floral diversity of this Reserve Forest. A total of 164 species of plants recorded from the reserve in which 38 plants were used for medicinal purposes by local people. Herbs are the most domonent life froms in this reserve. The presence of large number of medicinal plant, Medicinal Plant Conservation Area (MPCA) was made in some parts of this Reserve Forest. Invasion of *Prosopis juliflora* is the major threats for the floristic diversity of this Reserve Forest. Aparts from invasion, intensive grazing by livestock and excessive utilization of forest produces are also posing threats for the Reserve Forest. Both in-situ and ex-situ conservation practices is essential for survival of threatened plant species of this Reserve Forest.
Keywords: Conservation; Floral diversity; Gugariyana; Kachchh; Medicinal plant; Threat.
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INTRODUCTION

Flora plays a vital and crucial role in any kind of ecosystem and provides a vital natural resource like shelter, food, medicine; oxygen and raw material for various uses which helps in sustainance life on this earth. Plants also plays basic role in ecosystem functioning and fertility of soil. The diversity of floral species is correlates with the stability of ecosystem. Phyto-sociological analysis of a plant community is an important aspect of ecological study to reveals the structural arrangement of various components of plant community and understating the community dynamics. To document the diversity and distribution of floral diversity is the basic principle and foremost need for developing any conservation strategies (Kumar, *et. al*, 2006). Kachchh district is located in the western most part of India and falls under Desert Biogeograophical Region of India (Rodger and Panwar, 1988). The vegetation of this district is characterized by tropical thorn forest (Champion and Seth, 1968). The district has diverse habitats like; grassland, savannah, mangroves, rann or saline desert and fresh water wetlands along with tropical thorn forest (Singh, 1998). The plant diversity of arid and semi-arid region is less diverse in comparision with other tropical forest region of India, as this region face high temperature and very low precipitation. The diversity of medicinal plants and its ethnomedicinal uses in various parts of the district has been studies by few workers (Patel *et al.,* 2013a; Patel *et al*., 2013b; Patel *et al*., 2014a; Patel *et al*., 2013b; Patel and Mahato, 2014). Some previous workers (Thaker, 1926; Blatter, 1908; Rao and Sabnis, 1977; Shah, 1978; Bhatt, 1993) made studies on listing floristic components of this region time to time, but no any detailed study available on the diversity of flora in this region. Hence, the presnt study was conducted to document the diversity of flora in Gugariyana Reserve Forest

located in the western most part of the district and its conservation significance.

Study Area: The present study was carried out in Gugariyana Reserve Forest (GRF) is located partially in Lakhpat and Nakhatrana talukas of Kachchh district, Gujarat. The landscape of the Reserve forest is undulating with hilly tract, some moderate to steep slope, supports dense *Acacia* thorn forest, Mixed Dry Deciduous forest (in valley or riverine areas) and *Euphorbia* scrub. The climate of the area is dry with scanty rainfall. The average minimum temperature is 10°c and average maximum temperature is 42°C.

EXPERIMENTAL

Floristic inventory in GRF was carried out during months of August and September, 2011. Preliminary fieldwork was carried to collect quantitative data on differest plant life form. Quantitative assessment of plants was collected by line transects method (Mishra, 1968). The sampling locations were decided on the basis of floristic composition, topography and the terrain of the certain patches. A total of 60 sample plots were laid in various kinds of habitats to cover the diversity, distribution and phyto-sociology of heterogeneous vegetation found in GRF. Quadrate size of 15m X 15m was laid to assess trees, shrubs, under shrubs and climber's species in an interval of 200m in each line transect; while two plots of 1x1 m^2 size were laid down for herbaceous species. Phytosociological analysis was performed to calculate the relative density and relative frequency.

RESULTS AND DISCUSSION

Habitat types identified in GRF: The GRF represent unique blends of habitats distributed in various landscape includes; plain area, hills and hillocks, river tributaries, seasonal water channels and undulating lands. As the Kachchh ditrict represent semi arid to arid climatic condition which leads to a maximum plants having xerophytic adaptation. A total of 6 major habitat types identified during our survey in the GRF include; *Euphorbia* Scrub, *Prosopis* scrub, open scrub, mixed thorn forest, *A. senegal* forest and dry deciduous forest.

Vegetation Status: A total of 164 species belonging to 126 genera and 45 families were recorded from the Gugariyana Reserve Forest. Poaceae was recorded as most dominant family with 26 species (15.85%), followed by Fabaceae (n=12), Malvaceae (n=11) and Acanthaceae (n=10) family. A total of 19 families of flora recorded from the GRF which represent only single species. Among the total recorded 126 genera, *Acacia* was the most dominant with four species followed by *Abutilon, Blepharis, Cenchrus, Heliotropium, Ipomoea, Pavonia, Sida* and *Solanum* which represents three species each. Out of of the total recorded plant species, 38 species of medicinal plants recorded from GRF. Among the various life form of recorded floral species of GRF, it shows that, herb was dominanted with 66 species (40.24 %), followed by grass with 26 species (15.85%) and under shrub with 18 species (10.98 %). Climbing shrub, sarmentose shrub, sedge and woody twiner represented only single species (Table 1). Gugariyana Reserve Forest represents rich diversity of flora especially the medicinal plant species. The species like *Prosopis juliflora, Acacia Senegal, A. nilotica*, *A. Senegal, Euphorbia caducifolia, E. caducifolia, Fagonoa schweienfurthii, Enicostema axillare, Achyrathes aspera, Taverniera cuneifolia* and *Tribulus terrestris* are recorded as most common species of this Reserve Forest. *Grewia tenax* and *Enicostema axillare* are most abundant species interm of populations in GRF. Both these species are known for their high medicinal values and being widely used by local people. The relative frequency of common species of GRF includes; *Enicostema axillare* (29.51%), *Commiphora wightii* (22.95%), *Boerhavia diffusa* (19.67%), *Commicarpus verticillatus* (13.12%), *Prosopis juliflora* (13.12%), *Grewia tenax* (13.12%), etc (Table 2).

Table 1. Life Form status of the Gugariyana Reserve Forest

#	Life form	No. of species	Relative percentage
1.	Herb	66	40.24
2.	Grass	26	15.85

3.	Under Shrub	18	10.97
4.	Climber	13	7.93
5.	Tree	12	7.32
6.	Shrub	8	4.88
7.	Twiner	7	4.27
8.	Small Tree	5	3.05
9.	Straggling Shrub	3	1.83
10.	Twining Herb	2	1.22
11.	Climbing Shrub	1	0.61
12.	Sarmentose Shrub	1	0.61
13.	Sedge	1	0.61
14.	Woody Twiner	1	0.61
Total		**164**	**100**

Table 2. Relative frequency and Density of some species recorded in GRF

#	Species	Relative frequency (%)	Relative density (Individual/ha)
1.	*Abutilon indicum* subsp. *indicum*	4.92	177.78
2.	*Achyranthes aspera* var. *argentea*	6.56	10000
3.	*Asparagus racemosus* var. *javanicus*	8.20	266.67
4.	*Balanites aegyptiaca*	6.56	266.67
5.	*Boerhavia diffusa*	19.67	57500
6.	*Calotropis procera*	6.56	222.22
7.	*Capparis decidua*	8.20	533.33
8.	*Cardiospermum halicacabum*	8.20	75000
9.	*Chlorophytum tuberosum*	4.92	12500
10.	*Citrullus colocynthis*	3.28	133.33
11.	*Clerodendrum phlomidis*	1.64	88.89
12.	*Commicarpus verticillatus*	13.11	55000
13.	*Commiphora wightii*	22.95	1155.56
14.	*Dipcadi erythraeum*	3.28	5000
15.	*Enicostema axillare*	29.51	77500
16.	*Grewia tenax*	13.11	488.89
17.	*Helicteres isora*	3.28	533.33
18.	*Indigofera oblongifolia*	4.92	444.44
19.	*Indoneesiella echioides*	9.84	30000
20.	*Maerua oblongifolia*	3.28	177.78
21.	*Maytenus emarginata*	4.92	177.78
22.	*Moringa concanensis*	3.28	133.33
23.	*Pentatropis spiralis*	6.56	222.22
24.	*Premna resinosa*	3.28	177.78
25.	*Prosopis juliflora*	13.11	533.33
26.	*Rivea hypocrateriformis*	6.56	222.22
27.	*Salvadora oleoides*	8.20	222.22
28.	*Salvadora persica*	3.28	88.89
29.	*Sarcostemma acidum*	3.28	133.33
30.	*Solanum surattense*	3.28	10000
31.	*Taverniera cuneifolia*	4.92	10000
32.	*Tinospora cordifolia*	6.56	177.78
33.	*Tribulus terrestris*	9.84	25000

Although no scientific and systematic survey is available on the diversity of plants in regards to their richness, abundance and frequency. Few scattered information on diversity of flora of this district are documented by various authors in the past. Some notable authors like, Thaker (1926) reported 511 species of plants from Kachchh belongs under 75 families; Rao and Sabnis (1977) recorded a total of 700 species of flowering plants from the Kachchh region and Shah (1978) reviewed the floral diversity of Kacchchh and revealed 768 species of plants found in the district. Shah (1978) also reported that 45.89% of plant species were common, 7.04% rare, 3.38% occasional, 1.82% frequent and 13.46% of plants were halophytes, 13.36 % cultivated and 13.24% ornamental species. The floristic survey made by Bhatt (1993) highlighted 518 species of flowering plants from western

Kachchh. Vyas (2001) documented 46 species of medicinal plants from Kachchh district. GUIDE (2002) reported 640 species of flowering plants from various Reserve forests of Kachchh district out of which 402 species have some medicinal values. Since the prehistoric time people are inherently linked with plants for its medicinal and other beneficial properties (Jain and Saklani, 1991). The research and documentation on traditional knowledge based on various natural resources are found declining due to the loss of plant species diversity and interest on indigenous community (Joshi 2002, Silori *et al.* 2004, Silori and Rana, 2000). The loss of traditional knowledge is also due to change in the perception of user community, its commercialization and socio-economic transformation (Gadgil *et al.,* 1993). The invasion of *Prosopis juliflora*, an alien species introduced in the district for checking Greater Rann of Kachchh and its salinity to Banni grassland is one of the major threats of floral diversity of this reserve. The expansion of case and commercial cultivation around reserve is also posing threats to the reserve. The indiscriminate and destructive harvesting of medicinal plants to meet the growing market demand is now a major threat to the medicinal flora of this district (Pandey *et al.,* 2005). The commercial use of some plant species for their medicinal values including *C. wightii, C. cartilaginea, Boerhavia diffusa, Tribulus terrestris, etc.* is also a cause for loss of floral diversity (Patel *et al.* 2010). Apart from the above, intensive grazing by livestock in the reserve is also a threat for the floristic diversity of this reserve forest. There are some species like *Sterculia urens, Sarcocostemma acidum, Tinospora cordifolia and Helicteres isora* which have high medicinal values but their abundance was very low. Such species require in situ as well as ex *situ* conservation and management measures. There is also need for conducting a detailed ethnomedicinal surveys for promoting conservation (*in situ* and *ex situ*), cultivation and trade of medicinal plants at local and regional levels.

Conservation Measures: The study is suggesting some measure for the conservation and management of wild floristic wealth of the GRF which are given below:

- GRF is one of the dense forest areas of the arid district of Kachchh and admixture of mixed dry-decidous forest and tropical thorn forest, therefore, protection of characteristic species of flora is pre-requisite to manage the ecosystem.
- GRF has very good population and diversity of medicinal plant species which are being used by local community from long period of time, therefore protection of medicinal plant is required for socio-economic development.
- *Prosopis juliflora*, an invasive alien species of the area and advancing towards the wild species, therefore control and removal of this species in the GRF is very important to conserve the native biodiversity of the area.
- Controlled Grazing is required to manage the forests and floristic diversity of the GRF.
- Two sacred groves namely; Oran Mata and Sadhay Pir was recorded (Patel *et al.,* 2014a) from the GRF, therefore, initiatives should be taken for conserving these natural sites.

CONCLUSION

The study recorded 164 species of flora from the GRF which is about 21 per cent of the flora recorded from the district. Interestingly, it was found that GRF has admixture of two types of forests namely; mixed dry-decidous forest and tropical thorn forests. The study also reveled that the area has rich diversity of medicinal plants which was about 20 per cent of the total plant species recorded from the area. The notable medicinal plant species of the area was *Commiphora stocksiana* which is a dominant ethnomedicinal plant of the area. Therefore, Gugariyana Reserve Forest is one among the important forest areas of the district having rich diversity of flora which supports many wildlife of the area and socio-economic development of the local community.

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