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FLORISTIC STUDY ON ANGIOSPERMS SURROUNDING THE MEDAVAKKAM LAKE, CHENGALPATTU DISTRICT, TAMIL NADU, INDIA

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ABSTRACT

Biodiversity plays a significant role in maintaining the ecosystem for their sustainable utilization. A preliminary survey was conducted to document the diversity and economic importance of the angiosperms around the Medavakkam Lake, Chengalpattu district, Tamil Nadu. The study area act as a seed bank for native species and provide suitable conditions to endemic and certain endangered species. Diversity indices of the study area was found significant, in which the species abundance, richness and evenness were found. A total of 71 species belonging to 36 families of angiosperms were documented. Among which the Dicotyledons plants were 87.32% and monocotyledon plants were 12.67% of total flora reported. The study area was dominated by the family fabaceae (14.1%) with ten species. Habit wise classification of plants reveal that trees are predominant with 32%, followed by hers (25%), Shrubs (21%), Climbers (13%), undershrubs (6%) and grasses (3%). The Simpson Diversity Index, Shannon Wiener Index and evenness index of the study area is 0.777, 1.5634 and 0.8725 respectively. These plants was found with enormous benefits to the mankind such as medicinal, edible, timber, ornamental, oil and other sources. This investigation divulges that the Medavakkam Lake has substantial angiosperm diversity served as major source for native plants having greater economic importance.

Keywords: Diversity, Angiosperms, Endemic, Medavakkam

INTRODUCTION

In General biodiversity is referred as the composition of living organisms including plants, animals and microbes inhabiting the terrestrial, aquatic and other habitats of a region or a country. United Nations Environment Programme (UNEP) described biological diversity as the variety and variability of all animals, plants and microorganisms and the ecological complexes of which they are a part. Biodiversity is very indeed to the functioning of various ecosystems. Each species in the world plays a unique role within an ecosystem and every species is dependent on other species for food, shelter and other purposes. Even the loss of a single species, can make an impact on ecosystem as well human life.

India is a country rich in a wide variety of Biodiversity. Most of the plants that grow here serve a high medicinal purpose [(1)]. In India, from the pre-medieval age, holds a possession over natural medicine. Traditional uses of floristic diversity are the foremost vital part of indigenous information system, which is widely practiced by human populations all across the world. This knowledge has been transferred orally from generation to generation. Floristic studies is nothing but exploring the region by identifying plants and grouping them, data collection of plants present in the region and counting of them. These studies have gifted mankind with the knowledge of plants which are economically important and of high medicinal value. Since the angiosperms fulfills major needs of human life such as foods, medicines, shelter, cloths and other luxuries [(2)].

Tamil Nadu is one among the twenty eight states of India is found with rich floral diversity region. Irwin *et al.*, [(3)] revealed that there are about 5674 angiospermic species in Tamil Nadu state, which include 212 taxa that are endemic to the state. Medavakkam is one of the major suburban of the Chengalpattu district, located in the state Tamil Nadu. The district supports a wide variety of biodiversity even though it is under the process of rapid urbanization. Though Nehru *et al.*, [(4)] studied Nanmangalam Reserve Forest (NRF) of Chengalpattu district, and documented 313 genera with 449 species of angiosperms representing 83 families, Chengalpattu still needs more attention to explore the natural wealth of the district.

Medavakkam of Chengalpattu district is considered to be home for many native and exotic species and is surrounded by several waterbodies. These waterbodies not only support the flora and fauna but also serve as the water source for mankind, yet investigation on flora of Medavakkam and the surrounding localities is still found with paucity. Furtherly such isolated habitats may act as a seed store for native species and provide suitable conditions to endemic and certain endangered species. Hence an attempt was made to document the angiosperms associated with the Medavakkam Lake, Chengalpattu

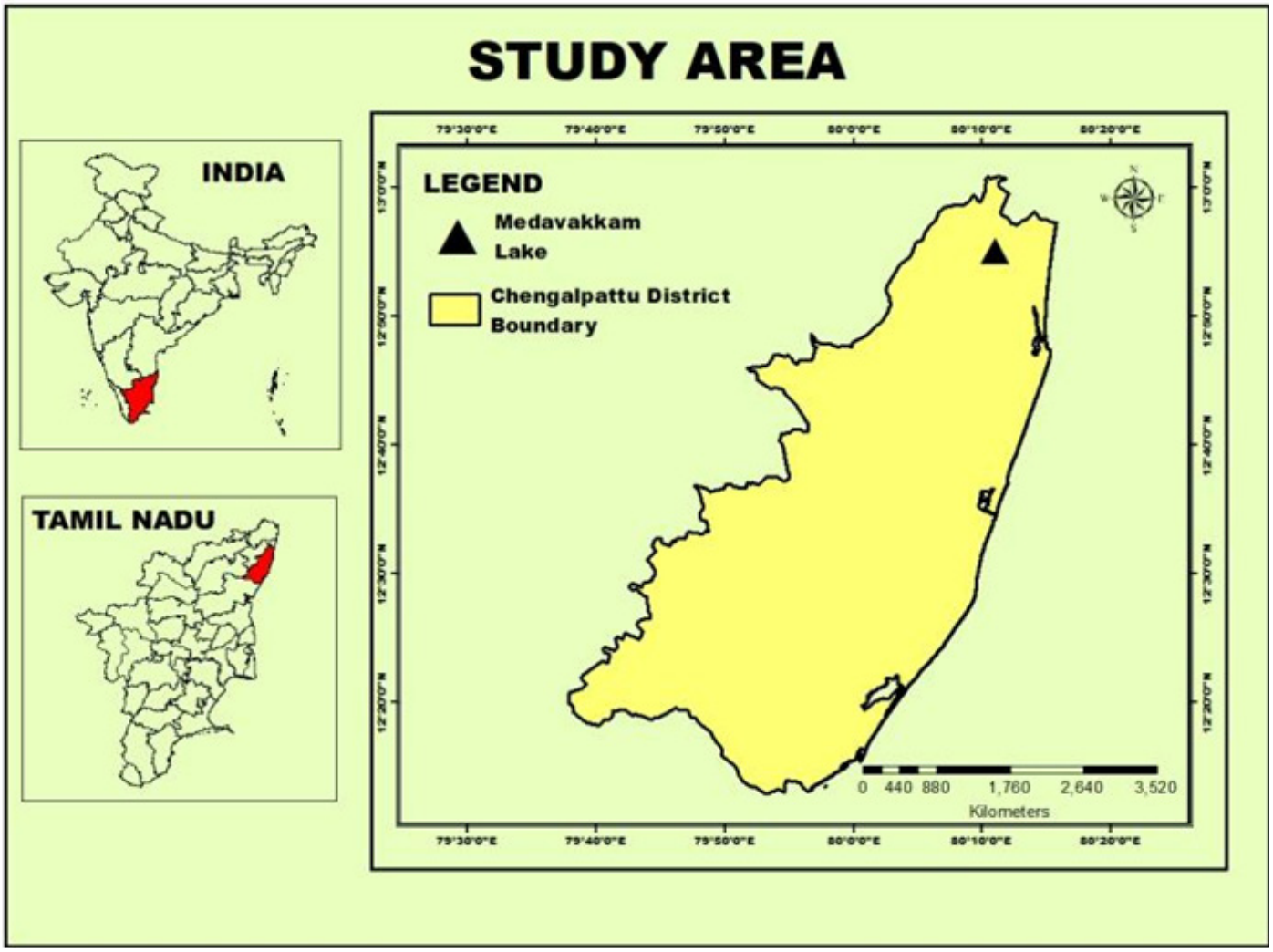
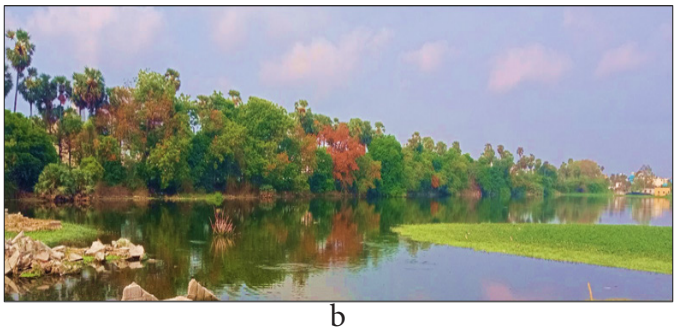


Fig.1 Map of the Study Area

The above location map of this study was created using software ArcGIS 10.3 Version 10.3.0.4322 © 1999 – 2012 Esri Inc.

DATA COLLECTION

a



b

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d

a – Satellite image of the study area (Source: Google Earth); b - d – Images showing the domination of angiosperms from the study area

district, Tamil Nadu.

The primary goal in the present work is to document the angiosperms associated with Medavakkam Lake, Chengalpattu district, Tamil Nadu, India that may lead to formulating steps to conservation of natural resources associated with it. The study is also aimed to explore the diversity indices and economic importance of the plants from the study area.

Methodology

Study Area

The Medavakkam Lake is located in north east direction of Chengalpattu district, Tamil Nadu, India (Fig.1). This lake is named as 'Medavakkam Lake' because of it is located in the suburban Medavakkam and is 25km distance form Chennai city. The total area of lake is estimated as 10.2 hectares with 1243m as perimeter, in which the southern bank (620m) is distinctly occupied by angiospermic diversity (PLATE I). Rest of the lake was surrounded by human settlements and serve as water sources for plants, birds and humans.

Data Collection

The source of materials for this floristic research was the extensive data collections on flowering plants surrounding the Medavakkam Lake, Chengalpattu district, Tamil Nadu. This preliminary survey was conducted between post monsoon and dry seasons (October 2020 - December 2020) which ensured the diversity of plants from the study area. The study was focused on collecting data on various habits of angiosperms including herb, grass, climber, liana, shrub and tree.

Identification of Plants

The identification and authentication of plants were done with the aid of valid publications and references [5, 6, 7, 8, 9, 10 & 11]. Angiosperm phylogenic group II was followed to classify the species. Nomenclature and author citation for all the species were thoroughly checked with standard monographs and books.

Diversity Analysis

In ecology, a diversity index is a statistic which is proposed to measure the biodiversity of an ecosystem. To analyze and evaluate the level of diversity from study area, the diversity indices such as Simpson's Diversity index; Wiener index and Evenness were derived. Simpson's index (D) - species abundance; Shannon Wiener Index (H) – species richness and Evenness (H-max) – measurement of evenness were calculated.

The formula are used as follows,

$$\text{Simpson's Index } (\mathbf{D}) = \mathbf{1} - \frac{\sum \mathbf{n(n-1)}}{\mathbf{N\,(N-1)}}$$

$$\text{Shannon's index } (\mathbf{H}) = -\sum_{i=1}^{S} \boldsymbol{pi\ In\ pi}$$

$$\text{Evenness } (\mathbf{E_H}) = \mathbf{H} / \mathbf{H_{max}}$$

RESULTS AND DISCUSSION

A total number of seventy one taxa belonging to seventy genera and thirty six families of angiosperms were documented from the Medvakkam Lake, Chengalpattu district of Tamil Nadu during the study period. The number of genera (70) and species (71) were almost found equal quantity in the study area which ensured the greater diversity of plants. The plants documented from the study area had showed more variations in terms of cotyledons, taxonomic categories and habits (Table 1). The study area was found with both monocotyledon as well as dicotyledon plants. Among which the dicotyledons plants represent the highest group on the basis of number of species in the study area with about 87.32% and the monocotyledons with only 12.67% of the total flora reported (Fig.2).

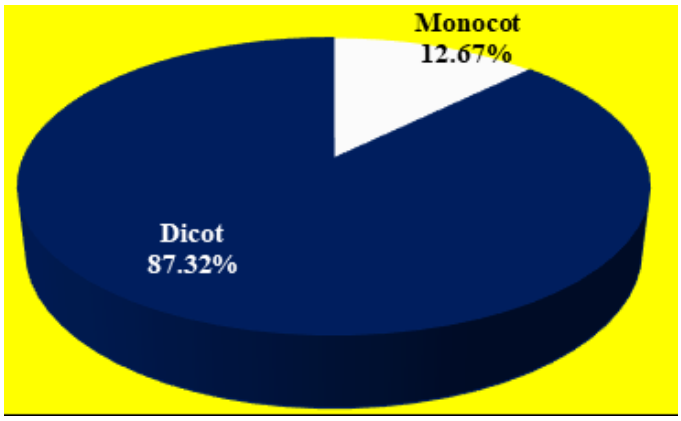

Fig.2 - Graphical representation of monocots & dicots recorded from the study area

Hence, the study showed that dicots were dominant over monocot with reference to their numerical strength which is in similar to the study reported by Khanna [12] in Madhya Pradesh and Sandeep *et al.,* [13] in Uttaranchal that showed domination of dicots.

Thirty six families were documented from the study area, name of the family, division to which they belong and the nature of their habits were given in table 1. The study area was dominated by the family *Fabaceae* (14.1%) with ten species (Fig.3). Similarly the dominance of Fabaceae were reported by Nehru *et al.*, [4] Irwin *et al.,* [14] and Radha *et al.,* [15] in their floral diversity study.

The families *Apocynaceae* and *Malvaceae* were documented with 5 species (7%) found to be second dominant from the study area. Wherein the families such as *Cucurbitaceae, Euphorbiaceae, Lamiaceae* and *Solanaceae* were reported with 4 species (5.6%) from the study area. Although single species (1.4%) were recorded

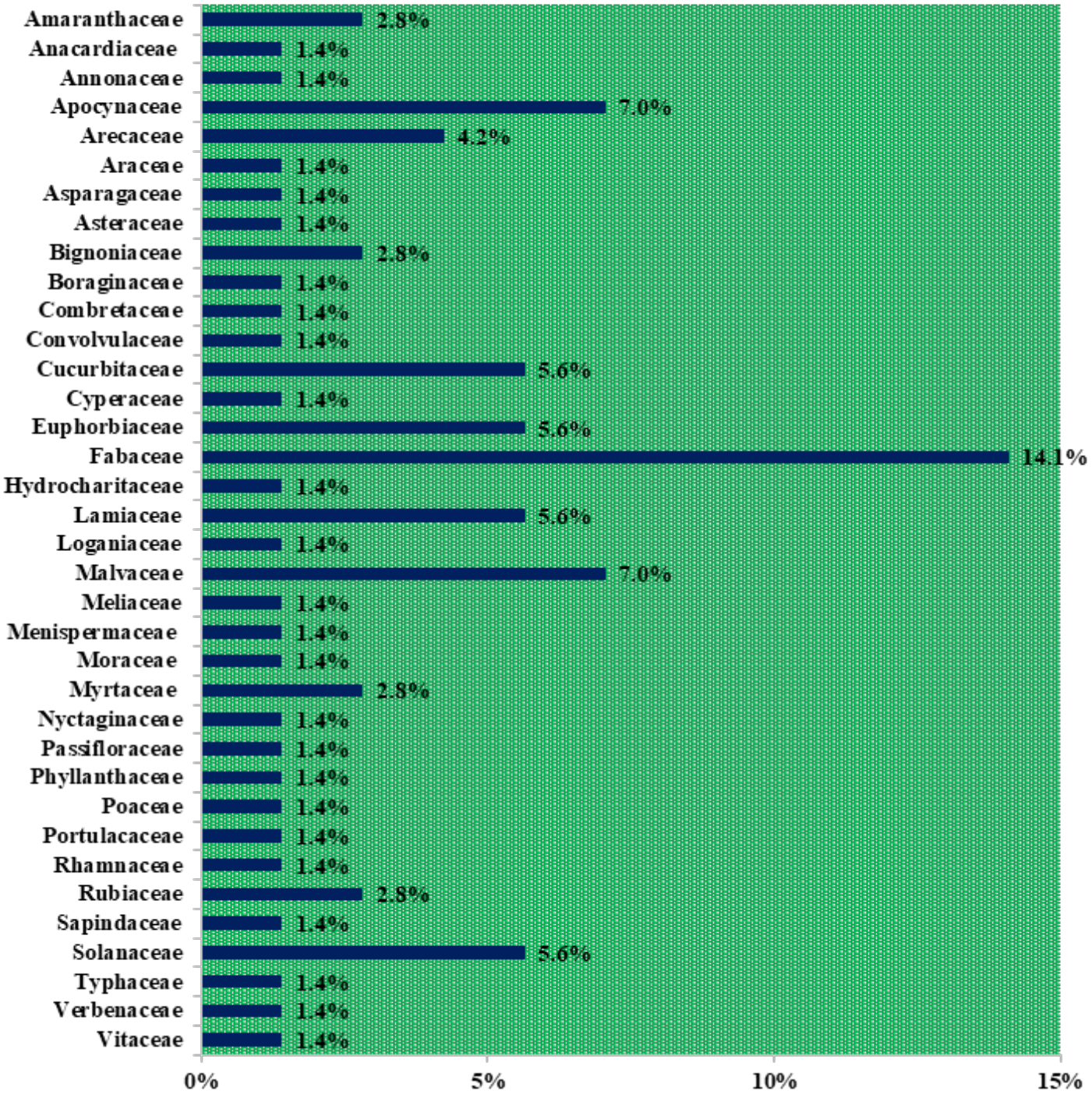

Fig .3 - Bar diagram is showing percentages of families reported in the study area.

in 24 families from the study area, the taxonomic categories of the study area showed that all the families were found with equal number of genus and species except family *Solanaceae* (Fig.4). *Solanum* was the only genus with 2 seperate species *(S. torvum and S. trilobatum)* recorded from the study area. The results showed that study area was rich in Genus.

Habit-wise classifications of the plants from the study area reveals that trees (32%) were dominant, followed by herbs (25%) and shrubs (21%). Other habits like climbers (13%), under shrubs (6%) and grasses (3%) were also contributed towards the species composition of the study area (Fig.5). Similarly the domination of tree species were also documented by Abhishek *et al.,* [16] and Rahman *et al.,* [17]. Generally the floristic studies were dominated by herbaceous families [18, 19] for example the work done by Gamble and Fischer [5], Kushwaha *et al.,* [20] and Ronak *et al.,* [21] also dominated by herbaceous plants. Wherein this investigations was dominated by the trees as compared with other forms of angiosperms from the study area.

In the present study the value of Simpson's Diversity Index is 0.777. The results showed that the study area has greater level of diversity (Fig.6). Shannon's Wiener Index is calculated to find out the species richness and species evenness as overall index of diversity. The value of Shannon's Wiener index also ranges between 0 and 1. Higher the value greater the species diversity. In this study the Shannon Wiener Index and evenness index is 1.5634 and 0.8725 respectively were derived (Fig.6). Similarly Muralidharan [19] and Shafighi *et al.,* [22] employed diversity

Table.1 –List of species recorded from the Medavakkam Lake, Chengalpattu district.

S. No	Division	Family	Name of the Species	Habit
1	Dicotyledons	*Amaranthaceae*	*Achyranthes aspera* L.	Herb
2	Dicotyledons	*Amaranthaceae*	*Aerva lanata* (L.) Juss. *ex* Schul.	Herb
3	Dicotyledons	*Anacardiaceae*	*Mangifera indica* L.	Tree
4	Dicotyledons	*Annonaceae*	*Annona squamosa* L.	Tree
5	Dicotyledons	*Apocynaceae*	*Calotropis gigantea* (L.) W.T. Aiton.	Shrub
6	Dicotyledons	*Apocynaceae*	*Catharanthus roseus* (L.) G. Don.	Herb
7	Dicotyledons	*Apocynaceae*	*Hemidesmus indicus* (L.) R. Br.	Climber
8	Dicotyledons	*Apocynaceae*	*Nerium oleander* L.	Shrub
9	Dicotyledons	*Apocynaceae*	*Wrightia tinctoria* R. Br.	Tree
10	Monocotyledons	*Arecaceae*	*Borassus flabellifer* L.	Tree
11	Monocotyledons	*Arecaceae*	*Cocos nucifera* L.	Tree
12	Monocotyledons	*Arecaceae*	*Phoenix sylvestris* (L.) Roxb.	Tree
13	Monocotyledons	*Araceae*	*Colocasia esculenta* (L.) Schott.	Herb
14	Monocotyledons	*Asparagaceae*	*Dracaena trifasciata* (Prain) Mabb.	Herb
15	Dicotyledons	*Asteraceae*	*Tridax procumbens* L.	Herb
16	Dicotyledons	*Bignoniaceae*	*Millingtonia hortensis* L.f.	Tree
17	Dicotyledons	*Bignoniaceae*	*Tecoma stans* (L.) Juss. *ex* Kunth.	Shrub
18	Dicotyledons	*Boraginaceae*	*Heliotropium indicum* L.	Herb
19	Dicotyledons	*Combretaceae*	*Terminalia catappa* L.	Tree
20	Dicotyledons	*Convolvulaceae*	*Ipomoea aquatica* Forssk.	Herb
21	Dicotyledons	*Cucurbitaceae*	*Carica papaya* L.	Tree
22	Dicotyledons	*Cucurbitaceae*	*Coccinia grandis* (L.) Voigt.	Climber
23	Dicotyledons	*Cucurbitaceae*	*Momordica charantia* L.	Climber
24	Dicotyledons	*Cucurbitaceae*	*Mukia maderaspatana* (L.) M. Roem.	Climber
25	Monocotyledons	*Cyperaceae*	*Cyperus Spp.*	Grass
26	Dicotyledons	*Euphorbiaceae*	*Acalypha indica* L.	Herb
27	Dicotyledons	*Euphorbiaceae*	*Euphorbia hirta* L.	Herb
28	Dicotyledons	*Euphorbiaceae*	*Jatropha gossypiifolia* L.	Shrub
29	Dicotyledons	*Euphorbiaceae*	*Ricinus communis* L.	Shrub
30	Dicotyledons	*Fabaceae*	*Abrus precatorius* L.	Climber
31	Dicotyledons	*Fabaceae*	*Cassia auriculata* L.	Shrub
32	Dicotyledons	*Fabaceae*	*Clitoria ternatea* L.	Climber
33	Dicotyledons	*Fabaceae*	*Delonix regia* (Boj. *ex* Hook) Raf.	Tree
34	Dicotyledons	*Fabaceae*	*Mimosa pudica* L.	Herb
35	Dicotyledons	*Fabaceae*	*Peltophorum pterocarpum* (DC.) Backer *ex* Heyne.	Tree
36	Dicotyledons	*Fabaceae*	*Pongamia pinnata* (L.) Merr.	Tree
37	Dicotyledons	*Fabaceae*	*Prosopis juliflora* (Sw.) DC.	Tree
38	Dicotyledons	*Fabaceae*	*Tamarindus indica* L.	Tree
39	Dicotyledons	*Fabaceae*	*Tephrosia villosa* (L.) Pers.	Herb
40	Monocotyledons	*Hydrocharitaceae*	*Hydrilla verticillata* (L. f.) Royle.	Herb
41	Dicotyledons	*Lamiaceae*	*Leucas aspera* (Willd.) Link.	Herb
42	Dicotyledons	*Lamiaceae*	*Ocimum tenuiflorum* L.	Under Shrub
43	Dicotyledons	*Lamiaceae*	*Tectona grandis* L.f.	Tree
44	Dicotyledons	*Lamiaceae*	*Vitex negundo* L.	Shrub
45	Dicotyledons	*Loganiaceae*	*Strychnos nux-vomica* L.	Tree
46	Dicotyledons	*Malvaceae*	*Abutilon indicum* (L.) Sweet.	Shrub
47	Dicotyledons	*Malvaceae*	*Guazuma ulmifolia* Lam.	Tree
48	Dicotyledons	*Malvaceae*	*Hibiscus rosa-sinensis* L.	Shrub

Continued...

49	Dicotyledons	*Malvaceae*	*Sida cordifolia* L.	Under Shrub
50	Dicotyledons	*Malvaceae*	*Thespesia populnea* (L.) Sol. *ex* Corrêa.	Tree
51	Dicotyledons	*Meliaceae*	*Azadirachta indica* A. Juss.	Tree
52	Dicotyledons	*Menispermaceae*	*Tinospora cordifolia* (Willd.) Miers.	Climber
53	Dicotyledons	*Moraceae*	*Ficus benghalensis* L.	Tree
54	Dicotyledons	*Myrtaceae*	*Psidium guajava* L.	Tree
55	Dicotyledons	*Myrtaceae*	*Syzygium cumini* (L.) Skeels.	Tree
56	Dicotyledons	*Nyctaginaceae*	*Mirabilis jalapa* L.	Herb
57	Dicotyledons	*Passifloraceae*	*Passiflora foetida* L.	Climber
58	Dicotyledons	*Phyllanthaceae*	*Phyllanthus amarus* Schumach and Thonn.	Herb
59	Monocotyledons	*Poaceae*	*Cynodon dactylon* (L.) Pers.	Grass
60	Dicotyledons	*Portulacaceae*	*Portulaca oleracea* L.	Herb
61	Dicotyledons	*Rhamnaceae*	*Ziziphus oenopolia* (L.) Mill.	Shrub
62	Dicotyledons	*Rubiaceae*	*Catunaregam spinosa* (Thunb.) Tirveng.	Shrub
63	Dicotyledons	*Rubiaceae*	*Morinda pubescens* Sm.	Tree
64	Dicotyledons	*Sapindaceae*	*Dodonaea viscosa* (L.) Jacq.	Shrub
65	Dicotyledons	*Solanaceae*	*Datura metel* L.	Under Shrub
66	Dicotyledons	*Solanaceae*	*Physalis angulata* L.	Herb
67	Dicotyledons	*Solanaceae*	*Solanum torvum* Sw	Shrub
68	Dicotyledons	*Solanaceae*	*Solanum trilobatum* L.	Climber
69	Monocotyledons	*Typhaceae*	*Typha angustifolia* L.	Under Shrub
70	Dicotyledons	*Verbenaceae*	*Lantana camara* L.	Shrub
71	Dicotyledons	*Vitaceae*	*Cissus quadrangularis* L.	Shrub

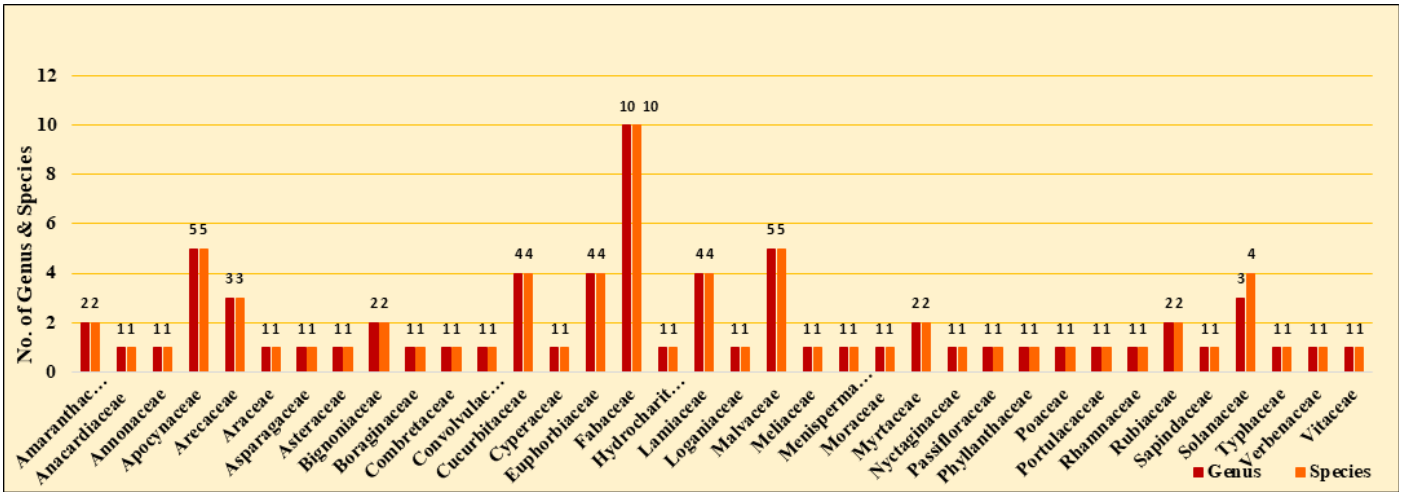

Fig. 4 - Bar diagram is showing taxonomical categories recorded in the study area.

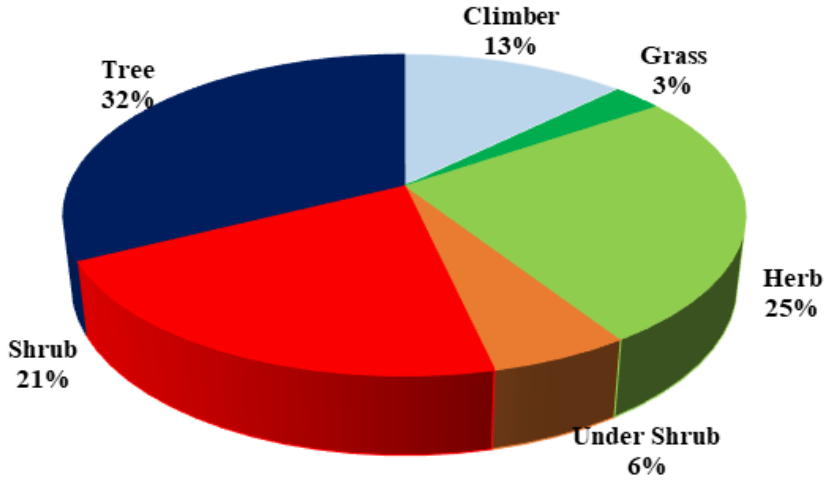

Fig.5 - Graphical representation of habit distribution of the angiosperms in the study area.

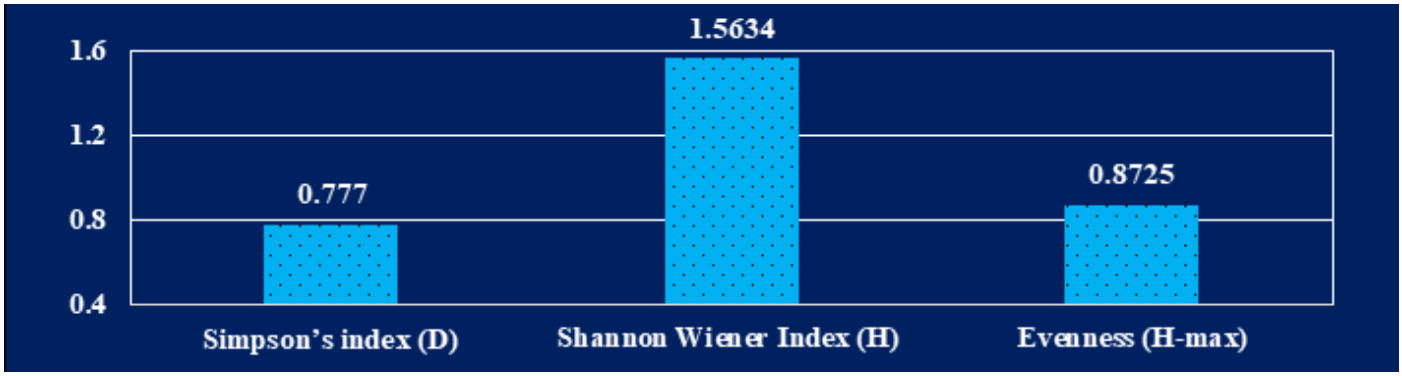

Fig.6 - Diversity Indices of plants in the study area

Table.2 - Medicinal and other economically importance of plants from the study area

S. No	Name of the Species	Plant used as					
		Medicinal purposes	Edible purposes	Timber purposes	Ornamental purposes	Oil Sources	Other purpose
1	*Achyranthes aspera* L	+	-	-	-	-	
2	*Aerva lanata* (L.) Juss. *ex* Schul	+	-	-	-	-	+
3	*Mangifera indica* L	+	+	+	-	-	-
4	*Annona squamosa* L	-	+	+	-	-	-
5	*Calotropis gigantea* (L.) W.T. Aiton	+	-	-	-	-	-
6	*Catharanthus roseus* (L.) G. Don	+	-	-	+	-	-
7	*Hemidesmus indicus* (L.) R. Br.	+	-	-	-	-	+
8	*Nerium oleander* L	+	-	-	+	-	-
9	*Wrightia tinctoria* R. Br	+	-	+	-	-	-
10	*Borassus flabellifer* L.	-	+	+	-	+	-
11	*Cocos nucifera* L.	-	+	+	-	+	-
12	*Phoenix sylvestris* (L.) Roxb.	-	+	+	-	-	-
13	*Colocasia esculenta* (L.) Schott	-	+	-	-	-	-
14	*Dracaena trifasciata* (Prain) Mabb	-	-	-	-	-	+
15	*Tridax procumbens* L	+	-	-	-	-	-
16	*Millingtonia hortensis* L.f.	-	-	+	+	-	-
17	*Tecoma stans* (L.) Juss. *ex* Kunth	-	-	-	+	-	-
18	*Heliotropium indicum* L	+	-	-	-	-	-
19	*Terminalia catappa* L.	-	+	+	-	-	-
20	*Ipomoea aquatica* Forssk.	-	+	-	-	-	-
21	*Carica papaya* L.	-	+	-	-	-	-
22	*Coccinia grandis* (L.) Voigt	-	+	-	-	-	-
23	*Momordica charantia* L.	-	+	-	-	-	-
24	*Mukia maderaspatana* (L.) M. Roem.	+	-	-	-	-	
25	*Cyperus Spp*	-	-	-	-	-	+
26	*Acalypha indica* L	+	-	-	-	-	-
27	*Euphorbia hirta* L.	+	-	-	-	-	-
28	*Jatropha gossypiifolia* L.	-	-	-	-	+	-
29	*Ricinus communis* L.	+	-	-	-	+	-
30	*Abrus precatorius* L.	+	-	-	-	-	-
31	*Cassia auriculata* L.	+	-	-	+	-	-
32	*Clitoria ternatea* L.	-	-	-	+	-	-
33	*Delonix regia* (Boj. *ex* Hook) Raf	-	-	+	+	-	-
34	*Mimosa pudica* L	-	-	-	+	-	-
35	*Peltophorum pterocarpum* (DC.) Backer *ex* Heyne	-	-	+	+	-	-

Continued...

36	*Pongamia pinnata* (L.) Merr.	-	-	+	-	-	-
37	*Prosopis juliflora* (Sw.) DC	-	-	+	-	-	-
38	*Tamarindus indica* L.	+	+	+	-	-	-
39	*Tephrosia villosa* (L.) Pers	+	-	-	-	-	-
40	*Hydrilla verticillata* (L. f.) Royle	+	-	-	-	-	-
41	*Leucas aspera* (Willd.) Link	+	-	-	+	-	-
42	*Ocimum tenuiflorum* L.	+	-	-	-	-	-
43	*Tectona grandis* L.f.	-	-	+	-	-	-
44	*Vitex negundo*	+	-	+	-	-	-
45	*Strychnos nux-vomica* L.	+	-	+	-	-	-
46	*Abutilon indicum* (L.) Sweet	+	-	-	-	-	-
47	*Guazuma ulmifolia* Lam.	-	+	-	-	-	-
48	*Hibiscus rosa-sinensis* L.	+	-	-	+	-	-
49	*Sida cordifolia* L.	+	-	-	-	-	-
50	*Thespesia populnea* (L.) Sol. ex Corrêa	-	-	+	-	-	-
51	*Azadirachta indica* A. Juss	+	-	+	-	+	
52	*Tinospora cordifolia* (Willd.) Miers	+	-	-	-	-	-
53	*Ficus benghalensis* L	-	+	+	-	-	-
54	*Psidium guajava* L	-	+	-	-	-	-
55	*Syzygium cumini* (L.) Skeels	-	+	+	-	-	-
56	*Mirabilis jalapa* L.	-	-	-	+	-	-
57	*Passiflora foetida* L.	-	-	-	+	-	-
58	*Phyllanthus amarus* Schumach and Thonn	+	-	-	-	-	-
59	*Cynodon dactylon* (L.) Pers.	+	-	-	-	-	-
60	*Portulaca oleracea* L.	-	-	-	+	-	-
61	*Ziziphus oenopolia* (L.) Mill	-	+	-	-	-	-
62	*Catunaregam spinosa* (Thunb.) Tirveng	-	+	-	-	-	-
63	*Morinda pubescens* Sm.	+	-	-	-	-	-
64	*Dodonaea viscosa* (L.) Jacq	+	-	-	-	-	-
65	*Datura metel* L.	+	-	-	+	-	-
66	*Physalis angulata* L	-	-	-	-	-	-
67	*Solanum torvum* Sw	+	+	-	-	-	-
68	*Solanum trilobatum* L.	+	+	-	-	-	-
69	*Typha angustifolia* L.	-	-	-	-	-	-
70	*Lantana camara* L	-	-	-	+	-	-
71	*Cissus quadrangularis* L.	+	+	-	-	-	-

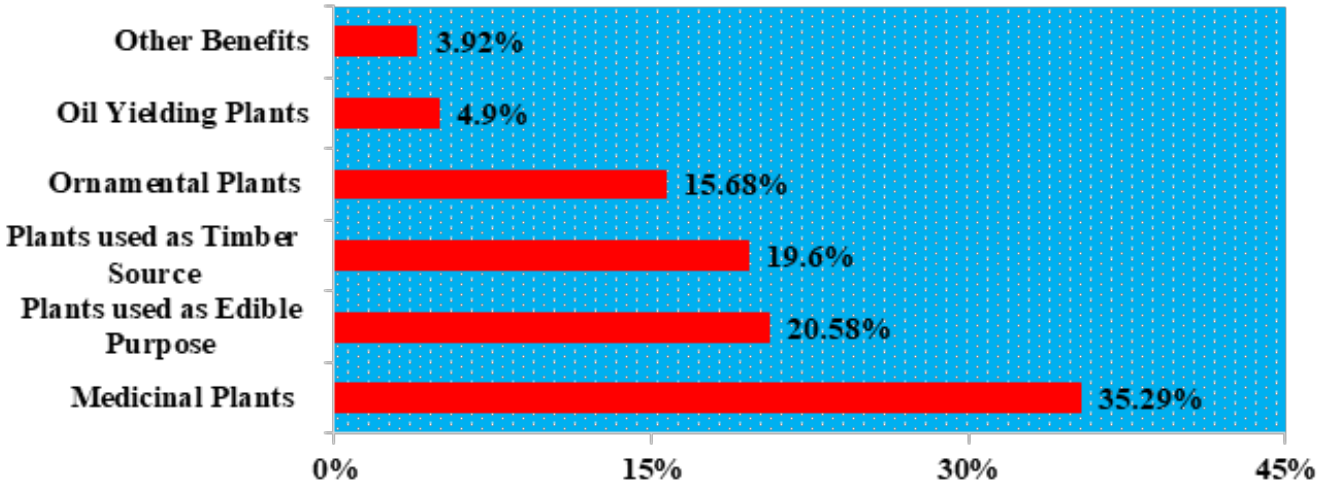

Fig .7 - Bar diagram showing medicinal & economically important plants from the study area

indices in their studies which was found partially similar to the present investigation. The diversity analysis of the study showed that the study area was endowed with greater level of species abundance, species richness and evenness.

The plants documented from the study area are categorized according to their uses in Table 2. It was elucidated that the study area was found with medicinally as well as other economically significant plants (Fig.7). The study area was dominated by medicinally important plants (35.29%) followed by plants used as edible sources (20.58%) and timber sources (19.6%). The significant number of ornamental plants (15.68%) we also documented from the study area. The plants from the study area has more medicinal plants which is similar to the studies by Rahman and Keya [23] and Gowramma *et al.,* [24].

This indicate the study area was found with medicinally as well as economically notable plants. Study of biodiversity, as the present one provides an opportunity to know the different species in their natural habitat. The number of species recorded was enormous indicating the resources of the nature. Considering the fact that only very few genera have so far been used in industry, gives a wide scope for the choice of other potential species which are available in plenty.

CONCLUSION

A preliminary floristic survey on angiosperms from the surroundings of Medavakkam Lake, Chengalpattu district was explored for the first time. The investigation resulted with a total of seventy-one taxa belonging to seventy genera and thirty-six families of angiosperms was documented during the study period. The plants recorded from the study area was found with enormous benefits to the mankind. It revealed that the study area was dominated by medicinally important plants followed by plants used as edible and timber sources. Documentation of many angiosperms and study of their utility appears to be a promising area for future research. Plants from natural habitats of India could prove to be a very good resource for human welfare.

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CONFLICT OF INTEREST

We declare that we have no conflict of interest.

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