



Floral diversity and distribution of angiosperms and gymnosperms growing in the campus of V.P.&R.P.T.P. science college, V.V. Nagar, Gujarat (India)

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Abstract

Biodiversity gives references to the different genera and species of organisms present in the particular area which change from one ecosystem to another. The present study deals with an account of the floral diversity and distribution of angiosperms and gymnosperms in the campus of V.P. & R.P.T.P. Science College, Vallabh-Vidyanagar, Gujarat (INDIA) during the year 2019-20. The campus premises have a total of 147 species of angiosperms and gymnosperms belonging to 131 genera under 62 families. Of these, 74 species of trees, 21 shrubs, 28 herbs, 17 climbers, 5 grasses, and 2 gymnosperms are present across the campus. Ecological analysis shows that *Fabaceae*, *Apocynaceae*, *Moraceae*, *Arecaceae*, and *Combretaceae* families were the dominant and *Lauraceae*, *Magnoliaceae*, *Asphodelaceae*, *Heliconiaceae*, *Musaceae*, *Zingiberaceae*, *Crassulaceae*, *Vitaceae*, *Elaeocarpaceae* and *Asclepiadaceae* were in decreasing order of dominance, respectively. *Ficus* is the dominant genera in the campus area with six species, followed by *Terminalia* and *Jasminum*. This study was Conducted to realize that how educational institutes could play a considerable role in conserving biological diversity and how to study scientifically. This study is one of the initial endeavors in this effort. Some endangered plant species like *Santalum album*, *Saraca asoca*, and *Leptadenia reticulata* are also conserved in the campus.

Keywords: APG III, family, plants, taxonomy

Introduction

Biodiversity gives references to the different genera and species of organisms present in the particular area which change from one ecosystem to another. Biodiversity is also known as 'Biological diversity'. It is a systematic study of plants and animals. India is known for the rich flora and fauna in natural habitat in the world (Modi, 2013) [9]. Biodiversity is the total variety of life on earth. It also includes all the genes, species, and ecosystems. In short, it is reflecting to the whole of genes, species, and ecosystems in a region (Rajendran, 2014) [11]. Plants are an integral and vital component of planet earth. There are more than 3,00,000 different species of plants on the globe (Ahmad, 2013). The diversity of plants includes flowering plants (87%), non-flowering plants (0.32%), ferns (4.4%), mosses (5%), and red and green algae (3.3%) (Nautiyal, 2011) [10]. About 13 % of the flora are on the verge of extinction (Nautiyal, 2011) [10]. Two Mega-biodiversity hotspots are located in India are 'The Western Ghats' and 'The Himalayas'. These two biodiversity hotspots are home of about 16,000 plant species, with 38% in the Western Ghats and 62% in the Himalayas. About 2.1% of the world's plant species are found in these two hotspots (Nautiyal, 2011) [10]. India has about 200,000 villages, classified under the 'forest villages' category, and have an ampule role in maintaining the biodiversity across the country (Nautiyal, 2011) [10]. Preserving plant biodiversity is one of the biggest challenges in the present time. They are endangered by various human resources such as the growing human population and their destruction by various pharmaceutical companies and fragrance chemical industries to meet their increasing demand. The systematics study of flora and forest is most important. The systematics study of flora is the only way we can achieve the goal. The Flora also help to give the

clue of modifying floristic pattern, new incursion, present status, rare, endemic, and threatened taxa in the phytogeographical area (Rajendran,2014) [11]. Biological diversity is useful in all facets of life. Nevertheless, the importance of Biological diversity is not sufficient for the local people at present. Plants contribute to the balance of environment and climate, conservation of biological diversity as well as a supply of natural drugs in pharmaceutical industries as a raw material.

Plants help in various functions in our routine life. Mainly common is the dependable provision of food by agriculture. Ethnobotany is the study of plants use through native people; Economic botany emphasizes on cultivation of plants in the contemporary epoch. Plants are also used in traditional medicine and also deliver several drugs. This system is common since the beginning to the present day, and help like feedstock for many drugs. Industrial products such as timber, giant chemicals, and paper are some examples. Plants are given us joy by gardening. Besides, plants play an important role in art, religion, literature, mythology. Many valuable products have been extracted from plants and animals since ancient times. (Mathur, 2017) [8] Plants provide animals and micro-organisms habitat. It is therefore necessary to protect it. Biological diversity or biodiversity refers to all organisms occurring on earth (Kartawinata, 2004) [6]. The present comprehensive study provides inclusive data on the diversity of plants that are occurring on the campus of V.P. & R.P.T.P Science College. The V.P. & R.P.T.P Science College is situated in the Charotar area of Anand district in central Gujarat. It has authoritative identification of plants and it's up to date botanical names. Local names are the basis of communication on plants all the students of V.P. & R.P.T.P Science College. Therefore, local names are also written

along with the scientific name.

Materials and Methods

Study area

The study area lies between longitude of 22.33'02.6" in the north and 72.55'36.3" in the south in the tropical zone (Fig: 1). The area of V.P & R.P.T.P Science College is about 0.929 hectare. Irrigation in the study area along with adjacent areas developed extraordinarily in the Charotar area. The campus remains cool in the winter, warm during the summer, and moderate rain during the monsoon seasons. The frequent field visit was done in each of the patches and corners of the campus from Aug. 2019 to Feb. 2020. During the field survey, a magnifying glass, plant cutter, and notebook were used for the collection and examination of specimens. A preliminary survey was conducted to identify the parts of this diversified college campus. The specimens were collected in pre-monsoon, monsoon, and post-monsoon seasons. The specimens selected for the present study are in the reproductive phase. Natural photographs were taken in the field with the help of a Nikon digital camera (COOLPIX), along with morphological characters were also noted down in the field note. Specimen's diagnostic characters were compared and identified taxonomically with the help of Shah (1978) and Hooker (1879). Families and species are arranged according to the APG-III (2009).

Results

The present comprehensive work resulted in the identification of 147 species of angiosperms and gymnosperm belonging to 131 genera under 62 families. Among these, 74 species of trees, 21 shrubs, 28 herbs, 17

climbers, 5 grasses, and 2 gymnosperms were identified (Table: 1; Fig: 2). To simply work and do the identification of plants, the easy campus was divided into 12 small parts. Ecological analysis shows that Fabaceae, Apocynaceae, Moraceae, Arecaceae, and Combretaceae were the dominant family and low present families are Lauraceae, Magnoliaceae, Asphodelaceae, Heliconiaceae, Musaceae, Zingiberaceae, Crassulaceae, Vitaceae, Elaeocarpaceae, and Asclepiadaceae respectively (Fig:3). Ficus is the dominant genera in the campus area with 6 species, followed by Terminalia and Jasminum (Fig: 5). The greatest number of species were recorded under the family *Fabaceae* with a total of 14. *Mangifera indica* and *Polyalthia longifolia* were found more in numbers on the campus of the college area. Besides this, *Tabernaemontana divaricata*, *Cocos nucifera*, *Roystonea regia* were also found in good numbers. Five species of grasses along with two species of gymnosperms were also recorded. Our study area is the college campus and botanical garden where various medicinal plants and ornamental plants. *Rauvolfia serpentine*, *Aloe vera*, *Barleria prionitis*, *Bryophyllum pinnatum* and *Justicia adhatoda* are medicinally important plants that are naturally occurring in the campus area (Harisaranraj 2009; Sahu 2013; Aneja 2010; Yadav 2016; Kumar 2014) [4, 12, 1, 14, 7]. Medicinal plants are one of the vital Ingredients as far as the involvement of biodiversity to culture is related. The study of biodiversity was aimed at the identification of different species of trees, shrubs, herbs, climbers, grass, and other wild species in campus of the VP&RPTP Science college campus. Our study displays college campus diversity represents to area diversity.

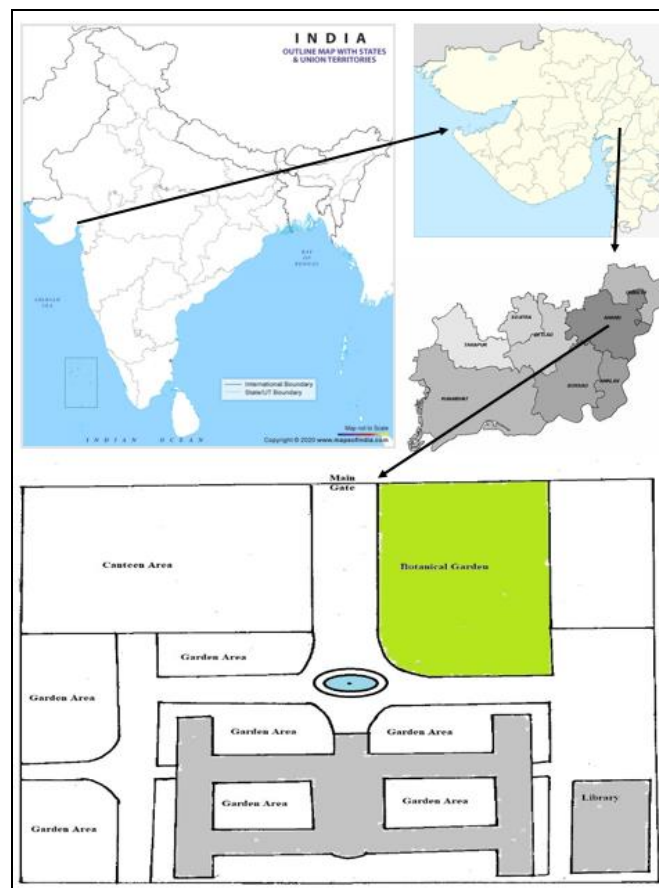


Fig 1: Map showing the campus of V.P. & R.P.T.P. SCIENCE COLLEGE

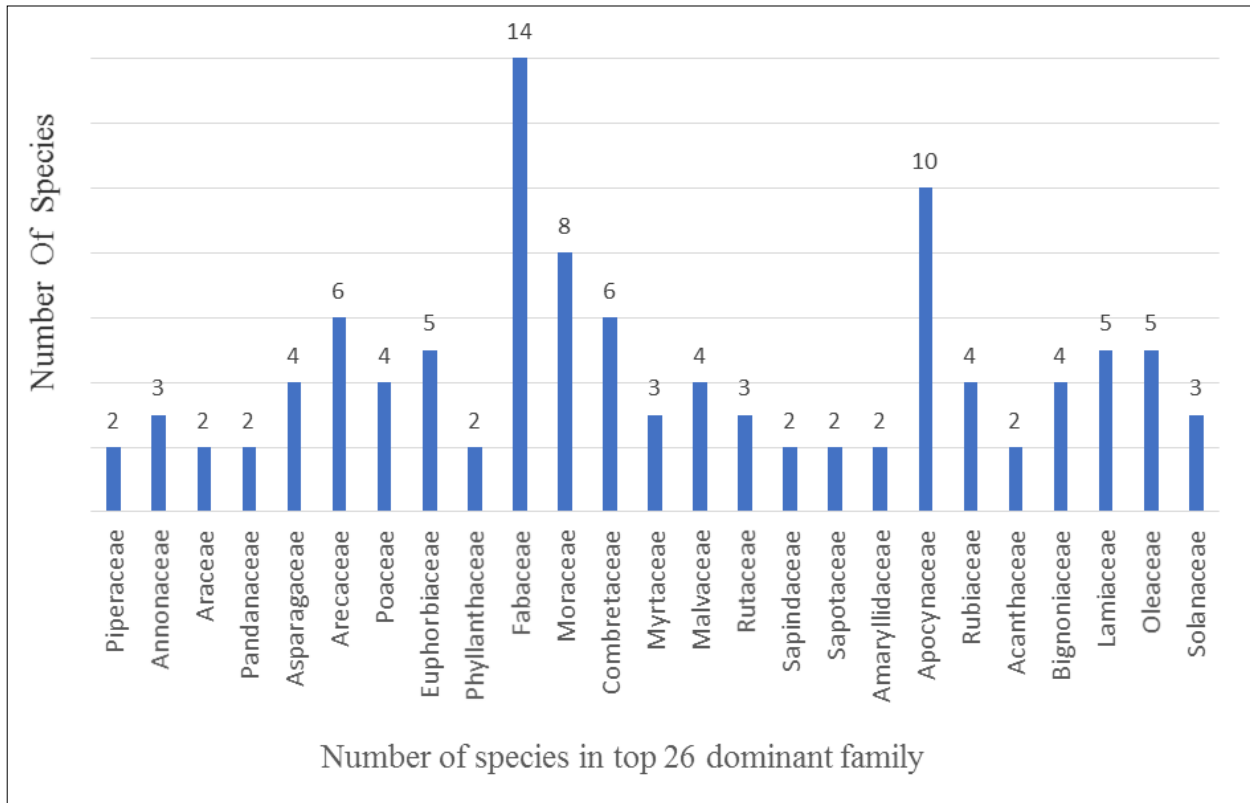


Fig 2: Top 26 dominant family included the number of species

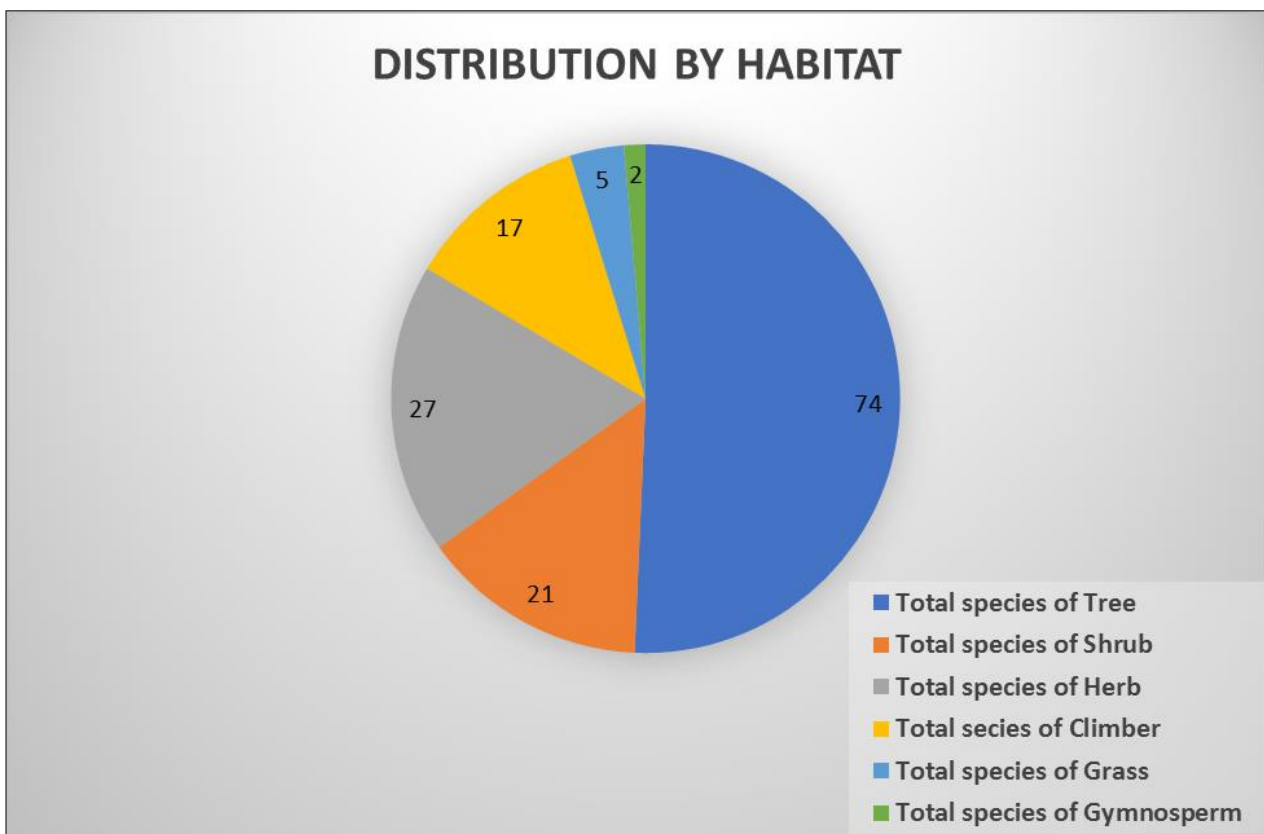


Fig 3: Distribution of Angiosperms and Gymnosperms

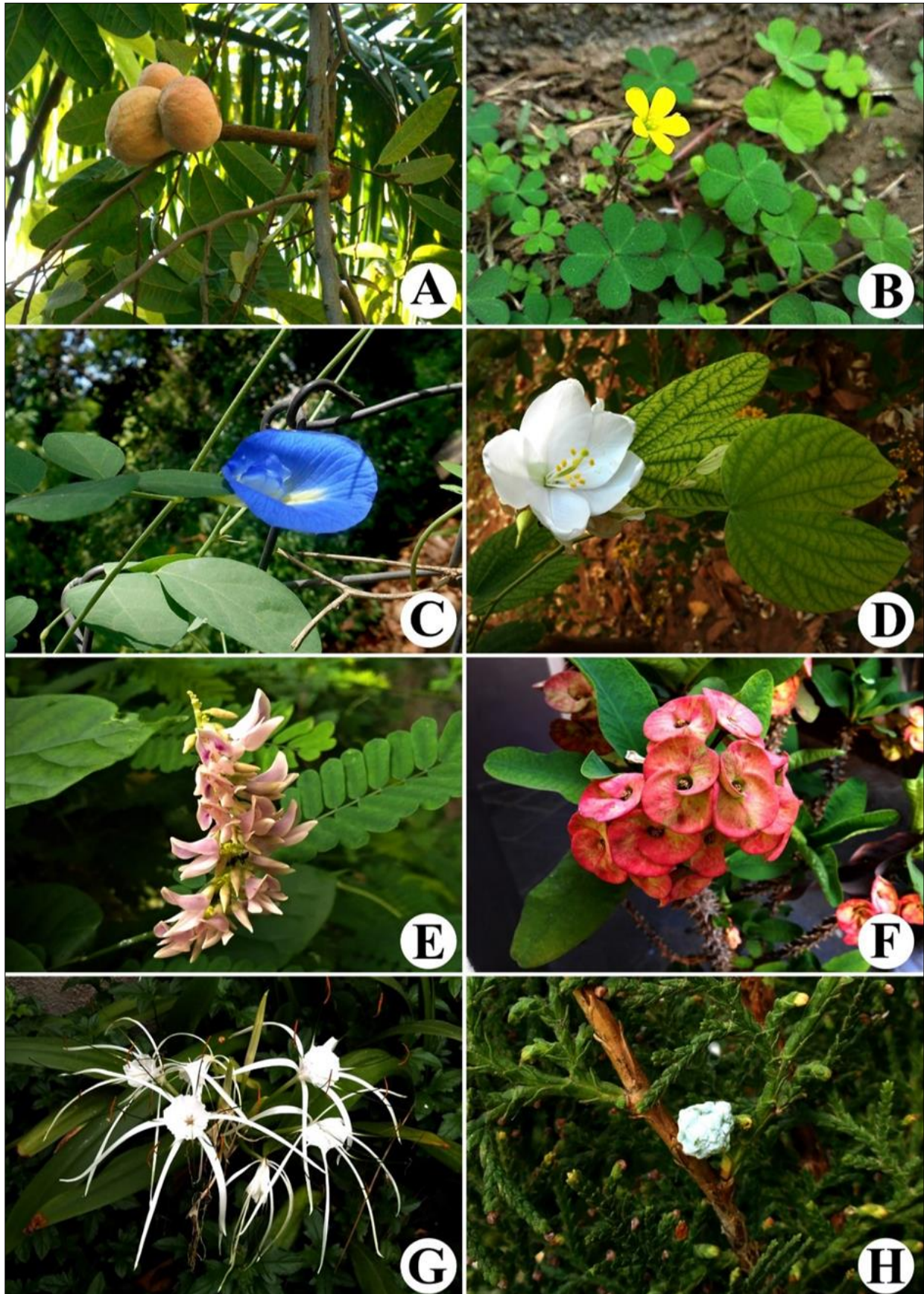


Fig 4: Plants collected from the campus of VP&RPTP SCIENCE COLLEGE, V.V. Nagar, Gujrat A. *Annona reticulata*; B. *Oxalis corniculata*; C. *Clitoria ternatea*; D. *Bauhinia acuminata*; E. *Abrus precatorius*; F. *Codiaeum variegatum*; G. *Hymenocallis littoralis*; H. *Thuja occidentalis*

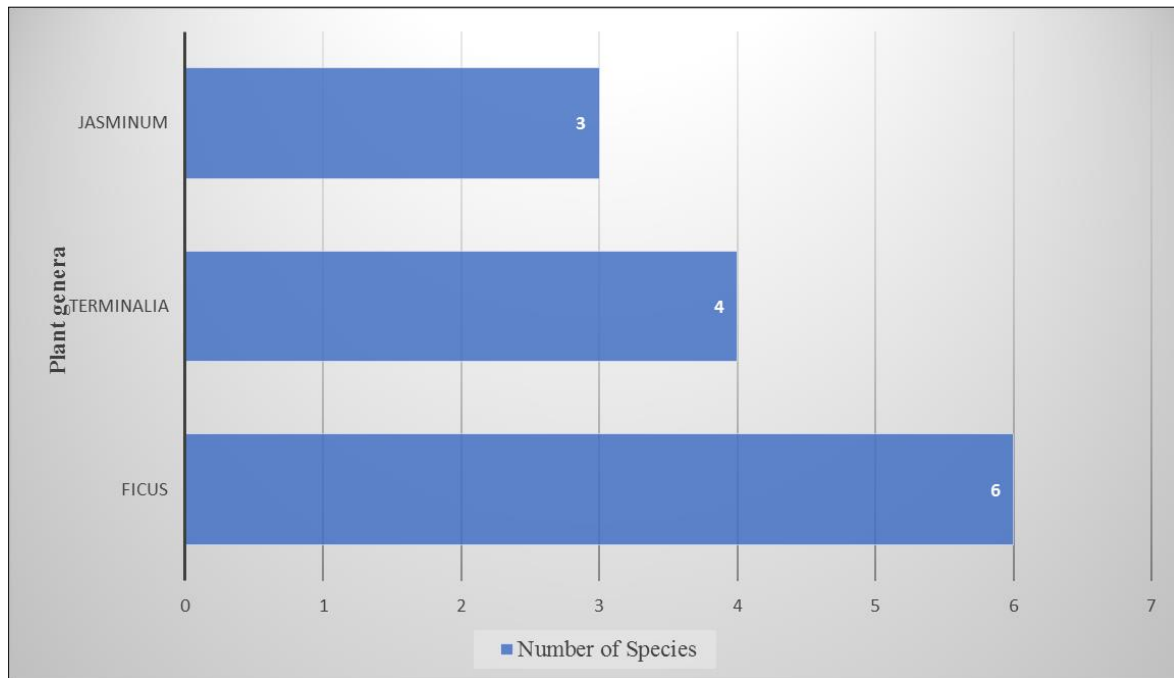


Fig 5: Top 3 dominant plant genera included the number of species

Table 1: List of species of angiosperms and gymnosperms from the campus of V.P. & R.P.T.P. Science College, V. V. Nagar.

Sr. No.	Family	Scientific Name	Common Name	Habit
1.	Piperaceae	<i>Piper betle</i>	Nagar	C
2.		<i>Piper longum</i>	Long Pepper	C
3.	Lauraceae	<i>Cinnamomum camphora</i>	Kapur	T
4.	Annonaceae	<i>Polyalthia longifolia</i>	Asopalav	T
5.		<i>Annona squamosa</i>	Sitafal	T
6.		<i>Annona reticulata</i>	Ramfal	T
7.	Magnoliaceae	<i>Magnolia champaca</i>	Champo	T
8.	Araceae	<i>Scindapsus officinalis</i>	Gaj Pipar	S
9.		<i>Dieffenbachia amoena</i>	Dumbcane	H
10.	Pandanaaceae	<i>Pandanus tectorius</i>	Kevdo	T
11.		<i>Pandanus odorifer</i>	Ketki	H
12.	Amaryllidaceae	<i>Zephyranthes candida</i>	Rain Lily	H
13.		<i>Hymenocallis littoralis</i>	Spider Lily	H
14.	Asparagaceae	<i>Chlorophytum comosum</i>	Ribbon Spider	H
15.		<i>Cordyline fruticose</i>	Cordyline	H
16.		<i>Yucca filamentosa</i>	Adam Needle	H
17.		<i>Asparagus racemosus</i>	Shatavri	C
18.	Asphodelaceae	<i>Aloe vera</i>	Aloe Vera	H
19.	Arecaceae	<i>Cocos nucifera</i>	Coconut	T
20.		<i>Areca catechu</i>	Sopari	T
21.		<i>Washingtonia sp.</i>	Fan Palm	T
22.		<i>Roystonea regia</i>	Royal Palm	T
23.		<i>Beccariophoenix madagascariensis</i>	Beccariophoenix	T
24.		<i>Phoenix loureiroi</i>	Khajuri	T
25.	Poaceae	<i>Cynodon dactylon</i>	Bermuda Grass	G
26.		<i>Desmostachya bipinnata</i>	Dabh	G
27.		<i>Cymbopogon schoenanthus</i>	Lemmon Grass	G
28.		<i>Pseudosasa japonica</i>	Bamboo	G
29.	Heliconiaceae	<i>Heliconia rostrate</i>	Heliconia	H
30.	Musaceae	<i>Musa sp.</i>	Banana (Largest Herb)	H
31.	Zingiberaceae	<i>Zingiber officinale</i>	Adu	H
32.	Crassulaceae	<i>Bryophyllum pinnatum</i>	Patthar Pan	H
33.	Vitaceae	<i>Cissus quadrangularis</i>	Hadsankal	C
34.	Elaeocarpaceae	<i>Elaeocarpus ganitrus</i>	Rudrax	T
35.	Euphorbiaceae	<i>Acalypha wilkesiana</i>	Copper Leaf	S
36.		<i>Jatropha integerrima</i>	Ratanjyot	S
37.		<i>Kirganelia reticulata</i>	Kamboli	S
38.		<i>Codiaeum variegatum</i>	Croton	H
39.		<i>Euphorbia royleana</i>	Thor	H

40.	Malpighiaceae	<i>Galphimia gracilis</i>	Golden Shower Thryallis	T
41.	Passifloraceae	<i>Passiflora caerulea</i>	Saras Vel	C
42.	Phyllanthaceae	<i>Breynia retusa</i>	Kamboi	T
43.		<i>Phyllanthus emblica</i>	Amla	T
44.	Putranjivaceae	<i>Putranjiva roxburghii</i>	Putrajiva/Purna Jiva	T
45.	Fabaceae	<i>Bauhinia acuminata</i>	Bohonia	T
46.		<i>Cassia fistula</i>	Garmalo	T
47.		<i>Tamarindus indica</i>	Ambli	T
48.		<i>Saraca asoca</i>	Ashoka	T
49.		<i>Millettia pinnata</i>	Kanjo	T
50.		<i>Butea monosperma</i>	Khakhro	T
51.		<i>Acacia auriculiformis</i>	Austrelian Baval	T
52.		<i>Pithecellobium dulce</i>	Goras Ambli	T
53.		<i>Senna siamea</i>	Kasid	T
54.		<i>Senna marilandica</i>	Senna	T
55.		<i>Caesalpinia pulcherrima</i>	Caesalpinia	S
56.		<i>Mimosa pudica</i>	Lajammi	C
57.		<i>Abrus precatorius</i>	Chanothdi	C
58.		<i>Clitoria ternatea</i>	Asian Pigeonwings	C
59.	Oxalidaceae	<i>Oxalis corniculata</i>	Oxalis	H
60.	Casuarinaceae	<i>Casuarina equisetifolia</i>	Saru	T
61.	Moraceae	<i>Artocarpus heterophyllus</i>	Fanas	T
62.		<i>Ficus carica</i>	Anjeer	T
63.		<i>Ficus sp.</i>	Ficus	T
64.		<i>Streblus asper</i>	Harra Tree	T
65.		<i>Ficus racemose</i>	Umardo	T
66.		<i>Ficus religiosa</i>	Pipal	T
67.		<i>Ficus benjamina</i>	Weeping Fig	T
68.		<i>Ficus subg. Urostigma</i>	Vad	T
69.	Rhamnaceae	<i>Ziziphus nummularia</i>	Bordi	T
70.	Rosaceae	<i>Rosa chinensis</i>	Rose	S
71.	Combretaceae	<i>Conocarpus erectus</i>	Conocarpus	T
72.		<i>Terminalia arjuna</i>	Arjun Sadar	T
73.		<i>Terminalia bellirica</i>	Behda	T
74.		<i>Terminalia catapa</i>	Badam	T
75.		<i>Terminalia chebula</i>	Harde	T
76.		<i>Combretum indicum</i>	Madhumalti	S
77.	Lythraceae	<i>Lawsonia inermis</i>	Mahedi	H
78.	Myrtaceae	<i>Syzygium cumini</i>	Jambu	T
79.		<i>Psidium guajava</i>	Jamfal	T
80.		<i>Melaleuca citrina</i>	Bottal Brush	T
81.	Moringaceae	<i>Moringa oleifera</i>	Saragvo	T
82.	Salvadoraceae	<i>Salvadora persica</i>	Piludi	T
83.	Bixaceae	<i>Bixa Orellana</i>	Sindur	T
84.	Malvaceae	<i>Grewia asiatica</i>	Phalsa	T
85.		<i>Ceiba pentandra</i>	Cotton Silk	T
86.		<i>Hibiscus rosa-sinensis</i>	Jasud	S
87.		<i>Gossypium arboretum</i>	Cotton	S
88.	Anacardiaceae	<i>Mangifera indica</i>	Ambo	T
89.	Burseraceae	<i>Commiphora wightii</i>	Gugal	T
90.	Meliaceae	<i>Azadirachta indica</i>	Neem Tree	T
91.	Rutaceae	<i>Murraya koenigii</i>	Mithi Limdi (Kadi Patta)	T
92.		<i>Aegle marmelos</i>	Bilipatra	T
93.		<i>Citrus limon</i>	Lemmon	T
94.	Sapindaceae	<i>Sapindus Saponaria</i>	Aritha	T
95.		<i>Aesculus indica</i>	Indian Horse-Chestnut	T
96.	Simaroubaceae	<i>Ailanthus excelsa</i>	Arduso	T
97.	Santalaceae	<i>Santalum album</i>	Chandan	T
98.	Nyctaginaceae	<i>Bougainvillea glabra</i>	Boganvelia	C
99.	Plumbaginaceae	<i>Plumbago zeylanica</i>	White Chitrak	H
100.	Sapotaceae	<i>Manikara hexandra</i>	Rayan	T
101.		<i>Madhuca longifolia</i>	Mahudo	T
102.	Boraginaceae	<i>Cordia dichotoma</i>	Galgundo	T
103.	Apocynaceae	<i>Tabernaemontana divaricate</i>	Tagar	T
104.		<i>Pulmeria obtuse</i>	Khad Champo	T
105.		<i>Alstonia scholaris</i>	Saptaparni	T
106.		<i>Nerium oleander</i>	Karen (Pink)	S
107.		<i>Cascabela thevetia</i>	Karen (Yellow)	S

108.		<i>Tabernaemontana divaricate</i>	Crepe Jasmine	S
109.		<i>Rauwolfia serpentine</i>	Sarpagandha	H
110.		<i>Catharanthus roseus</i>	Barmasi	H
111.		<i>Pentalinon luteum</i>	Wild Allamanda (Yellow)	C
112.		<i>Allamanda blanchetii</i>	Purple Allamanda	C
113.	Rubiaceae	<i>Neolamarckia cadamba</i>	Kadam	T
114.		<i>Ixora coccinea</i>	Ixora	S
115.		<i>Ixora chinensis</i>	Ixora	S
116.		<i>Hamelia patens</i>	Hemiliya	S
117.		Acanthaceae	<i>Andrographis paniculate</i>	Kariyatu
118.	<i>Justicia adhatoda</i>		Kali Ardushi	S
119.	<i>Barleria prionitis</i>		Vajra Danti	H
120.	Bignoniaceae	<i>Jacranranda mimosifolia</i>	Jacranranda mimosifolia	T
121.		<i>Tecoma stans</i>	Yellow Elder	S
122.		<i>Mansoa alliacea</i>	Lasan Vel	C
123.	Lamiaceae	<i>Gmelina arborea</i>	Sevan	T
124.		<i>Tectona grandis</i>	Sag	T
125.		<i>Ocimum basilicum</i>	Damro	H
126.		<i>Ocimum sanctum</i>	Tulsi	H
127.		<i>Plectranthus tomentos</i>	Montos	C
128.	Oleaceae	<i>Nyctanthes arbor-tristis</i>	Parijat	T
129.		<i>Ligustrum lucidum</i>	Glossy Privet	S
130.		<i>Jasminum officinale</i>	Chameli	S
131.		<i>Jasminum sambac</i>	Mogra	H
132.		<i>Jasminum officinale</i>	Jui	C
133.	Convolvulaceae	<i>Argyria nervosa</i>	Samudra Shosh	C
134.	Solanaceae	<i>Cestrum nocturnum</i>	Ratrani	T
135.		<i>Solanum melongena</i>	Ringan	S
136.		<i>Datura stramonium</i>	Dhaturo	H
137.	Asteraceae	<i>Tagetes erecta</i>	Mari Gold	H
138.		<i>Sphagneticola trilobata</i>	Singapore Daisy	H
139.		<i>Parthenium hysterophorus</i>	Carrot Grass	G
140.		<i>Tarlmounia elliptica</i>	Parda Bel	C
141.	Goodeniaceae	<i>Scaevola taccada</i>	Beach Naupuka	H
142.	Adoxaceae	<i>Viburnum tinus</i>	Laurustinus	T
143.	Apiaceae	<i>Trachyspermum ammi</i>	Ajmo	H
144.	Asparageaceae	<i>Dracaena sp.</i>	Dracaena	S
145.	Asclepiadaceae	<i>Leptadenia reticulata</i>	Dodi / Jivanti	C
146.	Cupressaceae	<i>Thuja occidentalis</i>	Vidhya	GY
147.	Cycadaceae	<i>Cycas circinalis</i>	Cycas	GY

(T=Tree, S=Shrub, H=Herb, C=Climber, G=Grass and GY=Gymnosperm)

Conclusion

All living and inanimate objects are inter-reliant in the environment. Humans depend on plants in some way or another. Plants are directly linked to human health. 147 species of angiosperms and gymnosperms belonging to 131 genera under 62 families; of these, 74 species of trees, 21 shrubs, 28 herbs, 17 climbers, 5 grasses, and 2 gymnosperms from the campus of V.P. & R.P.T.P. Science College.

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References

1. Aneja KR, Joshi R, Sharma C. Potency of *Barleria prionitis* L. bark extracts against oral diseases causing strains of bacteria and fungi of clinical origin. New York Sci J, 2010;3(11):5-12.
2. APG (Angiosperm Phylogeny Group) An update of the Angiosperm Phylogeny Group classification for the

orders and families of flowering plants: APG III. Botanical Journal of the Linnean Society, 2009;161(2):105-121.

3. Ahmad M, Wajid M. Plants as potential source of antimicrobial agents. J Pharm Altern Med, 2013;2:18-25.
4. Harisaranraj R, Suresh K, Saravanababu S, AchudhanVV. Phytochemical based strategies for pathogen control and antioxidant capacities of *Rauwolfia serpentina* extracts. Recent Research in Science and Technology, 2009.
5. Hooker JD. Flora of British India, Vol. II. Flora of British India, 1879, 2.
6. Kartawinata K. Biodiversity conservation in relation to plants used for medicines and other products in Indonesia. Journal of Tropical Ethnobiology, 2004;1(2):1-11.
7. Kumar A, Mishra P, Singh SC *et al* Efficiency of ISSR and RAPD markers in genetic divergence analysis and conservation management of *Justicia adhatoda* L., a medicinal plant. Plant Syst Evol, 2014;300:1409-1420. <https://doi.org/10.1007/s00606-013-0970-z>
8. Mathur AA. Study of Some Plants of Economic Importance and their Values in JIET Campus. 4th

- International Conference on Multidisciplinary Research & Practice, 2017.
9. Modi NR, Dudani SN. Biodiversity conservation through urban green spaces: a case study of Gujarat university campus in Ahmedabad. *International Journal of Conservation Science*, 2013, 4(2).
 10. Nautiyal S. Plant biodiversity and its conservation in Institute for Social and Economic Change (ISEC) Campus, Bangalore: A case study. *Journal of Biodiversity*, 2011;2(1):9-26.
 11. Rajendran A, Aravindhan V, Sarvalingam A. Biodiversity of the Bharathiar university campus, India: A floristic approach. *International Journal of Biodiversity and Conservation*, 2014;6(4):308-319.
 12. Sahu PK, Giri DD, Singh R, Pandey P, Gupta S, Shrivastava AK *et al.* Therapeutic and medicinal uses of *Aloe vera*: a review. *Pharmacology & Pharmacy*, 2013;4(08):599.
 13. Shah GL. *Flora of Gujarat state*, 1978.
 14. Yadav M, Gulkari VD, Wanjari MM. *Bryophyllum pinnatum* leaf extracts prevent formation of renal calculi in lithiatic rats. *Ancient science of life*, 2016;36(2):90.