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Phyto-Diversity Analyses and Conservation Status of Senaankoil Sacred Grove, Pudukkottai District, Tamilnadu, India

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Abstract: ***Phyto-diversity analyses and conservation status of Senaankoil sacred grove was carried out to know the present floristic diversity and conservation status of the grove by the local community. This study area is located within latitude N10^{0}30'00" and longitude E 78^0 35'00". This present study area contributed 62 species together trees (18), shrubs (15) and herbs (29). Among them, the families Fabaceae (8 sp.) showed highest contribution followed by Acanthaceae, Apocynaceae and Rubiaceae (6 species each). Malvaceae 4 species and Rutaceae 3 species were also recorded and other families have contributed one to two species each. Phytodiversity indices such as Shannon - Weaver index, species richness index, evenness index and Simpson index also analysed to know vegetation status.***

Keywords: Sacred grove, Conservation, Phyto-diversity, Shannon-Weaver index

1. Introduction

Biodiversity, or biological diversity, is the variety of all species on earth. It is the different plants, animals and micro-organisms, their genes, and the terrestrial, marine and freshwater ecosystems of which they are a part. Biodiversity is both essential for our existence and intrinsically valuable in its own right.

This is because biodiversity provides the fundamental building blocks for the many goods and services a healthy environment provides. These include things are fundamental to our health, like clean air, fresh water and food products as well as the many other products such as timber and fibre.

From time immemorial, in India, as well as in parts of Asia and Africa, care and respect for nature has been influenced by religious belief and indigenous practices. Our country is well known for nature's worship, which plays an integral role in the lives of many communities. Every aspect of religious and cultural practices is deeply rooted with the forest that helps in nature conservation. It also acts as the subject of a great deal of myth, legend and lore. Still, today there exist some tribes in the remote hilly areas, whose livelihood were fully dependent on forest resources and their traditional practices conserved a large number of wild plant species for various reasons e.g. food, fibre, shelter or medicine. Unfortunately, various developmental activities and changes in people's attitude in terms of beliefs in religious and indigenous practices bring heedless actions towards forest. This leads to degradation of forest at an alarming rate and shrinking of biodiversity. However, there are some patches of forest, which are left untouched because of social fencing by local people. These types of forest bring the concept of "sacred groves". Generally, sacred groves are a tract of virgin forest, harbouring rich biodiversity and protected traditionally by the local communities as a whole. The area of scared groves ranges from few square meters to several hectares. Till today, there exists some fascinating example of forest patches harbouring native vegetation, which has been intertwined with the various aspects of indigenous, cultural and religious practices along with the associated taboos. The inextricable link between culture and biodiversity has been found in sacred groves. India is having abundance of scared groves and known by several names such as *kavu* in Kerala, *devaravana* or *devarakadu* etc. in Karnataka, *sarana* or *jaherthan* in Jharkhand, *dev van* in Himachal Pradesh, *devrai* or *devgudi* in Maharashtra, *ki law lyngdoh* or *ki law kyntang*etc. in Meghalaya, *vanis* or *kenkris*etc in Rajasthan, *kovilkadu*in Tamil Nadu, and *umanglai*in Manipur. The way of conservation varies in different states according to their nature, distribution and local beliefs. Sacred groves also exist in West Bengal, Uttar Pradesh, Uttranchal, Sikkim, Orissa, Gujarat, Bihar, etc. It is also found that in some state, sacred groves are known by different names within the state.

2. Common Taboos and Beliefs Associated with Sacred Groves

Cutting of any trees and destroying of groves are prohibited. Shoes and accessories of leather are not allowed at the entrance of the gate leading to the deities' temples as these are made from animal skin and believed to be impure. Women are not allowed to enter the grove at the particular place and particular time. It is believed that if anyone offended to the entity of the grove, deities will punish by bringing illness or unfortunate to him or her. People used to pray to the scared species with some offerings like- pan (it consist of Betel nut (*Areca catechu)* and Betel leaf (*Piper betel*), flowers, fruits, etc.

Sacred groves are the mini forests with rich diversity. Around 15000 sacred groves have been reported from different parts of India. Sacred groves occur in many parts of India, particularly where the indigenous communities live. Sacred Groves are also culturally important; various cultural

and religious festivals are often arranged by local people within these patches. Sacred groves contain various ecosystems, various food chains and food webs are present in Sacred Groves.

Types of Sacred Groves

1) Temple Groves – A grove is created around the temple.
2) Traditional sacred grove – The place where the village deity resides, and represented by an elementary symbol.
3) Burial groves – A grove is created around the cremation grounds.

In recent years temples associated with groves are being rebuilt and modernized at many places obviously at the expenses of the groves. Grazing, poaching and collection of woods and dry leaves also contribute to the deteriorating condition. Hence it is an urgent need for extensive research studies on plant diversity and conservation status of precious plant wealth to develop an appropriate strategy for conservation that would result in a sustainable use of biodiversity and would benefit both the present and future generation (Sukumaran *et al*., 2008).

The present study which is carried out in the inventoried traditional sacred grove aims:

1) To analysis the floristic diversity available in the 0.1 ha sampled area.
2) To study the frequency, density, abundance and diversity indices of the study area.
3) To record the factors involved in the reduction of the vegetation.

3. Study Area

Plant diversity analyses were carried out in a sacred grove ordained to Senaankoil Ayyanar, the peresiding deity. The sacred grove is situated in Senaankoil village, Illupur taluk of Pudukottai district. It is located within latitude $N10^0 30'00''$ and longitude $E\ 78^0\ 35'00''$.

The sacred grove is spread over 1ha in front of the village with Senan Ayannar open temple with other deities too. Terracottas were provided by the local community in the honour of presiding deity for their succeeded aspirations kept aside the temple of the sacred grove. The sacred grove was greatly affected by fallen of large trees due to the natural disasters said by the local people. Marriages, Village functions and earring ceremonies are celebrated in the open places within the sacred grove even the rain and hot sunny day also by the local people.

4. Materials and Methods

1) Materials

a) Measuring tape
b) Rope
c) Sickle
d) Paper & Pen
e) Field note book
f) Newspapers to collect unknown specimens.

2) Methodology

A 0.1 ha area was randomly marked with ropes into 10(10 × 10m) workable quadrats. Within each quadrat all the individuals of trees, shrubs lianas, stragglers and climbers girth ≥ 10cm gbh (girth at breast height) were measured and entered in the field note book. Multistemmed individuals were measured separately and added. Three 1 m^2 quadrats also studied randomly within each 10× 10m quadrats for herbs and are documented in field note book. Unidentified plants were collected, dried using standard herbarium techniques and identified at RHT (Rapinat Herbarium, Trichy). The recorded data were utilized to calculate the following calculations frequency, density, abundance, basal area and diversity indices.

1. Frequency – Proportion of total number of sample taken that contain the species.

$$\% F = \frac{\text{No.of quadrats in which species present}}{\text{Total no.of quadrats studied}} \times 100$$

2. Density – Number of individuals expressed per unit area.

$$D = \frac{\text{No.of individuals of a species}}{\text{Total no.of quadrats studied}}$$

3. Abundance – Total number of individuals of a species in all quadrats studied.

$$AB = \frac{\text{Total no.of individuals of a species}}{\text{No.of quadrats in which the species occured}}$$

4. Basal area – It is the ground occupied by the individual (Woody species).

$BA = P^2/4\pi \times 100 \times xm^2$

Where, P = Perimeter (Girth)

π = $\frac{22}{7}$ or 3.14

X= No. of quadrats

5. Relative frequency – The dispersion of species in relation to that of all the species.

$$R.F = \frac{\text{\% frequency of a species}}{\text{Sum of frequency of all the species}} \times 100$$

6. Relative density – The proportion of density of a species to that of stand as a whole.

$$R.D = \frac{\text{Density of a species}}{\text{Sum of density of all the species}} \times 100$$

7. Relative basal area - The proportion of basal area of a species to that total area of all the species

$$R.BA = \frac{\text{Basal area of a species}}{\text{Total area of all the species}} \times 100$$

8. Proportion index

$$Pi = \frac{\text{Frequency of the species}}{\text{Total no.of species}}$$

9. Important value Index for woody species

IVI = R.F+R.D+R.BA

10. Important value index for Herbaceous species

IVI = R.F+R.D+R.AB

11. Shannon and Weaver index

$H' = -\Sigma[(ni/N).Ln(ni/N)]$

Where 'ni' is the IVI of individual species N is the total IVI of all the species.

12. Dominance concentration

Concentration of dominance Cd of each stand was calculated as by Simpson (1949)

Cd = $\Sigma(ni/N)^2$

13. Evenness index

Evenness index (e) will be calculated according to Pielou (1966).

E = H/log S

Where, S = Number of species

H' - Shannon index

14. Species Richness index (Margalef,1958)

D = S-1/log N.

Where, S = Number of species, N=Important value index.

15. Stand density = Total number of individuals
16. Stand basal area = Σ of all BA of all the species.
17. AB/% F ratio,

(Distribution of species is regular if the ratio is 0.025, Random if between 0.025 and 0.05 and contagious if >0.05 by Curtis and Cottam, 1956)

5. Results and Discussion

The data collected during the field sampling are tabulated and consolidated separately for the species of trees, shrubs and herbs. Lianas, climbers and straggler which are woody included with shrubs (Table – 1 to 6).

The flora of the present study area comprises tree species (18) belonging to genera (17) distributed among families (9), shrub species (15) belonging to genera (15) distributed among families (12) and herb species (29) belonging to genera (27) distributed among families (15) of flowering plants. The present study contributed more woody species: trees and shrubs together (33) than the study on conventional and indigenous biodiversity conservation approach: a comparative study of Jachie sacred grove and Nkrabea in Ashanti region, Ghana which contributed (28) species totally (Samuel Boadi *et al*., 2017). The present study area contributed 62 species together trees (18), shrubs (15) and herbs (29). Among them, the families *Fabaceae*(8 sp.) showed highest contribution followed by *Acanthaceae*, *Apocynaceae* and *Rubiaceae* (6 species each). *Malvaceae* 4 species and *Rutaceae* 3 species were also recorded and other families have contributed one to two species each.

Stand Density to the tree Species of the Study Area

Strycnos nuxvomica (1.5) is the highest contributor among the tree species followed by *Albizia amara*, *Gyrocarpus americanus*, *Limmonia acidissima* (1.4) each, *Wrightia tinctoria* (0.8), *Diospyros ebenum* and *Prosopis juliflora* (0.7) to the total density with the related percentages 14, 13, 13, 13, 7,6 and 6 respectively and others together covered 27 percentage to the total density of the study area.

Relative Frequency of Various Tree Species of the Study Area

In tree species, the frequency of *Strychnos nuxvomica* (80) followed by *Albizia amara* (70), *Gyrocarpus americanus* (60), *Limmonia acidissima* (40), *Wrightia tinctoria* (40) and others together (230) among the total frequency (520) of all the species. The relative percentages of *Strychnos nuxvomica*, *Albizia amara*, *Gyrocarpus americanus*, *Limmonia acidissima*, *Wrightia tinctoria* and others together are 15.4, 13.5, 11.5, 7.7, 7.7 and 44.2 respectively.

Stand Basal Area of Various Tree Species of the Study Area

The present study area is mostly covered by deciduous tree species whose basal area in m^2per 0.1 hectare discussed below. *Ficus benghalensis* (3.5 m^2), *Albizia amara* (2.72 m^2), *Gyrocarpus americanus* (2.64 m^2), *Strychnos nuxvomica*(2.3 m^2) and *Limmonia acidissima* (2.1 m^2) have recorded high basal area,the other tree species together contributed (7.43 m^2) basal area to the total stand basal area (20.69 m^2) of all the tree species. The relative percentages of tree species *Ficus benghalensis*, *Albizia amara*, *Gyrocarpus americanus*, *Strychnos nuxvomica*, *Limmonia acidissima* and other tree species together are 16.9, 13.1, 12.8, 11.1, 10.1 and 35.9 respectively.

Stand Basal Area of Various Shrub Species of the Study Area

Memecylon umbellatum the dominant shrub species in the study area have contributed highest basal area (0.3 m^2) in the study area followed by *Alangium salvifolium* (0.12 m^2) and *Senna auriculata* (0.11 m^2).*Clausena dentata* and *Tarena asiatica* showed moderate basal area 0.1 m^2 each. The other shrub species contributed very low basal area and together contributed (0.3 m^2). The relative percentages of *Memecylon umbellatum* (29.1) is very high among the shrub species followed by *Alangium salvifolium*, *Senna auriculata*, *Clausena dentata* and *Tarena asiatica* are11.7, 10.7, 9.7 and 9.7 respectively.

Frequency, Density and Abundance of the Herb Species

Achyranthes aspera, *Justicia tranquebariensis*, *Digitaria didactyla* and *Evolvulus alsinoides* are have reported highest frequency (100) value in the sacred grove which are present in the all sampled quadrats. *Tridax procumbens* contributed frequency value (90) followed by *Mollugo pentaphylla* and *Justicia prostrata* (80) each. Other plant species of herbs shared together (820) among the total frequency value (1470) of all the herbs. The relative frequency value of herbs *Achyranthes aspera*, *Justicia tranquebariensis*, *Digitaria didactyla* and *Evolvulus alsinoides* 6.8 each are contributed highest frequency value followed by *Tridax procumbens* (6.1), *Mollugo pentaphylla* and *Justicia prostrata* 5.4 each. *Achyranthes aspera* have reported highest density value (11.2) followed by *Justicia tranquebariensis* (9.3), *Digitaria didactyla* (8.6), *Tridax procumbens* (3.7), *Mollugo pentaphylla* (3.6) and *Justicia prostrata* (3.2). The highest relative percentage densityof herbs recorded by the *Achyranthes aspera* (17.5) and *Justicia tranquebariensis* (14.5) in the study area. Among the abundance of herbs species, *Achyranthes aspera* (11.2) recorded highest value followed by *Justicia tranquebariensis* (9.3), *Digitaria didactyla* (8.6), *Sansevieria trifaciata* (6.3), *Mollugo pentaphylla* (4.5), *Tridax procumbens* (4.11) and others together contributed (44.4) among the total abundance (102.31) of all the species. Among the related percentage of abundance of herb species *Achyranthes aspera* (10.9), *Justicia tranquebariensis* (9.1), and *Digitaria didactyla* (8.4) contributed high abundance value followed by *Sansevieria*

trifaciata (6.2), *Mollugo pentaphylla* (4.4), *Tridax procumbens* (4.4).

Phyto– Diversity Indices Analysis

The tree population comprises the number of species (18) with genera (17) and families (9). The diversity indices showed Shannon – Weaver index value (2.63), evenness index (2.14), species richness index (8.14), Simpson index (1.99) and the dominance concentration of the tree species (0.8) . The Shannon-Weaver index of this study area is equal to floristic diversity and phyto –sociological studies of Indrakiladri sacred grove in Krishna district, Andhra Pradesh, India (Venkatesh Rampilla *et al*., 2015). The dominace concentration (Cd) was low compare to the sacred grove in Konjikuppam village of Cuddalore district (Nithyadevi and Sivakumar 2015). Among the shrub populations, number of species (15) with genera (15) and families (12). The diversity indices showed Shannon-Weaver index (H') was (2.52) lower than shrub species found in Konjikuppam sacred grove (Nithyadevi and Sivakumar, 2015). Species richness index (7.07) was low compare to the shrub species of the present study. The other diversity indices showed Simpson index (1.24), evenness index (2.19) and Simpson's concentration dominance (0.095). Among the herbs, population comprises number of species (29) with genera (27) and families (15). The diversity indices of herb species are Shannon – Weaver index (3.12), Simpson index (0.245), Simpson co – dominance (0.055), Stand density (64.0), evenness index (2.13) and species richness index (12.91).

Conservation Status of Plant Species in World

The conservation status of the plant species present in the study area were analysed using the Red Data book and Secure (Natureserve) G5. *Delonix regia* is in least concern, *Diospyros ebenum* is in data deficient, Psydrax dicoccos is in vulnerable regard to IUCN (3.1), IUCN (2.3) and IUCN A1c (2.3) respectively, Pithecellobium dulce is in secure regard to (Nature Serve) G5 among the tree species and other species are invulnerable.

Present Conservation Status of the Study Area

Five people of different ages ranged from 22 to 54 years old have met. Among them a men was doing pooja to the deities said that some large trees fell during the Tsunami and used as fuel wood during the festivals and family functions carried out in the grove. Recently few trees cleared by Thane storm. Some area made clear of by the local people to carry out functions. Remaining vegetation is under conservation. No modernization happened within the grove. Due to very low rainfall and also by invasion of invasive species Prosopis juliflora and *Pteralobium hexapetalum* regeneration of flora is deduced.

6. Conclusion

The present study was carried out in the inventoried sacred grove situated in Senaankoil village of Pudukkottai district. In the present study area, a total of 62 plant species were recorded under trees (18), shrubs (15) and herbs (29). The family *Fabaceae* comprises 8 species followed by *Acanthaceae*, *Rubiaceae, Apocyanaceae* (6 species) each, *Malvaceae* (4 species), *Rutaceae* (3species) and other plant families contributed 1 to 2 species. The Shannon – index of the study area ranged for tree species 2.63, for shrub species 2.28 and for herb species 3.12 which are lie between the ranges reported for Indian forest. Vegetation of the sacred grove is destructed by constructing path, large trees fallen during the natural disasters, little vegetation cleared to cook during festivals and through some human illegal activities. It should be stop through giving awareness to the local community and necessary steps also should take by the government. Good faith on deities by the local people keep the sacred groves conserve.

Table 1: Plant List of Tree Species Showing their Family

S.No	Name of the Species	Family	Conservation status / Remarks
1	***Albizia amara*** *(Roxb.)Boiv.*	Fabaceae	
2	***Atlantia racemosa*** *Wight & Arn.*	Rutaceae	
3	***Commiphora caudata*** *(Wight & Arn.)Engl.*	Burseraceae	
4	***Dalbergia sissoo*** *Roxb.*	Fabaceae	
5	***Delonix regia*** *(Boj. Ex Hook.)Raf.*	Fabaceae	Least Concern (IUCN3.1)
6	***Diospyros ebenum*** *J.Koenig ex Retz.*	Ebenaceae	Data Deficient (IUCN2.3)
7	***Diospyros montana*** *Roxb.*	Ebenaceae	
8	***Ficus benghalensis*** *L.*	Moraceae	
9	***Gyrocarpus americanus*** *Jacq.*	Hernandiaceae	
10	***Limmonia acidissima*** *L.*	Rutaceae	
11	***Morinda tinctoria*** *Roxb.*	Rubiaceae	
12	***Pithecellobium dulce*** *(Roxb.)Benth.*	Fabaceae	Secure (Nature Serve) G5
13	***Prosopis juliflora*** *(Sw.) DC.*	Fabaceae	Invasive species
14	***Psydrax dicoccos*** *Gaertn.*	Rubiaceae	Vulnerable A1c (IUCN2.3)
15	***Strychnos potatorum*** *L.f.*	Loganiaceae	
16	***Tamarindus indica*** *L.*	Fabaceae	
17	***Vachellia leucophloea*** *(Roxb.)Maslin,Seigler, &Ebinger*	Fabaceae	
18	***Wrightia tinctoria*** *(Roxb.) R.Br.*	Apocyanaceae	

Table 2: Plant list of shrub species showing their family

S.No.	Name of the Species	Family
1	*Alangium salvifolium (L.f.)Wangerin*	Cornaceae
2	*Azima tetracantha Lam.*	Salvodoraceae
3	*Calotropis gigantea (L.)Dryand.*	Apocyanaceae
4	*Clausena dentata (Willd)M.Roem.*	Rutaceae
5	*Dodonea viscosa Jacq.*	Sapindaceae
6	*Flacourtia indica (Burm.f.) Merr.*	Salicaceae
7	*Fluggea leucopyrus Willd.*	Phyllanthaceae
8	*Grewia rhamnifolia Heyne ex Roth.*	Tiliaceae
9	*Ixora pavetta Andr.*	Rubiaceae
10	*Justicia adathoda L.*	Acanthaceae
11	*Memecelon umbellatum Burm.f.*	Melastomataceae
12	*Sapindus emarginatus Vahl.*	Sapindaceae
13	*Senna auriculata (L.) Roxb.*	Fabaceae
14	*Tabernamamontana divaricata R.Br. Ex Roem &Schult*	Apocyanaceae
15	*Tarena asiatica (L.) Kuntze ex K.Schum*	Rubiaceae

Table 3: Plant list of herb species showing their family

S.No.	*Name of the Species*	*Family*	*Conservation Status /Remarks*
1	*Abutilon grandiflorum G.Don*	Malvaceae	
2	*Abutilon indicum (L.) Sweet*	Malvaceae	
3	*Abutilon persicum (Burm.f.) Merr.*	Malvaceae	
4	*Achyranthes aspera L.*	Amaranthaceae	
5	*Andrographis alata (Vahl.) Nees*	Acanthaceae	
6	*Barleria prionitis L.*	Acanthaceae	
7	*Blepharis maderaspatensis (L.) Heyne ex Roth*	Acanthaceae	
8	*Coccinia indica Wight & Arn.*	Cucurbitaceae	
9	*Cocculus hirsutus (L.) Diels*	Menispermaceae	
10	*Cyanodon dactylon (L.) Pers.*	Poaceae	
11	*Digitaria didactyla Willd.*	Poaceae	
12	*Evolvulus alsinoides (L.) L.*	Convolvulaceae	
13	*Gymnema sylvestre R.Br.*	Apocynaceae	
14	*Justicia prostrata (Roxb. Ex C.B.Cl.) Gamble*	Acanthaceae	
15	*Justicia tranquebariensis Roxb.*	Acanthaceae	
16	*Leucas aspera (Willd.) Link*	Lamiaceae	
17	*Mollugo nudicaulis Lam.*	Molluginaceae	
18	*Mollugo pentaphylla L.*	Molluginaceae	
19	*Passiflora foitida L.*	Passifloraceae	
20	*Pavonia odorata Willd.*	Malvaceae	
21	*Pergularia daemia (Forssk.) Chiov.*	Asclepiadaceae	
22	*Sansevieria roxbhurgiana Schult. & Schult. F.*	Asparagaceae	
23	*Sansevieria trifasciata Prain*	Asparagaceae	
24	*Sarcostema acidum (Roxb.) Voigt.*	Apocynaceae	Sub family Asclepioideae
25	*Spermacoce articularis L.f.*	Rubiaceae	
26	*Spermacoce hispida L.*	Rubiaceae	
27	*Tinospora cordifolia (Thunb.) Miers.*	Menispermaceae	
28	*Tridax procumbens L.*	Asteraceae	
29	*Watakaka volubilis (L.f.) Stap f.*	Apocynaceae	Sub family Asclepioideae

Table 4: Diversity Indices of Tree Species

S.No.	Name of the Species	Total No. of Indi.	No. of Quadrats in which sp. Occurred	% F	D	BA	R.F	R.D	R.BA	IVI	AB	AB/%F RATIO
1	*Albizia amara*	14	7	70	1.4	2.72	13.46	12.96	13.15	39.57	2	0.03
2	*Atlantia racemosa*	2	1	10	0.2	0.13	1.92	1.85	0.63	4.4	2	0.2
3	*Commiphora caudata*	5	2	20	0.5	0.5	3.85	4.63	2.42	10.89	2.5	0.13
4	*Dalbergia sissoo*	4	3	30	0.4	1.35	5.77	3.7	6.52	16	1.3	0.04
5	*Delonix elata*	2	1	10	0.2	0.24	1.92	1.85	1.16	4.93	2	0.2
6	*Diospyros ebenum*	7	3	30	0.7	1.22	5.77	6.48	5.9	18.15	2.3	0.08
7	*Diospyros montana*	3	3	30	0.3	0.4	5.77	2.78	1.93	10.48	1	0.03
8	*Ficus benghalensis*	2	1	10	0.2	3.5	1.92	1.85	16.92	20.69	2	0.2
9	*Gyrocarpus americanus*	14	6	60	1.4	2.64	11.54	12.96	12.76	37.26	2.3	0.04
10	*Limmonia acidissima*	14	4	40	1.4	2.1	7.69	12.96	10.15	30.81	3.5	0.09
11	*Morinda tinctoria*	3	2	20	0.3	0.4	3.85	2.78	1.93	8.56	1.5	0.08
12	*Pithecellobium dulce*	2	1	10	0.2	0.41	1.92	1.85	1.98	5.76	2	0.2
13	*Prosopis juliflora*	7	3	30	0.7	1	5.77	6.48	4.83	17.08	2.3	0.08
14	*Psydrax dicoccos*	2	1	10	0.2	0.23	1.92	1.85	1.11	4.89	2	0.2

15	*Strychnos nuxvomica*	15	8	80	1.5	2.3	15.38	13.89	11.12	40.39	1.9	0.02
16	*Tamarindus indica*	2	1	10	0.2	0.43	1.92	1.85	2.08	5.85	2	0.2
17	*Vachellia leucophloea*	2	1	10	0.2	0.12	1.92	1.85	0.58	4.35	2	0.2
18	*Wrightia tinctoria*	8	4	40	0.8	1	7.69	7.41	4.83	19.93	2	0.05

Table 5: Diversity Indices of Shrub Species

S.No.	Name of the Species	Total No. of Indi.	No. of Quaderats in which sp. Occurred	% F	D	BA	R.F	R.D	R.BA	IVI	AB	AB/% F Ratio
1	*Alangium salvifolium*	7	3	30	0.7	0.12	7.69	10.14	11.65	29.49	2.3	0.08
2	*Azima tetracantha*	3	2	20	0.3	0.03	5.13	4.35	2.91	12.39	1.5	0.08
3	*Calotropis gigantea*	3	2	20	0.3	0.03	5.13	4.35	2.91	12.39	1.5	0.08
4	*Clausena dentata*	9	7	70	0.9	0.1	17.95	13.04	9.71	40.7	1.3	0.02
5	*Dodonea viscosa*	4	2	20	0.4	0.02	5.13	5.8	1.94	12.87	2	0.1
6	*Flacourtia indica*	3	2	20	0.3	0.03	5.13	4.35	2.91	12.39	1.5	0.08
7	*Fluggea leucopyrus*	3	2	20	0.3	0.03	5.13	4.35	2.91	12.39	1.5	0.08
8	*Grewia rhamnifolia*	2	1	10	0.2	0.06	2.56	2.9	5.83	11.29	2	0.2
9	*Ixora pavetta*	4	3	30	0.4	0.03	7.69	5.8	2.91	16.4	1.3	0.04
10	*Justicia adathoda*	3	1	10	0.3	0.02	2.56	4.35	1.94	8.85	3	0.3
11	*Memecelon umbellatum*	6	3	30	0.6	0.3	7.69	8.7	29.13	45.51	2	0.07
12	*Sapindus emarginatus*	2	1	10	0.2	0.03	2.56	2.9	2.91	8.38	2	0.2
13	*Senna auriculata*	12	6	60	1.2	0.11	15.38	17.39	10.68	43.46	2	0.03
14	*Tabernamamontana divaricata*	2	1	10	0.2	0.02	2.56	2.9	1.94	7.4	2	0.2
15	*Tarena asiatica*	6	3	30	0.6	0.1	7.69	8.7	9.71	26.1	2	0.07

Table 6: Diversity Indices of Herb Species

S.No.	Name of the Species	Total No. of Indi.	No. of Quadrats in which sp. Occurred	% F	D	AB	R.F	R.D	R.AB	IVI	AB/%F
1	*Abutilon grandiflorum*	7	3	30	0.7	2.33	2.04	1.09	2.28	5.42	0.08
2	*Abutilon indicum*	16	5	50	1.6	3.2	3.4	2.5	3.13	9.03	0.06
3	*Abutilon persicum*	10	3	30	1	3.33	2.04	1.56	3.26	6.86	0.11
4	*Achyranthes aspera*	112	10	100	11.2	11.2	6.8	17.5	10.95	35.25	0.11
5	*Andrographis alata*	17	6	60	1.7	2.83	4.08	2.66	2.77	9.51	0.05
6	*Barleria prionitis*	5	3	30	0.5	1.67	2.04	0.78	1.63	4.45	0.06
7	*Blepharis madraspatana*	18	6	60	1.8	3	4.08	2.81	2.93	9.83	0.05
8	*Coccinea indica*	4	2	20	0.4	2	1.36	0.63	1.95	3.94	0.1
9	*Cocculus hirsutus*	3	1	10	0.3	3	0.68	0.47	2.93	4.08	0.3
10	*Cyanodon dactylon*	22	8	80	2.2	2.75	5.44	3.44	2.69	11.57	0.03
11	*Digitaria didactyla*	86	10	100	8.6	8.6	6.8	13.44	8.41	28.65	0.09
12	*Evolvulus alsinoides*	27	10	100	2.7	2.7	6.8	4.22	2.64	13.66	0.03
13	*Gymnema sylvestre*	3	2	20	0.3	1.5	1.36	0.47	1.47	3.3	0.08
14	*Justicia prostrata*	32	8	80	3.2	4	5.44	5	3.91	14.35	0.05
15	*Justicia tranqubariensis*	93	10	100	9.3	9.3	6.8	14.53	9.09	30.42	0.09
16	*Leucas aspera*	15	4	40	1.5	3.75	2.72	2.34	3.67	8.73	0.09
17	*Mollugo nudicaulis*	12	4	40	1.2	3	2.72	1.88	2.93	7.53	0.08
18	*Mollugo pentaphylla*	36	8	80	3.6	4.5	5.44	5.63	4.4	15.47	0.06
19	*Passiflora foitida*	8	3	30	0.8	2.67	2.04	1.25	2.61	5.9	0.09
20	*Pavonia odorata*	16	5	50	1.6	3.2	3.4	2.5	3.13	9.03	0.06
21	*Pergularia daemia*	4	3	30	0.4	1.33	2.04	0.63	1.3	3.97	0.04
22	*Sansevieria trifasciata*	12	2	20	1.2	6	1.36	1.88	5.86	9.1	0.3
23	*Sansivieria roxbhurgiana*	16	7	70	1.6	2.29	4.76	2.5	2.23	9.5	0.03
24	*Sarcostema acidum*	2	1	10	0.2	2	0.68	0.31	1.95	2.95	0.2
25	*Spermacocce hispida*	6	3	30	0.6	2	2.04	0.94	1.95	4.93	0.07
26	*Spermacoce articularis*	12	7	70	1.2	1.71	4.76	1.88	1.68	8.31	0.02
27	*Tinospora cordifolia*	7	3	30	0.7	2.33	2.04	1.09	2.28	5.42	0.08
28	*Tridax procumbens*	37	9	90	3.7	4.11	6.12	5.78	4.02	15.92	0.05
29	*Watakaka volubilis*	2	1	10	0.2	2	0.68	0.31	1.95	2.95	0.2

Figure 1: An overview of the study area

Figure 2: Deities present in the grove

Figure 3: Laying Quadrat in the study area

Figure 4: Measuring the girth of a tree

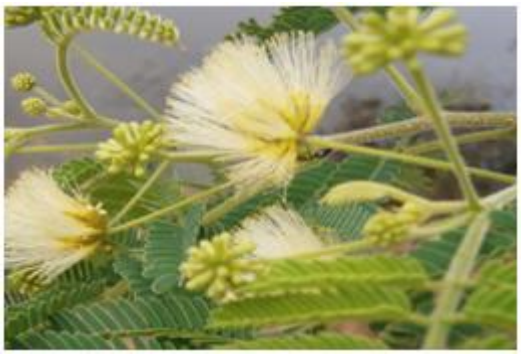

Figure 5: Albizia amara

Figure 6: Corypha umbraculifera

Figure 7: Memecylon umbellatum

Figure 8: Carissa carandas

Figure 9: Barleria prionitis

Figure 10: *Catharanthus pussilla*

Note:
The above figures 1 to10 show that an over view of the study area, deities and few plants among the flora found in the study area (Senaankoil Sacred grove)

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