



Phyto-diversity on campus of hajee karutha rowther howdia college, Uthamapalayam, Theni district, Tamil Nadu, India

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Abstract

The main purpose of this field survey is to investigate the richness of floristic diversity in Hajee Karutha Rowther Howdia College in Uthamapalayam region of Theni District, Tamil Nadu, India. This survey was done in all the areas of institution from (08-01- 2020) to (08-03-2021). After field survey and herbarium preparation, available plants were identified by botanical name and family with the help of existing literature. A total of 80 species were observed which belongs to 33 families. Of this, one species is represented by Gymnosperms. The family holds dominance through its distribution in the campus is Fabaceae. This survey shows the heterogeneous floristic diversity of the campus. This survey will be helpful for the plant conservationists and botanical scholars as a baseline to assess and for maintaining and enhancing the sustainability of these kinds of plant species in and around the regions of Uthamapalayam town.

Keywords: floristic diversity, field survey, herbarium, fabaceae, uthamapalayam

Introduction

Nature has consistently been reliant on flora which is a blessing on earth (Hazrat *et al.*, 2020) [6]. Nature has a wide variety of plant species which plays a vital role in the complexity of natural ecosystems (Kumar *et al.*, 2016) [28] and a key role in providing habitats to animals and raw materials for many industries (Kandel *et al.*, 2019; Diaz *et al.*, 2018) [21]. The plant diversity of a country is its wealth and acquiring knowledge of flora and vegetation is of enormous scientific and commercial importance (Reddy *et al.*, 2008) [27]. India occupies 2.4% of the world's geographical area (Ponnuchamy *et al.*, 2013; Gupta *et al.*, 2006) [23, 5] and it represents a rich flora including a large number of endemic species (Reddy *et al.*, 2008; Chatterjee., 1940; Nayar., 1980; Reddy *et al.*, 2002) [27, 1, 25]. But in India, people are more dependent on forest which exerts pressure of forest resources in logarithmic manner. (Jayakumar *et al.*, 2002; Pragasan, 2010). This leads to raise concern on loss of valuable species which damages the ecosystem's equilibrium (Wright., 2003). Oldfield *et al.*, 1998 recorded that the trees are threatened to extinction by ten percent. In situ conservation methods are more appropriate and better for conservation of rare, threatened species to lessen the extinction rate. There is an increase in campaigns for conservation effort outside the ecosystem also known as ex situ conservation. It considered as a way to reduce immediate extinction (Kramer *et al.*, 2011; Mc Namara., 2011; Ma *et al.*, 2013) [13, 17]. Therefore, conservation of biodiversity is of great concern for society and government agencies. Documentation of this biodiversity patterns is a fundamental step to show potential areas for conservation and management. To assess the richness of biodiversity in a region, a taxonomic study of flora is the foremost step. Floristic surveys are the only way by which we can explore

the diversity of plants (Rajendran *et al.*, 2014; Rajendran., 2013) [24, 11]. Such surveys involve the identification of individual species and also the assessment of the abundance of plant species (Gilbertson *et al.*, 1985; Theertha *et al.*, 2021) [4, 29]. The floristic catalog is the source of botanical details for a particular field and it serves as a useful point for numerous detailed learning. (Theertha *et al.*, 2021; Keith., 1988) [29, 12]. In addition to it, these kinds of surveys help us to make a consolidated and up-to-date account of flora. The present survey was done in Hajee Karutha Rowther Howdia College Campus, Uthamapalayam (India). The distribution of flora in the open area of campus along with Herbal garden, Lawns in administrative and all department blocks are recorded through this survey.

Materials and Methods

A. Study area

Hajee Karutha Rowther Howdia College, a renowned institution which is located in the south-west part of the Theni district with an elevation of 384m (1,260ft) in the foothills of Western ghats (Fig 1). It was established in the year 1956 by the late Hajee Mohamed Meeran Rowther, popularly known as Hajee Karutha Rowther in order to promote higher education for the youngsters of Uthamapalayam, a town near Cumbum Valley. The college campus has a total area of 25 acres. It has a main building and four blocks surrounded by dense vegetation and greenery. It has a lawn before each building and Herbal garden is surrounded by many trees and shrubs (Fig 2a, b, c, d). It is geographically located at 9.8086°N latitude and 77.3281°E longitudes. The temperature varies from 33°C to 22°C during summer and winter season. The highest temperature is 35°C and lowest is 12°C. The south west monsoon starts from June and ends in the month of

September. The campus receives an annual rainfall of 736 mm in an average. This region is rich in red soil by nature.

The campus has a good climatic condition for the growth of different plant species.



Fig 1: Study Area – Hajee Karutha Rowther Howdia College, Uthamapalayam.



Fig 2a: Collage entrance blooming with *millettia pinnata*



Fig 2 d: *Phyllanthus emblica* l. saplings planted by honourable secretary hajee dharvesh mohideen inside the herbal garden

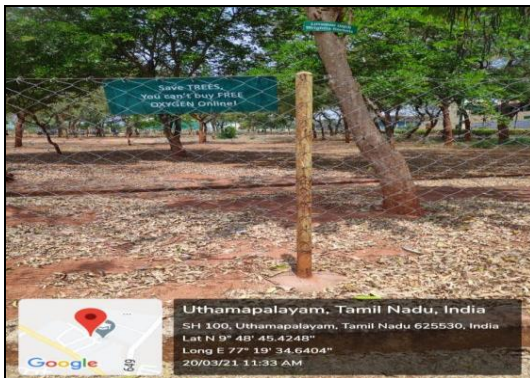


Fig 2b: *Wrightia tinctoria* inside the collage campus before self finance building.

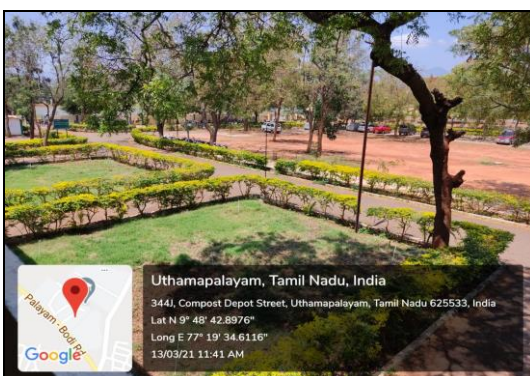


Fig 2c: Square lawn along with *Azadirachta indica* tree before College Auditorium

B. Floristic analysis

The field study was carried out from 08 January 2020 to 08 March 2021 in the campus of HKRH College, Uthamapalayam, Theni, Tamil Nadu (India). The study was performed in the study area and plants were collected and herbarium was prepared. Herbaceous flora was taken as a whole whereas, in the case of large shrubs and trees, tender twigs containing flowers and fruits were taken. The dried specimens were taken and herbarium sheets are prepared (Jain and Rao, 1977) [9]. The herbarium sheets were protected from damage from fungal pathogens and insects by applying sheets with 1% mercuric chloride and naphthalene balls. After field survey and herbarium preparation, all plants were identified by botanical name and family with the help of accessible literature. The Herbarium prepared from the collected plant material has been deposited in the Department of Botany, HKRH College, Uthamapalayam, Theni District, Tamil Nadu. The methodology was followed in two phases that are given below.

1. Field survey

The survey was conducted to accumulate information about the plant species their identification and documentation of Vernacular name, Botanical name and family. The whole campus was visited several times for plant collection.

2. Literature collection

The identification was also carried out based on a literature study (Hooker., 1875; Maheshwari., 1963; Jain., 1968; Jain

et al., 2000; Gamble *et al.*, 1936; Kumar., 2001) [7, 15, 8, 11].

List of plant species available in HKRH College campus.

Table 1: List of Plant species with Tree Habit.

Sl. No.	Botanical Name	Vernacular Name	Family
1	<i>Albizia lebbek</i> (L.) Benth.	Vaagai maram	Fabaceae
2	<i>Albizia saman</i> (Jacq.) F.Muell.	Thoongu moonchi	Fabaceae
3	<i>Araucaria columnaris</i> J. R. Forst. Hook.	Christmas tree	Araucariaceae
4	<i>Azadirachta indica</i> A. Juss.	Veppamaram	Meliaceae
5	<i>Cassia fistula</i> L.	Sarakkondrai	Fabaceae
6	<i>Cassia siamea</i> Lam.	Manjal Kondrai	Fabaceae
7	<i>Casuarina equisetifolia</i> L.	Savukku	Casuarinaceae
8	<i>Citrus limon</i> (L.) Osbeck.	Elumichai maram	Rutaceae
9	<i>Cocos nucifera</i> L.	Thennai maram	Areaceae
10	<i>Dalbergia melanoxylon</i> Guill. & Perr.	Erikai	Fabaceae
11	<i>Dalbergia sissoo</i> Roxb.	Thotakathi / Eetti	Fabaceae
12	<i>Delonix regia</i> (Boj.ex Hook.) Raf.	Chemmayir kondrai	Fabaceae
13	<i>Giliricidia sepium</i> (Jacq.) Steud.	Cheemai agathi	Fabaceae
14	<i>Holoptelea integrifolia</i> (Roxb.) Planch.	Aayamaram	Ulmaceae
15	<i>Leucacena leucocephala</i> (Lam.) de Wit.	Periyathagarai	Fabaceae
16	<i>Limonia acidissima</i> L.	Vizhampalam	Rutaceae
17	<i>Millettia pinnata</i> (L.) Panigrahi.	Punnai maram	Fabaceae
18	<i>Millingtonia hortensis</i> L.f.	Maramalli / Paneer maram	Bignoniaceae
19	<i>Moringa pterygosperma</i> Gaertn.	Murungai	Moringaceae
20	<i>Murraya koenigii</i> (L.) Sprengel.	Kariveppilai	Rutaceae
21	<i>Peltophorum pterocarpum</i> (DC.)K. Heyne.	Perunkontrai	Fabaceae
22	<i>Phyllanthus acidus</i> (L.) Skeels.	Arunelli	Phyllanthaceae
23	<i>Phyllanthus emblica</i> L.	Perunelli	Phyllanthaceae
24	<i>Polyalthia longifolia</i> (Soon.) Thwaites.	Nettilingam	Annonaceae
25	<i>Psidium guajava</i> L.	Koyya	Myrtaceae
26	<i>Pterocarpus marsupium</i> Roxburgh.	Vengai	Fabaceae
27	<i>Senna auriculata</i> (L.) Roxb.	Aavarai	Fabaceae
28	<i>Tamarindus indica</i> L.	Puliyamaram	Fabaceae
29	<i>Tectona grandis</i> L.f.	Thekku	Lamiaceae
30	<i>Thespesia populnea</i> (L.) Sol. Ex. Correa.	Poovarasu	Malvaceae
31	<i>Thuja occidentalis</i> L.	White cedar	Cupressaceae
32	<i>Wrightia tinctoria</i> (Roxb.) R.Br.	Paalai maram	Apocynaceae

Table 2: List of Plant Species with Herb/Shrub Habit

Sl. No.	Botanical Name	Vernacular Name	Family	Habit
1	<i>Abutilon indicum</i> (link) Sweet.	Thuthi	Malvaceae	Shrub
2	<i>Acalypha indica</i> L.	Kuppaimeni	Euphorbiaceae	Herb
3	<i>Achyranthes aspera</i> L.	Naayuruvi	Amaranthaceae	Herb
4	<i>Aerva lanata</i> (L.) Juss. Ex Schult.	Poolai Poo	Amaranthaceae	Herb
5	<i>Aloe vera</i> (L.) Burm. F.	Soatru katraalai	Asphodelaceae	Shrub
6	<i>Amaranthus viridis</i> L.	Kuppaikerai	Amaranthaceae	Herb
7	<i>Andrographis paniculata</i> (Burm.f.) Nees	Siriyangai	Acanthaceae	Herb
8	<i>Brassica nigra</i> L.	Kadugu	Brassicaceae	Herb
9	<i>Bryophyllum pinnatum</i> (Lam.) Oken.	Ranakalli	Crassulaceae	Herb
10	<i>Calotropis gigantea</i> (L.) Dryand.	Vellerukku	Asclepiadaceae	Shrub
11	<i>Calotropis procera</i> (Aiton) W.T. Aiton.	Erukku	Asclepiadaceae	Shrub
12	<i>Catharanthus roseus</i> (L.) G. Don.	Nithya kalyani	Apocynaceae	Shrub
13	<i>Chamaecostus cuspidatus</i> (Nees & Mart.) C. Specht & D.W. Stev.	Neyccarikamaram	Costaceae	Herb
14	<i>Coriandrum sativum</i> L.	Kothamalli	Apiaceae	Herb
15	<i>Croton bonplandianum</i> Baill.	Rail poondu	Euphorbiaceae	Herb
16	<i>Datura metel</i> L.	Umathai	Solanaceae	Herb
17	<i>Duranta erecta</i> L.	Aagayapoo chedi	Verbenaceae	Shrub
18	<i>Euphorbia cyathophora</i> Murray.	Thithili poo	Euphorbiaceae	Shrub
19	<i>Euphorbia heterophylla</i> L.	Paal perukki	Euphorbiaceae	Herb
20	<i>Euphorbia hirta</i> L.	Ammaanpacharisi	Euphorbiaceae	Herb
21	<i>Hibiscus lunarifolius</i> Willd.	Vana sembaruthi	Malvaceae	Herb
22	<i>Hibiscus rosasinesis</i> L.	Sembaruthi	Malvaceae	Shrub
23	<i>Justicia adhatoda</i> L.	Aadaathodai	Acanthaceae	Shrub

24	<i>Mentha arvensis</i> L.	Puthinaa	Lamiaceae	Herb
25	<i>Mentha piperita</i> L.	Milagu keerai	Lamiaceae	Herb
26	<i>Nerium oleander</i> L.	Sevvarali	Apocynaceae	Shrub
27	<i>Ocimum basilicum</i> L.	Pacchai thulasi	Lamiaceae	Herb
28	<i>Ocimum americanum</i> L.	Naai thulasi	Lamiaceae	Herb
29	<i>Ocimum sanctum</i> L.	Thulasi	Lamiaceae	Herb
30	<i>Ocimum tenuiflorum</i> L.	Karunthulasi	Lamiaceae	Herb
31	<i>Plectranthus amboinicus</i> Lour.	Karpuravalli	Lamiaceae	Herb
32	<i>Phyllanthus niruri</i> L.	Keezhanelli	Phyllanthaceae	Herb
33	<i>Ricinus communis</i> L.	Aamanakku	Euphorbiaceae	Shrub
34	<i>Sida cordata</i> Burm. f.	Palam Paci	Malvaceae	Herb
35	<i>Sida cordifolia</i> L.	Siddhamutti	Malvaceae	Herb
36	<i>Tecoma stans</i> (L) Jurs. Ex. Kunth.	Thanga arali	Bignoniaceae	Shrub
37	<i>Tridax procumbens</i> L.	Vettukaal poondu	Asteraceae	Herb
38	<i>Xanthium strumarium</i> L.	Marul Oomathai	Asteraceae	Herb

Table 3: List of plants species with Creepers/ Climber/ Grass Habit.

S. No.	Botanical Name	Vernacular Name	Family	Habit
1	<i>Cissus quadrangularis</i> L.	Pirandai	Vitaceae	Creeper
2	<i>Clitoria ternatea</i> L.	Karuvilai / Neelasangu malar	Fabaceae	Creeper
3	<i>Cymbogon flexuosus</i> (Nees. Ex. Steud.) W. Watson.	Elummichai pul	Poaceae	Grass
4	<i>Cynodon dactylon</i> (L.) Pers.	Arugampul	Poaceae	Grass
5	<i>Oryza sativa</i> L.	Nel	Poaceae	Grass
6	<i>Oxalis corniculata</i> L.	Puliyarai	Oxalidaceae	Creeper
7	<i>Passiflora foetida</i> L.	Siruponaikkaali	Passifloraceae	Climber
8	<i>Pergularia daemia</i> (Forssk.) Chiov.	Veliparuthi	Apocynaceae	Climber
9	<i>Tinospora cordifolia</i> (Thunb.) Miers.	Seenthil	Menispermaceae	Climber
10	<i>Tylophora indica</i> L.	Nanjumricchaan	Apocynaceae	Climber

Table 4: Comparison of the other Institution campus floras in Tamil Nadu.

Sl. No.	Name of the Campus	No. of Species	Reference
1	Madras Christian College, Tambaram	458	Giles Lal and Livingstone, 1978
2	Guru Nanak College, Chennai.	162	Gopi, 2008; Natarajan and Gopi, 2010
3	Pondicherry University, Campus, Puducherry.	499	Parthasarathy <i>et al.</i> , 2010
4	Indian Institute of Technology, Chennai including Guindy National Park.	300	Daniels, 2008.
5	Pachaiyappa's College, Chennai.	256	Udayakumar <i>et al.</i> , 2011
6	Scott Christian College, Nagercoil.	670	Brintha <i>et al.</i> , 2015
7	Bharathiyar University Campus, Coimbatore.	335	Rajendran <i>et al.</i> , 2014
8	S. T. Hindu College, Nagercoil.	238	Parthiban <i>et al.</i> , 2016
9	Theosophical Society campus, Chennai.	449	Irwin <i>et al.</i> , 2015
10	Hajee Karutha Rowther Howdia College, Uthamapalayam, Theni.	80	Present study

Result and Discussion

On the basis of field survey conducted in the campus area, 80 species belonging to 33 families were collected, identified and listed (Table-1, 2, 3). Out of the identified plant species, 79 belong to the Angiosperms which include 73 species of Dicotyledons (91%) and 06 species of monocotyledons (8%) and the remaining 01 species belongs

to Gymnosperms (1%) (Figure 3) belongs to the family called Araucariaceae. When floral elements were examined based on family, it was determined that Fabaceae contained most species with 15 species, Lamiaceae represented with 09 species, Malvaceae and Euphorbiaceae were represented with 06 species each, Apocynaceae is represented with 05 species (Figure 4).

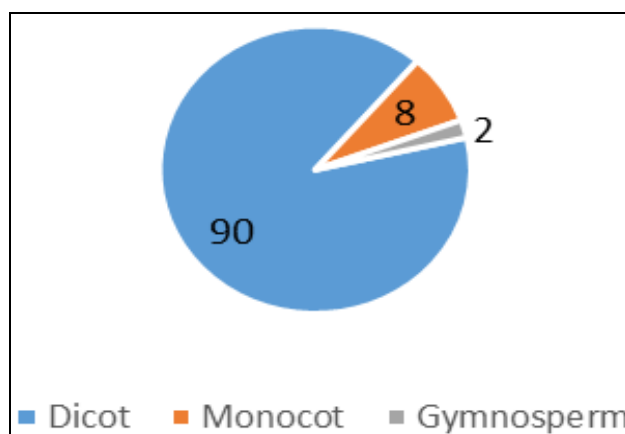


Fig 3: Systematic groups of the plants in the campus area

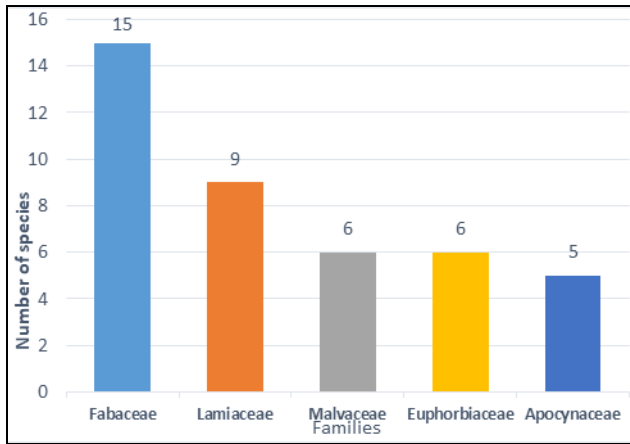


Fig 4: Analysis of Habit-wise distribution of plant species in the campus area.

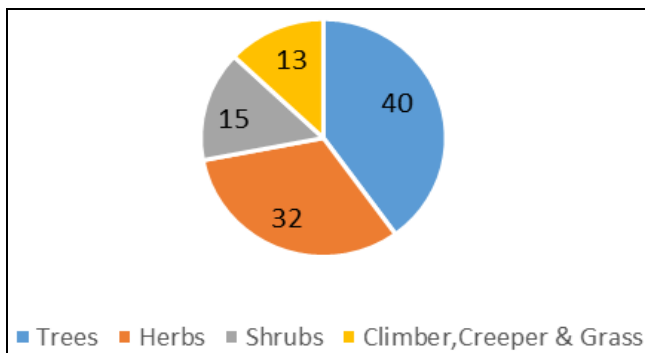


Fig 5: Analysis of Habit-wise distribution of plant species in the campus area.

of the total plant species observed, based on the habit, 40% are Trees, 32% are herbs, 15% are shrubs and 13% are creepers, climbers and grass collectively (Figure 5). The grasslands of campus comprise the grasses like *Cymbogon flexuosus* (Nees ex steud.) W. Watson., *Cynodon dactylon*, *Cyperus rotundus*, *Oryza sativa*. The species *Acalypha indica* L., *Achyranthes aspera* L., *Bryophyllum pinnatum* (Lam.) Oken, *Euphorbia hirta* L., *Croton bonplandianum* Baill., *Amaranthus viridis* L., are the common herbs in this campus. Some of the climbers found in this campus are *Passiflora foetida* L., *Tinospora cordifolia* (Thunb.) Miers, *Tylaphora indica*, *Pergulariadaemia* (Forssk.) Chiov. Some of the creepers found in this campus are *Cissus quadrangularis* L., *Clitoria ternatea* L., *Oxalis corniculata* L. Some of the species are utilized as fruit-yielding like *Citrus limon* (L.) Osbeck, *Limonia acidissima* L., *Phyllanthus acidus* (L.) Skeels, *Phyllanthus emblica* L., *Psidium guajava* L., *Cocos nucifera* L., *Tamarindus indica* L. Some of the species producing Oil seeds are *Ricinus communis* L., *Brassica nigra* L. There are many medicinal species in this campus. Some of them are *Abutilon indicum* (link) Sweet., *Amaranthus viridis* L., *Ocimum basilicum* L., *Cissus quadrangularis* L., *Tylophora indica* L., *Andrographis paniculata* (Burm.f.) Nees, *Sida cordifolia* L., *Justicia adhatoda* L., *Sida cordata* Burm. F., *Clitoria ternatea* L., *Acalypha indica* L., *Cynodon dactylon* (L.) Pers., *Achyranthes aspera* L., *Aerva lanata* (L.) Juss. Ex Schult., *Moringa pterygosperma* Gaertn. nom. illeg., *Aloe vera* (L.) Burm. F., *Cymbogon flexuosus* (Nees ex steud.) W. Watson., *Justicia adhatoda* L.

Some species utilized as spices also identified in this campus. Few of them are *Murraya koenigii* (L.) Sprengel,

Mentha arvensis L., *Coriandrum sativum* L. Some species with ornamental values are *Delonix regia* (Boj. ex Hook.) Raf., *Hibiscus rosasinesis* L., *Senna auriculata* (L.) Roxb., *Cassia fistula* L., *Tecoma stans* (L) Jurs. ex Kunth., *Millingtonia hortensis* L.f., *Polyalthia longifolia* (Soon.), *Clitoria ternatea* L., *Peltophorum pterocarpum* (DC.) K. Heyne, *Araucaria columnaris* J.R. Forst. Hook., *Nerium oleander* L. There are few endangered species of *Dalbergia melanoxylon* Guill. & Perr., *Chamaecostus cuspidatus* (Nees & Mart.) C. Specht & D.W. Stev., *Tinospora cordifolia* (Thunb.) Miers, *Tylaphora indica* reported in the campus. The floristic survey of the campus conquered by angiospermic plant species. Based on this survey, Fabaceae was reported as the dominant family. Dominance of Fabaceae shows that these areas are nutrient deficient up to some extent especially nitrogen (Kumar *et al.*, 2016; Manhas *et al.*, 2010; Vasistha *et al.*, 2010) [28, 30]. Thus, the richness of plant diversity is clearly shown through this survey. Comparison of Campus Flora of HKRH College, Uthamapalayam with that of Different Institutional Campuses in Tamil Nadu viz., Indian Institute of Technology – Chennai, Madras Christian College, Tambaram, Chennai, Pachaiyappa's College and Guru Nanak College – Chennai, Pondicherry University – Puducherry, Theosophical Society campus, Chennai, Bharathiyar University campus, Coimbatore and Scott Christian College campus, Nagercoil, S.T Hindu College, while comparing the campus flora of HKRH College, Uthamapalayam is less in number but moderately diverse. The plant diversity of this campus is greater than those of the Guru Nanak College, Chennai (Table 4). The floristic work on ornamental plants reported greater number of species in Kanyakumari District (Rejitha *et al.*, 2021) [26]. The flora of the present study area have moderate floral diversity when compared to the same geographically positioned Scot Christian College, Nagercoil (Sarasabai *et al.*, 2015 and Parthipan *et al.*, 2016) [20]. The main reason behind this is due to many anthropogenic activities made on the campus such as the construction of new buildings and the undisturbed area of the campus was converted into the new playground. So this is the right time to the floristic studies in the campus are considered as the backbone of the assessment of phytodiversity, conservation, management and sustainable utilization (Rajendran *et al.*, 2013). The campus flora of an institution is a unique opportunity as an outdoor botanical and ecological learning for the campus community. The subsequent measures should be taken in the campus to preserve and enhance the biodiversity (Priya *et al.*, 2020) Kumar S [22].

- The pruning of branches can be avoided during the summer season. This helps to enhance the bird populations and insect variety in the campus.
- A greenhouse can be constructed to keep up the tree saplings.
- A separate model garden is an urgent need of the hour.
- Planting endemic and endangered trees can be given importance.

The number of viable tree saplings grown under the shade of the tree is a vital attribute within the study of biodiversity. They might resolve the regeneration of new plants in the study area. Furthermore, it plays a fundamental role in carbon trapping and sequestration. The dense young tree saplings entrap more carbon from the atmosphere than

the mature trees. Hence the germination of seeds and associated survival of the saplings is an optimistic indicator of the healthy ecosystem. Furthermore, it also provides information about the ability of plant species to adapt, compete and grow in various climates. The present study recorded many tree saplings of *Millingtonia hortensis* and *Cassia fistula*. The college has always given importance to the healthy surroundings. We need a clean environment that represents a powerful sense of positivity and hope for the future. The environment fulfills us when it is used to reconstruct, apply our sciences and practice our arts. Its natural resources and energy also serve as an exclusive means of capita. The present study is all about conserving and to maintain and regenerate the “green campus” that is a universal symbol of value, respect, and apprehension of the life-sustaining processes of the natural ecological system, where we live in and a part of it.

Conclusion

The floristic diversity of the study area is very important for the conservation of species. A large number of Medicinal herbs, fruit, spice and ornamental trees were found out through this survey on this campus. The species identified through this survey can be conserved. It acts as an ex-situ method conservation approach for the conservation of the natural vegetation. Moreover, the study area can be accorded with proper attention to maintain the diversity of the campus and to raise it. The present observation also justifies the need for the conservation of natural flora for the existence of current and future generations.

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Conflict of Interest

The authors do not have any conflict of interest.

References

- Chatterjee D. Studies on the endemic flora of india nd Burma. J. Asiat. Soc. Bengal, 1940:5:19-67.
- Díaz S; Pascual U; Stenseke M; Martín-López B, Watson RT; Molnár Z; Hill R; *et al.* Assessing nature's contributions to people. Science, 2018:359(6373):270-272.
- Gamble JS, Fischer CEC. Flora of the Presidency of Madras, Vol.1-III. Adlard & Son, Ltd. London, 1915-1936.
- Gilbertson DD, Kent M, Pyatt FB. Practical ecology for Geography and Biology, 1985.
- Gupta N, Anthwal A, Bahuguna A. Biodiversity of Mothronwala Swamp, Doon Valley, Uttaranchal. The Journal of American science, 2006:2(3):33-40.
- Hazrat A, Shah Z, Sher K, Ahmad Z, Bibi S, Rahim G. *et al.* Floristic diversity and ecological characteristics of flora of Kharawo Talash, Dir lower, Khyber Pakhtunkhwa, Pakistan Bioscience Research, 2020:17(2):681-687.
- Hooker JD. `Flora of British India, Reeve & Co Ltd., England, 1875.
- Jain SK. Medicinal Plants, National Book Trust, India, 1968, 1-126.
- Jain SK, Rao RR. Handbook of Field and Herbarium Methods. Today and Tomorrow Printer and Publications, New Delhi, India, 1977.
- Jain SP, Singh SC, Verma DM, Singh JS, Kumar S. Flora of Haryana, CIMAP, Lucknow, India, 2000, 1-266.
- Kumar S. Flora of Haryana, Bishan Pal and Mahender Co. Dehradun, India. Jayanthi P., Rajendran A., (2013). Life-forms of Madukkarai Hills of Southern Western Ghats, Tamil Nadu, India. Life Sci. Leaflets, 2001:9:57-61.
- Keith DA. Floristic lists of new south wales, Cunninghamia, 1988:2(1):39-73.
- Kramer A, Hird A, Shaw K, Dosmann M, Mims R. Conserving North America's Threatened Plants: Progress Report on Target of the Global Strategy for Plant Conservation. Botanic Gardens Conservation International U.S. Glencoe, USA, 2011.
- Ma Y, Chen G, Grumbine RE, Dao Z, Sun W, Guo H. Conserving plant species with extremely small populations (PSESP) in China. Biodiversity & Conservation, 2013:22:803-809.
- Maheshwari JK. Flora of Delhi, CSIR, New Delhi, India, 1963.
- Manhas RK, Singh L, Vasistha HB, Negi M, Diversity of Protected Ecosystems of Kandi Region of Punjab, India. New York Sci. J, 2010:3(4):96-103.
- Mcnamara WA. Acer pentaphyllum. Curtis's Botanical Magazine, 2011:28:128-140.
- Nayar MP. Endemic flora of Peninsular India and its significance. Bull. Bot. Surv. India, 1980:22:12-23.
- Oldfield S, Lusty C, Mackinven A. The World List of Threatened Trees. World Conservation Press, WCMC, Cambridge, UK, 1998.
- Parthipan BM, Rajeeswari, Solomon Jeeva. Floristic Diversity of South Travancore Hindu College (S. T. Hindu College) Campus, Kanyakumari District (Tamilnadu) India. Bioscience Discovery, 2016:7(1):41-56.
- Pratikshya Kandel, Nakul Chettri, Ram P Chaudhary, Hemant Kumar Badola, Kailash S Gaira, Sonam Wang chuk. Plant diversity of the Kangchenjunga Landscape, Eastern Himalayas. Plant diversity, 2019:41:153-165.
- Priya PV, Rekha GS, Saravana Ganthi A. Diversity of Tree Species in the District Science Centre Campus, Tirunelveli, Tamil Nadu. Curr. World Environ, 2020:15(2):218-226.
- Raja Ponnuchamy, Arunachalam Pragasam, Soupramanien Aravajy, Prakash Patel, Lipi Das, Krishnamurthy Anupama. A floristic study on herbs and climbing plants at Puducherry, South India: An approach to biodiversity Conservation and regeneration through eco-restoration. Journal of Species lists and distribution, 2013:9(3):555.
- Rajendran A, Aravindhan V, Sarvalingam A. Biodiversity of the Bharathiar university campus, India: A floristic approach. International Journal of Bio diversity and conservation, 2014:6(4):308.
- Reddy CS, Murthy MSR, Dutt CBS. Vegetation diversity and endemism in Eastern Ghats, India. In: Proceedings of National Seminar on Conservation of Eastern Ghats. EPTRI, Hyderabad, 2002:109-134.

26. Rejitha S, Uma Devi S. Ornamental Plant Diversity of the Family Apocynaceae in Kanyakumari District, Tamil Nadu, India. *Med Aromat Plants (Los Angeles)*,2021:10:369.
27. Sudhakar Reddy, Thulsi Rao K, Siva Rama Krishna I, Javed SMM, Vegetation and Floristic Studies in Nallamalais, Andhra Pradesh, India. *Journal of Plant Sciences*,2008:3(1):85.
28. Surendar Kumar, Sunita Duggal, Laura JS, Narender Singh, Rajdeep Kudesia. Phyto-Diversity on Campus of K.M. Government College Narwana, India. *International Journal of Current Microbiology and Applied Sciences*,2016:5(7):566.
29. Theertha PC, Dr Sincy Joseph, Drishya NS, Atheena K, Anusree N. Floristic Diversity and Phytosociological Studies of Selected Area in Kanayannur, Kannur District, Kerala. *International Journal of Creative Research Thoughts (IJCRT)*,2021:9:4048.
30. Vasistha HB., Manhas RK, Singh L, Negi M, Sharma J. Impact of Disturbances on Biodiversity Status, Resource Availability and their Management for Sustainable Development in Kandi Area of Punjab, Punjab Forest Department, Chandigarh, 2010.