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Diversity of Tree Species in the District Science Centre Campus, Tirunelveli, Tamil Nadu

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Abstract

District Science Centre campus is not only a green lung for Tirunelveli City, but also aimed to create awareness about the biodiversity among the public. District Science Centre is committed towards developing a green campus, and established a Garden in achieving the commitment. It is the centre for higher learning, being both recreational and educative role; it will continually host a human population consisting of students and common public. The present study focused on tree diversity and their abundance in District Science Centre, Tirunelveli, Tamil Nadu, India. An extensive floristic survey was conducted in 2019. The results of tree diversity in District Science Centre campus showed 80 tree species. Among 80 species confined in 34 families and 68 genera, *Polyalthia longofolia* was the most dominant and frequent species in the study area. A total of 75 tree species represented by dicot and belong to 63 genera and 32 families were recorded. Out of the identified species, 5 tree species are monocot and belongs to 5 genera and 2 families. In the present study 14 families reported with only one species, 13 families represented by more than 2 species. During the study several anthropogenic activities exploited the tree population in the campus. Still Campus area is was still quite barren, so the entire campus should be lush greenery by new initiative on garden development.

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Angiosperm;
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Conservation;
Endanger;
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Introduction

Planting indigenous tree species and mixing with several other species significantly improve the conservation of biodiversity. Numerous scientific publications are offered the justification for biodiversity conservation (Frankham *et al.,* 2002; Pregernig, 2006). The number of ecological niches in an ecosystem can be increased by growing a higher number and diversity of tree species. This has been sequentially enhanced the associated species

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such as understory plants (Kanowaski *et al.,* 2003) and animals (Wunderle, 1997). Therefore, growing diversity of many tree species on a location not only conserves numerous trees but also other organisms (Markku, 2008).

Oldfield *et al.,* (1998) reported that ten percent of all trees in the world are threatened with extinction. *In situ* conservation methods are more suitable and successful for conservation of rare, vulnerable, threatened species to reduce extinction. There is a increasing awareness that conservation efforts outside the ecosystem (*ex situ* conservation) are essential for species survival (Kramer *et al.,* 2011; Oldfield and Newton, 2012; Pritchard *et al.,* 2012). *In situ* conservation methods are not viable for those tree species with a little population size or edging with threat. *Ex situ* conservation method is the only alternative to avoid its immediate extinction (McNamara, 2011; Ma *et al.,* 2013). Since 1980s, the botanical garden plays a vital role in the field of *ex situ* conservation (Bramwell *et al.,* 1987; Falk, 1987; Falk and Holsinger, 1991; Guerrant *et al.,* 2004). The gardens grown in the urban environment also play vital role in conservation of trees. Trees are our wealth on planet earth. Trees represented in all vascular plants such as tree fern, Gymnosperms include cycads, conifers etc. and Angiosperms include all flowering trees. In a city the streets, parks, playgrounds and backyards of the home are lined with trees that create a peaceful, aesthetically pleasing environment. Being District Science Centre, Tirunelveli, is a government and non-profit organization can be effective to excite better involvement by gardens in plant conservation. The objective of this study was to evaluate the diversity of tree species in District Science Centre, Tirunelveli, Tamil Nadu, India. The District Science Centre campus consists of a diversity of plants and the perusal of literature reveals that there is no published record on the flora of this campus which represents an interesting floristic composition.

Study Area

District Science Centre

The District Science Centre (DSC) was opened to the public on 27th February 1987. It is started with a gallery on "Treasures from Ocean" and a Science Park. It is located near the Collector Office, Kokkirakulam, Tiruneveli Corporation area. It has lot of exhibits, science working models and many displays to gain knowledge. Before long the Center got one of the most well known Centre in National Council of Science Museums (NCSM) due to the tremendous support from the local community. National Council of Science Museums, Government of India is the controlling authority of the centre. Popularize science and technology among public and to supplement science education in schools and colleges to foster a spirit of scientific enquiry among the students is major objective of the centre. The beautiful architectural main building of the centre locates in the middle of the campus. Many outreach programmes such as rural science camp, workshops, seminars, science quizzes, science fair vacation hobby courses etc., are regularly organized.

Methodology

During the course of present study, regular field trips were carried out to the area in 2019 in different seasons to explore the various tree species. Standard methodology was used to elicit the knowledge of trees. All the relevant information of each tree species was recorded in an index card. The plants specimens collected were processed at the laboratory of Botany, Rani Anna Govt. Arts College for Women, Gandhi Nagar and identified with the help of available literature. The identification of plants was done using The Flora of Tamil Nadu Carnatic by K.M. Mathew (1983 -1988), Flora of Tamil Nadu, India by A.N. Henry *et al.,* (1987), Flowering Plants of Chittoor District, Andhra Pradesh, India by Madhavacheetty *et al.,* (2008), Tropical Garden Plants by Bimal Das Chowdhury *et al.,* (1991) and Flora of Presidency of Madras by Gamble (1915 – 1936). The families and nomenclatures are arranged according to online Tropicos database 3.0.2, Missouri Botanical Garden, 2020.

Results and Discussion

On the basis of field survey conducted in The District Science Centre campus area, 80 tree species were collected and identified. They belong to 68 genera and 29 families. Out of the identified tree species 75 are dicot and belong to 63 genera and 27 families; 5 tree species are monocot and belongs to 5 genera and 2 families (Table 1). Among the dicots, 53 species are Polypetalae and family Fabaceae is the most dominant with 16 genera and 20 species. In Gamopetalae 15 genera covering 15 species are

recorded and Bignoniaceae is the most dominant family. In Monochlamydeae 7 species covering 4 genera are recorded and Euphorbiaceae is the most dominant family. In the present study 15 families reported with only one species, 9 families represented by more than 2 species. Present study recorded 12 fruit yielding trees, 9 medicinal trees, 26 ornamental trees, 29 timber value trees and 1 fibre yielding tree. The total number of trees observed during the period of study was 338.

Polyalthia is the dominant species followed by *Lagerstomia* species. Many introduced tree species like *Lagerstomia flos-reginae, L. reiginae, Parkia bigalandulosa, Sterculia foetida* also recorded in the study area. The timber yielding trees like *Dalbergia sisso, Acacia auriculiformis, Tectona grandis, Neolamarckia cadamba, Casuarina littorea* also recorded. The two scared trees *Aegle marmelos, Couroupita guianensis* was observed. The fruit yielding tree like S*yzigium cumini, Mangifera indica, Carica papaya etc. are also observed. Neolamarckia cadamba, Madhuca longifolia, Alstonia scholaris, Ficus religiosa, F. racemosa, Millingtonia hortensis, Erythrina variegata* are huge trees in the campus. Some tall trees like Cassine paniculata are now in the shrub state.

Two endanger tree *Saraca asoka* also grown in the study area. This small tree has become threatened in some parts of its range mainly through the loss of its habitat and overexploitation for medicinal use. Considering the conservation need of this species, it has been listed under the threat category of 'Vulnerable' by International Union for Conservation of Nature (IUCN, 2013) and 'Endangered' by Conservation Assessment and Management Prioritisation (CAMP, 2001). *Santalum album* is another IUCN listed vulnerable species (The IUCN Red List of Threatened Species 2019). *Pterocarpus santalinus* (Red sanders) is listed as an endangered plant species on the IUCN red data list as a result of the exploitation of its wood and essential oil. *Holarrhena pubescens* and *Couroupita guianensis* are classified as 'Least Concern' in the IUCN Red List of Threatened Species 2013.

The number of viable tree saplings grown under the shade of the tree is a crucial aspect within the study of biodiversity. They might determine the regeneration of new plants in the study area. Additionally, it plays a crucial role in carbon trapping and sequestration. The previous reports suggested that the dense young tree saplings trap more carbon from the atmosphere than the mature trees. Thus the germination of seeds and associated survival of the saplings is a positive indicator of the healthy ecosystem. Moreover, it also provides information about the ability of plant species to adapt, compete and grow in several climates. The campus was recorded many tree saplings of *Cassia fistula* and Millingtonia hortensis. Less number of tree saplings was recorded for *Holarrhena pubescens*. The most remarkable tree species in this area of study includes *Delinia indica, Saraca asoca, Holarrhena pubescens* and *Sterculia foetida.*

Flowering phenology

Summer flowering species such as *Azadirachta indica, Lannea coromandelica¸ Erythrina variegata, Cassia fistula, Moringa pterygosperma and Delonix regia* are initiate flower buds on foliated shoots during the hot-dry period (March–June). For these species probable flowering cue increasing day length/ temperature. South west monsoon rainy flowering species such as *Syzygium cumini, Eucalyptus globules, Peltophorum pterocarpum, Mangifera indica, Averrhoa carambola* are initiate flower buds on foliated shoots during the warm-wet period (June–August). The first significant rains after the summer may act as flowering cue for these species. Autumn flowering species such as *Malpighia emarginata, Bauhinia purpurea, Bauhinia variegata* initiate flower buds on shoots with mature leaves (September–December) during the period of decreasing day length. In such species, the frequent rain and less photoperiod may signal the flowering. Dry-season flowering species such as *Terminalia catappa, Dalbergias sissoo, Hardwickia binata, Leucaena leucocephala, Parkia biglandulosa, Lagersroemia indica*, initiation of flowering occur on twigs during cool dry season (December–March), soon after sporadic winter rains.

Characteristic tree species with large branches are nurtured and given preferences by the management to create picnic/play spaces for tourist. Routine weeding of the gardens ensured only desired trees are allowed to thrive while naturally regenerated seedlings are removed for easy human movement

and excellent scenic view. This is in line with the report of Agarwala *et al.,* (2016) who asserted that tree species populations and regeneration is impacted by purpose and level of human use in India.

Table 1: List of trees available in the campus

S. No	Name of Species	Family	Economical importance	Reference	Voucher number
1.	*Lannea coromandelica* (Houtt.) Mann.	Anacardiaceae	Timber	Flo. Pts. Chittoor District A P. 76, 2008.	RAC 367, RAC 401
2.	*Mangifera indica* L.	Anacardiaceae	Fruit, Timber	Fl. Pres. Madras 1:259. 1918.	RAC 371
3.	*Polyalthia longifolia* (Sonner.) Thw.	Annonaceae	Ornamental	Flo. Pts. Chittoor District A P. 17, 2008.	RAC 302
4.	*Polyalthia longifolia* Hook. &Thoms. var. pendula	Annonaceae	Ornamental	Flo. Pts. Chittoor District A P. 17, 2008.	RAC 248
5.	*Alstonia scholaris* (L.) R. Br.	Apocynaceae	Medicinal	Flo. Pts. Chittoor District A P. 196, 2008.	RAC 360
6.	*Holarrhena pubescens* (Buch.-Ham.) Wall. ex G. Don	Apocynaceae	Medicinal	Flo. Pts. Chittoor District A P. 198, 2008.	RAC 263
7.	*Borassus flabellifer* L.	Arecaceae	Timber	Fl. Tamil Nadu Carnatic 3:1670. 1983	RAC 379
8.	*Caryota urens* L.	Arecaceae	Ornamental	Flo. Pts. Chittoor District A P. 366. 2008.	RAC 346
9.	*Cocos nucifera* L.	Arecaceae	Fruit	Flo. Pts. Chittoor District A P. 367, 2008.	RAC 402
10.	*Millingtonia* hortensis L.f.	Bignoniaceae	Ornamental	Flo. Pts. Chittoor District A P. 245, 2008.	RAC 288
11.	*Spathodea* campanulata P. Beauv.	Bignoniaceae	Ornamental	Flo. Pts. Chittoor District A P. 246, 2008.	RAC 300
12.	*Tabebuia rosea* (Bertol.) DC.	Bignoniaceae	Ornamental	Flo. Pts. Chittoor District A P. 247, 2008.	RAC 293
13.	*Tecoma stans* (L.) Kunth.	Bignoniaceae	Ornamental	Flo. Pts. Chittoor District A P. 248, 2008.	RAC 323, RAC 254
14.	*Ceiba pentandra* (L.) Gaerten	Bombacaceae	Fibre	Fl. Tamil Nadu Carnatic 3: 1983	RAC 354
15.	*Cordia dichotoma* Forst. F	Boraginaceae	Timber	Flo. Pts. Chittoor District A P. 216, 2008.	RAC 388
16.	*Carica papaya* L.	Caricaceae	Fruit	Flo. Pts. Chittoor District A P. 136, 2008.	RAC 306
17.	*Casuarina littorea* L.	Casuarinaceae	Ornamental	Flo. Pts. Chittoor District A P. 335, 2008.	RAC 340
18.	*Cassine glauca* Kuntze	Celastraceae	Timber	Fl. of Tamil Nadu. 1: 1983	RAC 279
19.	*Terminalia arjuna* (Roxb. ex DC.) Wt. &Arn.	Combretaceae	Medicinal	Flo. Pts. Chittoor District A P. 125, 2008.	RAC 261
20.	*Terminalia catappa* L.	Combretaceae	Timber	Flo. Pts. Chittoor District A P. 126, 2008.	RAC 233

21.	*Dillenia indica* L.	Deliniaceae	Ornamental	Flo. Pts. Chittoor District A P. 14, 2008.	RAC 223
22.	*Phyllanthus acidus* (L.) Skeels.	Euphorbiaceae	Fruit	Flo. Pts. Chittoor District A P. 321, 2008.	RAC 342
23.	*Phyllanthus emblica* L.	Euphorbiaceae	Fruit	Flo. Pts. Chittoor District A P. 322, 2008.	RAC 364
24.	*Acacia auriculiformis* A.Cunn. ex Benth.	Fabaceae	Ornamental	Flo. Pts. Chittoor District A P. 114. 2008.	RAC 203
25.	*Adenanthera* pavonina L.	Fabaceae	Timber	Flo. Pts. Chittoor District A P. 116, 2008.	RAC 243, RAC 399
26.	*Albizia lebbeck* (L.) Benth.	Fabaceae	Timber	Fl. Pres. Madras 1:432. 1919	RAC 332
27.	*Bauhinia purpurea* L.	Fabaceae	Ornamental	Flo. Pts. Chittoor District A P. 106, 2008.	RAC 283
28.	*Bauhinia variegata* L	Fabaceae	Ornamental	Flo. Pts. Chittoor District A P. 107, 2008.	RAC 315
29.	*Cassia fistula* L.	Fabaceae	Ornamental	Fl. Tamil Nadu Carnatic 3:499	RAC 289
30.	*Cassia javanica* L.	Fabaceae	Ornamental	Flo. Pts. Chittoor District A P. 109, 2008.	RAC 231
31.	*Cassia siamea* Lam.	Fabaceae	Ornamental	Fl. Pres. Madras 1:285, 1957	RAC 215, RAC 377
32.	*Dalbergia sissoo* Roxb.	Fabaceae	Timber	Fl. Pres. Madras 383, 1918	RAC 259
33.	*Delonix regia* (Boj. ex Hook.) Rafin	Fabaceae	Ornamental	Fl. Pres. Madras 1:280, 1957	RAC 295
34.	*Erythrina variegata* L.	Fabaceae	Ornamental	Flo. Pts. Chittoor District A P. 90, 2008.	RAC 358
35.	*Hardwickia binata* Roxb.	Fabaceae	Timber	Fl. Pres. Madras 1:412, 1919.	RAC 286
36.	*Leucaena leuco* -cephala (Lam.) de Wit	Fabaceae	Timber	Flo. Pts. Chittoor District A P. 118, 2008.	RAC 374
37.	*Parkia biglandulosa* Wt. &Arn.	Fabaceae	Ornamental	Flo. Pts. Chittoor District A P. 119, 2008.	RAC 256
38.	*Peltophorum ptero* carpum (DC.) Baker ex Heyne	Fabaceae	Ornamental	Flo. Pts. Chittoor District A P. 112, 2008.	RAC 313, RAC 362, RAC 200
39.	*Pithecellobium dulce* (Roxb.)Benth	Fabaceae	Fruit	Flo. Pts. Chittoor District A P. 119, 2008.	RAC 383
40.	*Pongamia pinnata* (L.) Pier.	Fabaceae	Timber, Medicinal	Flo. Pts. Chittoor District A P. 97, 2008.	RAC 212, RAC 333
41.	*Pterocarpus* santalinus L.f.	Fabaceae	Timber	Flo. Pts. Chittoor District A P. 98, 2008.	RAC 319
42.	*Saraca asoca* (Roxb.) Wilde	Fabaceae	Medicinal	Flo. Pts. Chittoor District A P. 113, 2008.	RAC 271
43.	*Tamarindus indica* L.	Fabaceae	Fruit	Flo. Pts. Chittoor District A P. 113, 2008.	RAC 272
44.	*Tectona grandis* L. f.	Lamiaceae	Timber	Flo. Pts. Chittoor District A P. 270, 2008.	RAC 355
45.	*Vitex altissima* L.f.	Lamiaceae	Medicinal	Flo. Pts. Chittoor	RAC 226

				District A P. 271, 2008.	
46.	*Couroupita guian -ensis* Aubl.	Lecythidaceae	Medicinal	Flo. Pts. Chittoor District A P. 129, 2008.	RAC 350
47.	*Lagerstroemia* indica L.	Lythraceae	Ornamental	Flo. Pts. Chittoor District A P. 132, 2008.	RAC 210, RAC 359
48.	*Lagerstroemia* parviflora Roxb.	Lythraceae	Ornamental	Flo. Pts. Chittoor District A P. 132, 2008.	RAC 301
49.	*Lagerstroemia* reginae Roxb.	Lythraceae	Ornamental	Flo. Pts. Chittoor District A P. 132, 2008.	RAC 328
50.	*Malpighia emargi -nata* DC.	Malphigiaceae	Ornamental	Tro. Gar. Plts. 1991	RAC 394
51.	*Grewia tiliifolia* Vahl.	Malvaceae	Timber	Flo. Pts. Chittoor District A P. 50, 2008.	RAC 321
52.	*Guazuma* ulmifolia Lam	Malvaceae	Timber	Flo. Pts. Chittoor District A P. 45, 2008.	RAC 356
53.	*Pterospermum aceri -folium* (L.) Willd.	Malvaceae	Timber	Flo. Pts. Chittoor District A P. 321, 2008.	RAC 347
54.	Sterculia foetida L.	Malvaceae	Ornamental	Flo. Pts. Chittoor District A P. 47, 2008.	RAC 318
55.	*Thespesia populnea* (L.) Soland. ex Correa.	Malvaceae	Timber	Flo. Pts. Chittoor District A P. 43, 2008.	RAC 208
56.	*Azadirachta indica* A. Juss	Meliaceae	Timber, Medicinal	Fl. Pres. Madras 1:177. 1915	RAC 268
57.	*Swietenia mahagonia* (L.) Jacq.	Meliaceae	Timber	Flo. Pts. Chittoor District A P. 64, 2008.	RAC 335
58.	*Ficus religiosa* L.	Moraceae	Timber	Fl. Pres. Madras 3:1368; 1919.	RAC 284
59.	*Ficus benghalensis* L.	Moraceae	Timber	Fl. Pres. Madras 1361,1928	RAC 273, RAC 398
60.	*Ficus racemosa* L.	Moraceae	Timber	Flo. Pts. Chittoor District A P. 333, 2008.	RAC 246
61.	*Morus alba* L.	Moraceae	Timber	Flo. Pts. Chittoor District A P. 334, 2008.	RAC 311
62.	*Moringa pterygo -sperma* Gaertn	Moringaceae	Vegetable	Flo. Pts. Chittoor District A P. 77, 2008.	RAC 207
63.	*Ensete superbum* (Roxb.) Cheesman	Musaceae	Ornamental	Flo. Pts. Chittoor District A P. 345, 2008.	RAC 344
64.	*Ravenala madagas* -carensis Sonner.	Musaceae	Ornamental	Flo. Pts. Chittoor District A P. 346, 2008.	RAC 220
65.	*Callistemon citrinus* (Curtis) Skeels	Myrtaceae	Ornamental	Flo. Pts. Chittoor District A P. 127, 2008.	RAC 251
66.	*Eucalyptus globules* Labill.	Myrtaceae	Medicinal	Flo. Pts. Chittoor District A P. 128, 2008.	RAC 317
67.	*Psidium guajava* L.	Myrtaceae	Fruit	Flo. Pts. Chittoor District A P. 321, 2008.	RAC 276
68.	*Syzygium cumini* (L.) Skeels	Myrtaceae	Fruit	Flo. Pts. Chittoor District A P. 47, 2008.	RAC 361, RAC 280
69.	*Averrhoa carambola* L.	Oxalidaceae	Fruit	Flo. Pts. Chittoor District A P. 55, 2008.	RAC 378
70.	*Ziziphus mauri*	Rhamnaceae	Fruit	Fl. Tamil Nadu Carnatic	RAC 308

	-tiana Lam.			3:271. 1983.	
71.	*Morinda pubescens* J.E. Smith	Rubiaceae	Timber, Medicinal	Fl. Pres. Madras 651, 1921;	RAC 236, RAC 330
72.	*Neolamarckia cada -mba* (Roxb.) Boss.	Rubiaceae	Timber	Flo. Pts. Chittoor District A P. 160, 2008.	RAC 303
73.	*Aegle marmelos* (L.) Correa.	Rutaceae	Medicinal	Fl. Tamil Nadu Carnatic 101,1982	RAC 309
74.	*Murraya koenigii* (L.) Spreng.	Rutaceae	Food preparation	Flo. Pts. Chittoor District A P. 58, 2008.	RAC 352
75.	*Murraya paniculata* (L.) Jack.	Rutaceae	Timber	Flo. Pts. Chittoor District A P. 58, 2008.	RAC 298
76.	*Santalum album* L.	Santalaceae	Timber, Medicinal	Flo. Pts. Chittoor District A P. 306, 2008.	RAC 253
77.	Madhuca longifolia (Koen.) Macbr.	Sapotaceae	Timber, Medicinal	Fl. Pres. Madras 2 : 536. 1957.	RAC 385
78.	*Manilkara zapota* (L.) P. Royen	Sapotaceae	Fruit	Flo. Pts. Chittoor District A P. 187, 2008.	RAC 337
79.	*Mimusops elengi* L.	Sapotaceae	Medicinal	Flo. Pts. Chittoor District A P. 187, 2008.	RAC 265
80.	*Ailanthus excelsus* Roxb.	Simaroubaceae	Timber	Flo. Pts. Chittoor District A P. 60, 2008.	RAC 325, RAC 381

The present study recorded many man-made activities that are not favourable to conserve the available vegetation in the campus. Cutting of branches of trees, plastic bags and plastic bottle thrown around the vegetated area of the campus are supported the unpleasant anthropogenic activities. The following measures should be taken in the campus to maintain and enrich the biodiversity.

- The pruning or cutting of branches should be avoided during the summer season. This promotes bird populations and insect diversity in the campus.
- A green house should be constructed to maintain the tree saplings.
- A separate model star garden is an immediate need of the hour.
- Planting endemic and endangered trees should be given more importance.

Role of Gardens in Conservation

The present study reveals the District Science Centre is one of the most suitable areas to conserve important tree species. Presently the garden in DSC critically contributes to conservation of biodiversity. Tree conservation should include in all aspects of garden operations and activities. Gardens can work more collaboratively by establishing or joining a hub of conservation action. The participation of non-traditional gardens in tree conservation and provides an exponential increase in the number of threatened trees protected. These gardens can collaborate with leading gardens by volunteering to grow threatened tree species. Empowering smaller gardens it is particularly important for the global garden community to build capacity for tree conservation in biodiversity (Nicole *et al.,* 2015).

Suggestions

The Distract Science Centre, Tirunelveli is known for its Science related programmes and training camps. The entire campus is planted with a variety of trees. It is a valuable asset. It provides space for people to engage in recreational activities. People from the local area regularly visit this centre, thus provides space to interact with each other and meet new people. It will be more informative, if more interpretation panels are setup at many locations giving data of the fauna and flora throughout the campus. This will able to produce awareness among the visitors towards the conservation of flora and fauna. In near future the entire campus to be converts into an ecological laboratory.

- Still Campus area is not fully used for the garden making, so the entire campus should be utilized

for the garden development.

- Government should appoint gardener and a Botanist for maintenance of the garden.
- Growing Gymnospermous trees give more attraction
- Naming of trees give more exposure on medicinal plants to the students and visitors.

At present, diversity and number of plants in an ecosystem is degraded at an exponential rate. This reduction in the diversity of flora is directly associated decrease in ecosystem services (Gao Chen and Weibang, 2018). Recently, the increasing agricultural and forestry practices cause over-harvesting and over-exploitation of vegetation, rapid increasing urbanization, various serious environmental pollution, change in land use pattern, invasion of alien species, and world climate change due to the numerous anthropogenic activities, encompass tremendous pressure on vascular plants. This resulted in a third of the world's 300,000 - 450,000 vascular plant species face extinction (Pitman and Jørgensen, 2002; Ren and Duan, 2017). Hence, there is a greater need to widen integrative conservation approaches to conserve the rare and vulnerable plant species in the natural habitats (Li and Pritchard, 2009) and therefore our approaches on the plant conservation should be an integrative. Gardens in the scientific institutions offer their resources to the study and conservation of plants, as well as making the world's plant species diversity known to the public.

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Conflict of Interest

The authors do not have any conflict of interest.

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