

Phytosociological and Floristic Survey of the Sacred Grove Thekkumbhad Thazhe Kavu, Kannur District, Kerala, India

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Received March 05, 2021; Revised April 09, 2021; Accepted April 19, 2021

Abstract Conservation of nature and natural resources has been an important part of cultural ethos, especially in remote rural and indigenous communities in many parts of the world, including India. These communities consider themselves connected with their biophysical environment in a web of spiritual relationships. Sacred groves are the relic forest segments preserved in the name of religion and culture. These groves are mostly associated with temples and are also culturally important. They manifest the spiritual and ecological ethos of rural indigenous communities. Many taboos are associated with sacred grove which helps in managing resources well through ritual representation. Different festivals are organized, where the local communities reaffirm their commitment to the forest and the deity. Sacred groves, in general, are a valuable tool of biodiversity conservation. The sacred groves as the treasure of repositories of a variety of plant species, the present study is conducted to find out the plant diversity in the sacred grove, Thekkumbhad Thazhe Kavu in Kannur district, Kerala. 15 species present in this Kavu are least concerned, and they are *Acanthus ilicifolius*, *Achrosticum aureum*, *Aegicera scorniculatum*, *Bruguiera cylindrica*, *Caryota urens*, *Cyperus ratundas*, *Fimbristilis ferrugenea*, *Kandelia candel*, *Lindernia crustacea*, *Lindernia tenuifolia*, *Ludwiga hyssopifolia*, *Pandanus odorifer*, *Panicum repens*, *Rhizophora apiculata* and *Rhizophoram uconata*. The species *Caryota urens* securing higher IVI of 38.835. The species of least significance (lowest IVI) were shown by *Derris trifoliata*, *Emilia sonchifolia* and *Rhizophora apiculata*. Based on IVI score made by this species it is understood that these are poorly established species in the communities of the study site.

Keywords: indigenous, spiritual, ecological ethos, taboos, biodiversity

Cite This Article: Jeeshna M V, "Phytosociological and Floristic Survey of the Sacred Grove Thekkumbhad Thazhe Kavu, Kannur District, Kerala, India." *Applied Ecology and Environmental Sciences*, vol. 9, no. 4 (2021): 477-483. doi: 10.12691/aees-9-4-8.

1. Introduction

Sacred groves are the relic forest segments preserved in the name of religion and culture. These groves are mostly associated with temples and are also culturally important. They manifest the spiritual and ecological ethos of rural indigenous communities. Various cultural and religious festivals are often arranged by local people within these patches, which they call 'Mela.' As a way of conservation of nature, sacred groves have proven to be a well-tryed and tested method over thousands of years [1]. Sacred groves help in the protection of many rare, threatened, and endemic species of plants and animals found in an area. The process of deforestation is strictly prohibited in this region by tribal. Sacred groves did not enjoy protection via federal legislation in India.

They are repository of several medicinal and economically important plants attached with socio-cultural and religious sentiments there exist has undisturbed islands. But today these are adversely affected by human

activities. However, such sacred groves are not restricted to India alone. These sacred groves may range in size from a group of few trees to a forest of trees [2,3]. Even the smallest groves often harbor some olden magnificent specimens of trees and climbers [4]. The larger groves are a treasure-trove for the naturalist, supporting many threatening species in the area and becoming extinct with deforestation. As an ecosystem sacred groves help in soil and water conservation besides preserving biological wealth. Preservation of these groves is a crucial need to this era. Assessment of biodiversity proves extremely practical for determining decreasing natural diversity, the effect of exotic species, migration,- and threat to the species.

The ecological processes are well balanced by the influence of biodiversity, which is necessary for human survival. Therefore, the biodiversity-rich sacred groves are of immense ecological significance. They also play an important role in the conservation of flora and fauna. Keeping in view the role of the sacred groves as the treasure of repositories of a variety of plant species, the present study is conducted to find out the plant diversity in

a wetland sacred grove, Thekkumbad Thazhe Kavu in Kannur district, Kerala.

2. Materials and Methods

Thekkumbad Thazhe Kavu Koolom Bhagavathy Temple is a naturalistic beauty of Matool Gramapanchayath in Kannur District (Figure 1 and Figure 2). Thazhekavu is a small island near Madakkara on the bank of Valapattanam River. It has an area of 3.24 hectares. This Kavu lies between 12.0041° N latitude and 75.3004° E longitude. The climate is moderately hot and temperature ranging from 24°C to 34°C . The total annual rain fall is 3844 mm. The main deity of this Kavu is Thekkumbad Devakooth, which is an art form played by woman acharya (spiritual guide),

a characteristic feature among north Malabar theyyam which is the one and only Theyyam which is performed by woman and it is performed here.

The myth behind the kavu is spread among people in many ways as a myth itself. But once the Thazhekavu was an immense place of beauty with many flower yards and mangrove islands surrounding them. Among these the local plant *choral* (Calamus) was abundantly seen and it highlighted the beauty of the island. Once many goddesses (angels) came to Thazhe Kavu to grab the beauty of the place. But one of the goddess lost her way and wandered through the garden. Later, sage Narada rescued her from there. Today also the land is famous as a heavenly site. The far-fetched facts is that this island is surrounded by salt mangrove and has a well at its center point where we can have pure drinking water.



Figure 1. Thekkumbad Thazhe Kavu Koolom Bhagavathy Temple

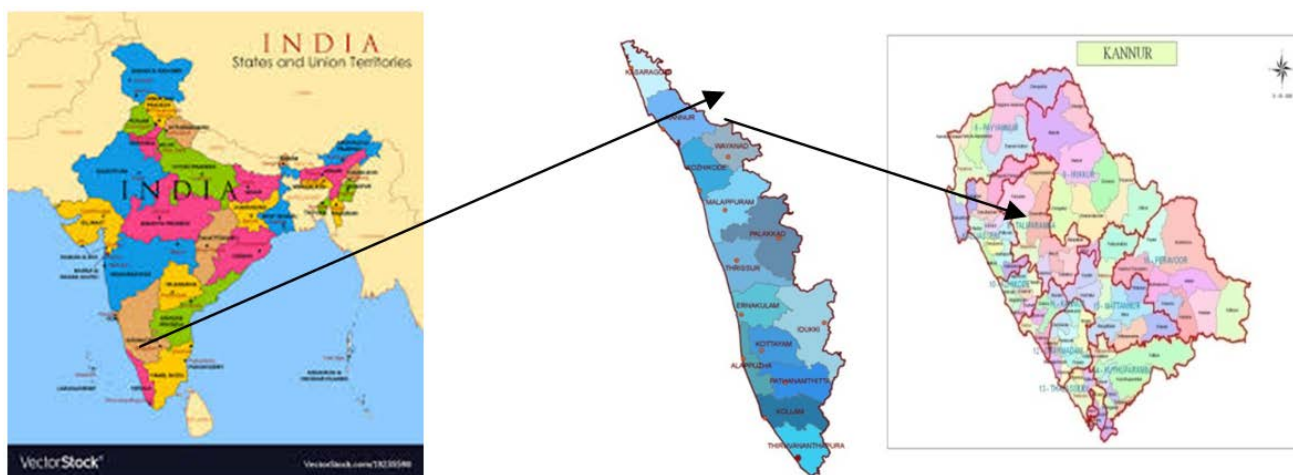


Figure 2. Map showing the location of study area, Thekkumbad Thazhe Kavu

3. Floristic Survey

This study envisages the estimation of the floral wealth of the sacred groves and their role in conservation. First hand information about the existence of sacred groves was gathered from personal contacts with village men, temple authorities, environmental action groups and various social organizations. With these backgrounds through field, surveys were carried out to know their exact location,

extent, presiding deity etc. Whenever any sacred groves were visited the neighboring people and temple worshippers were interviewed to confirm the above facts and also to elicit information about the presence other groves in the vicinity. The extent each grove was ascertained by discussion with local people and latter confirmed with temple records.

A brief floristic survey of the sacred grove in the region has been carried out. Plants are identified with the help of Madras Presidency [5], Flora of Cannanore [6] and also by

using available field keys and taxonomic bulletins. The identification was further confirmed with the help of taxonomic experts in Botany.

4. Phytosociological Analysis

The minimum quadrat size of 1 x 1 was fixed by the species-area curved method of phytosociological observations. Each time 10 quadrats were laid by the randomized method in each site. The minimum number of quadrats required (i.e., 10) was determined as described by Grieg-Smith [7].

The number and type of each species occurring in each quadrat were recorded. For grasses, each tiller was counted as an individual because it is impossible to decide from aerial shoots whether it is separated or connected in the subterranean region, especially in perennial grasses. Different workers have used arbitrary units to represent an individual. Armstrong and Stapledon [8,9] have counted the entire individuals as far as possible in the case of erect plants, but in creeping grasses each rooting unit has taken as an individual. Stove and Fryer [10] have considered an independent root system, as nearly as this could be determined without actually lifting the plant, to be a unit for counting. In the case of creeping plants, any portion of the plant up to 5 cm in length and having functional root was counted as one plant. Only the plants beyond the seedling stage (i.e., more than 2 cm height in case of monocots and beyond the first leaf stage in dicots) were counted. The basal areas at the point of emergence for the constituent species were measured. From the observations, the quantitative characters such as frequency, density, abundance, relative frequency, relative density, relative dominance, importance value index, and relative value of importance were calculated [11,12].

Frequency, density and abundance were calculated using the following formulae:

$$\text{Frequency} = \frac{\left(\begin{array}{c} \text{Number of quadrats} \\ \text{in which the species present} \end{array} \right)}{\text{Total number of quadrats studied}} \times 100$$

$$\text{Density} = \frac{\left(\begin{array}{c} \text{Total number of individuals} \\ \text{of the species in all quadrats} \end{array} \right)}{\text{Total number of quadrats studied}}$$

$$\text{Abundance} = \frac{\text{Total number of species in all quadrat}}{\text{Number of quadrats of occurrence of species}}$$

$$\text{Basal area} = \Pi r^2$$

Where, $\Pi = 3.14$ and 'r' is the radius of the stem at the point of emergence.

Relative frequency, relative density and relative dominance were calculated from the following formulae:

$$\text{Relative Frequency} = \frac{\text{Number of occurrence of the species}}{\text{Number of occurrence of all species}} \times 100$$

Relative density

$$= \frac{\text{Number of individuals of the species}}{\text{Number of individuals of all species}} \times 100$$

Relative dominance

$$= \frac{\text{Total basal area of the species}}{\text{Total basal area of all species}} \times 100$$

$$IVI = RD + RF + RDo$$

$$RIVI = IVI / 3$$

5. Result and Discussion

The present study on the phytosociological attributes of various plant species- present in Thekkumbhad Thazhe Kavu, Cherukkunnu, Kannur was carried out over a period of 2019 to 2020.

Man's belief in supernatural forces can be traced back to time immemorial. Behind each belief we can find stories connecting it with the purpose of pleasing someone or the fear of something. Although the sacred groves are protected by social taboos, they are not immune to anthropogenic influences like developmental activities, grazing, poaching, weed invasion, collection of wood and timber etc. The present work revealed that sacred groves act as a gene pool or preservation plots and many of them harbour rare, endemic, endangered and economically and ethno medicinally very important plants because of the restraints exercised due to the fear of deities/spirits residing in these groves. Most of the groves of the present study were small in size. Neglecting the smaller groves will lead to the disappearance of both vegetation and cultural diversity [13].

The sacred groves can be considered as the reservoir of the rural community and through that they are providing adequate irrigation and fertility to the soil. Many sacred groves contain water resources such as pond; stream etc. The vegetative mass that covers the floor of a grove can absorb water during the rainy season and release it during the time of draught. These are the last resorts for many of the animals and birds to fulfill the water requirement especially during summer season. The wells and tanks are seen with in the sacred groves satisfy the need of water to the near by community and also help to the traditional irrigation system. Sacred groves helped in reducing water run off and in maintaining soil moisture. A number of streams and rivers originated from sacred groves. The river water from sacred groves brings minerals and fertilizers in much quantity.

During the study in Thazhe Kavu, a total of 35 vascular plants falling under 32 genera and 18 families were documented (Table 1). Out of which angiosperms dominate with 34 members, while only one is pteridophyte. With respect to their habit, there are 17 herbs, 8 shrubs, 7 trees and 3 grasses. Among angiosperms dicots comprise 13 families, 22 genera and 23 species while monocot comprises 4 families, 10 genera and 11 species. The dominant families are Poaceae, Rhizophoraceae, Asteraceae, Rubiaceae, Arecaceae,

Cyperaceae, Scrophularaceae, and Lamiaceae with 5, 4, 4, 3, 2, 2, 2 and 2 species respectively.

The mangrove vegetation found here is particularly belonging to Rhizophoraceae. The mangrove also exists as fringing vegetation distributed along the sides of the paddy field. In this area 5 true mangroves species are found. These five mangroves belonging to 2 families (Table 2).

At Thekkumbad Thazhe Kavu 29 species (83%) are used for medicinal uses including the mangrove vegetation (Table 1). The majority of plant species have medicinal uses for snake bite, kidney problem, hair growth, anti-inflammatory, antioxidant uses. The wide range of

the plant species present in the study areas showed its potentiality for economic species.

During our present study, it is analysed that 15 species present in Thekkumbad Thazhe Kavu. In Thekkumbad Thazhe Kavu, all species which present in red list are least concerned, and they are *Acanthus ilicifolius*, *Achrosticum aureum*, *Aegicera scorniculatum*, *Bruguiera cylindrica*, *Caryota urens*, *Cyperus rotundas*, *Fimbristilis ferruginea*, *Kandelia candel*, *Lindernia crustacea*, *Lindernia tenuifolia*, *Ludwigia hyssopifolia*, *Pandanus odorifer*, *Panicum repens*, *Rhizophora apiculata* and *Rhizophora mucronata* (Table 3).

Table 1. Vascular flora of Thekkumbad Thazhe Kavu, Kannur

S.no.	SPECIES	FAMILY	HABIT	MEDICINAL	COMMON NAME
1	<i>Acanthus ilicifolius</i> L.	Acanthaceae	Herb	Medicinal	Chullikkandal
2	<i>Achrosticum ureum</i> L.	Pteridaceae	Herb	Medicinal	Cherupanal
3	<i>Acmella ciliata</i> (Kunth) Cass.	Asteraceae	Herb	Medicinal	Palluedhanachedi
4	<i>Aegiceras corniculatum</i> (L.) Blanco	Primulaceae	Shrub	Medicinal	Khalsi
5	<i>Brachiaria remota</i> (Retz.) Haines	Poaceae	Herb	Medicinal	Vayapullu
6	<i>Bruguiera cylindrica</i> (L.) Bl.	Rhizophoraceae	Small tree	Timber	Kutti kandal
7	<i>Calamus rotang</i> L.	Arecaceae	Climbing Shrub	Ornamental	Chooral
8	<i>Caryota urens</i> L.	Arecaceae	Tree	Medicinal and food	Pana
9	<i>Clerodendrum inerme</i> (L.) Gaertn	Verbenaceae	Shrub	Medicinal	Puzhamulla
10	<i>Cyanthillium cinereum</i> (L.) H.Rob. – GBIF	Asteraceae	Herb	Medicinal	Poovamkurunnilla
11	<i>Cyperus malaccensis</i> Lam.	Cyperaceae	Grass	Medicinal	Uppuvellapullu
12	<i>Cyperus rotundus</i> L.	Cyperaceae	Herb	Medicinal	Muttana
13	<i>Cyrtococcum trigonum</i> (Retz.) A. Camus	Poaceae	Herb	Cattle fodder	Tharipullu
14	<i>Derris trifoliata</i> Lour.	Fabaceae	Shrub	Medicinal	Kammattivalli
15	<i>Emilia sonchifolia</i> (L.) DC. ex Wight	Asteraceae	Herb	Medicinal	Muyalcheviyan
16	<i>Eupatorium odoratum</i> L.	Asteraceae	Shrub	Medicinal	Appachappu
17	<i>Fimbristylis ferruginea</i> (L.) Vahl	Cyperaceae	Herb	Control erosion	Rusty sedges
18	<i>Ischaemum ciliare</i> Retz.	Poaceae	Herb	Control erosion	Chenkodipullu
19	<i>Ixora coccinea</i> L.	Rubiaceae	Shrub	Medicinal	Chethi
20	<i>Kandelia candel</i> L.	Rhizophoraceae	Small Tree	Control erosion	Cherukandal
21	<i>Lindernia crustaceas</i> (L.) F. Muell.	Scrophulariaceae	Herb	Medicinal	Pimbernel
22	<i>Lindernia tenuifolia</i> (Colsm.) Alston	Scrophulariaceae	Herb	Medicinal	Chelichulli
23	<i>Ludwigia hyssopifolia</i> (G. Don) Exell	Onagraceae	Herb	Medicinal	Kaattukarayambu
24	<i>Morinda citrifolia</i> L.	Rubiaceae	Tree	Medicinal	Mulberry
25	<i>Ocimum sanctum</i> Linn.	Lamiaceae	Shrub	Medicinal	Thulasi
26	<i>Oplismens burmannii</i> (Retz.) P Beauz	Poaceae	Grass	Medicinal	Vattapullu
27	<i>Pandanus odorifer</i> (Forssk) Kuntze	Pandanaceae	Tree	Ornamental	Kaitha
28	<i>Panicum repens</i> L.	Poaceae	Grass	Control erosion	Ingipull
29	<i>Phyllanthus virgatus</i> G. Forst.	Euphorbiaceae	Herb	Medicinal	Bon-baberi
30	<i>Premna serratifolia</i> L.	Lamiaceae	Shrub	Medicinal	Arani
31	<i>Rhizophora apiculata</i> Blume	Rhizophoraceae	Tree	Medicinal	Valli Kandal
32	<i>Rhizophora mucronata</i> Lam.	Rhizophoraceae	Tree	Medicinal	Prandan Kandal
33	<i>Sperma cocepusilla</i> Wall.	Rubiaceae	Herb	Medicinal	SafedPhooli
34	<i>Torenia crustacea</i> (L.) Cham. & Schltdl.	Linderniaceae	Herb	Medicinal	Kattusangupushpam
35	<i>Tylophora indica</i> (Burm.f.) Merr.	Apocyanaceae	Climbing herb	Medicinal	Vallippala

Table 2. List of true mangroves in Thekkumbad Thazhe Kav

S.no.	Species	Family	Habit	Common Name	Local Name
1	<i>Acanthus ilicifolius</i> Linn.	Acanthaceae	Herb	Sea Holly/ Holly Mangroves	Chulli Kandal
2	<i>Bruguiera cylindrica</i> (L.) Blume.	Rhizophoraceae	Small Tree	Small Leaved Orange Mangrove	Kuttikandal
3	<i>Kandelia candel</i> L.Druce	Rhizophoraceae	Small Tree	Narrow-Leaved Kandelia	Cherukandal/Nallakandal
4	<i>Rhizophora apiculata</i> Blume.	Rhizophoraceae	Tree	Tall Stilted Mangrove	Vallikandal
5	<i>Rhizophora mucronata</i> Lamk.	Rhizophoraceae	Tree	Long Fruited Stilted Mangrove	Peekandal/Pranthan Kandal

Table 3. Red listed plants in inThekkumbad Thazhe Kavu, Kannur

S.no.	SPECIES	STATUS
1	<i>Acanthus ilicifolius</i> L.	Least concerned
2	<i>Achrosticum aureum</i> L.	Least concerned
3	<i>Aegiceras corniculatum</i> (L.) Blanco	Least concerned
4	<i>Bruguiera cylindrica</i> (L.) Bl.	Least concerned
5	<i>Caryota urens</i> L.	Least concerned
6	<i>Cyperus rotundus</i> L.	Least concerned
7	<i>Fimbristylis ferruginea</i> (L.) Vahl	Least concerned
8	<i>Kandelia candell</i> L.	Least concerned
9	<i>Lindernia crustacea</i> (L.) F. Muell.	Least concerned
10	<i>Lindernia tenuifolia</i> (Colsm.) Alston	Least concerned
11	<i>Ludwigia hyssopifolia</i> (G. Don) Exell	Least concerned
12	<i>Pandanus odorifer</i> (Forssk) Kuntze	Least concerned
13	<i>Panicum repens</i> L.	Least concerned
14	<i>Rhizophora apiculata</i> Blume	Least concerned
15	<i>Rhizophora mucronata</i> Lam.	Least concerned

Table 4. Species Composition in Thekkumbad Thazhe Kavu, Kannur.

S.no.	SPECIES	QUANTITATIVE ATTRIBUTES				SYNTHETIC ATTRIBUTES				
		Frequency (%)	Abundance (Individuals /m ²)	Density (Individuals /m ²)	Basel cover (mm ² /m)	R.F (%)	R.D (%)	R.Do (%)	IVI	RIVI
1	<i>Acanthus ilicifolius</i> L.	10	3	0.3	3.2	2.564	0.584	0.754	3.903	1.301
2	<i>Achrosticum aureum</i> L.	10	1	0.1	20.4	2.564	0.194	4.810	7.569	2.523
3	<i>Acmella ciliata</i> (Kunth) Cass.	10	14	1.4	1.5	2.564	2.729	0.353	5.646	1.882
4	<i>Aegiceras corniculatum</i> (L.) Blanco	10	46	4.6	1.7	2.564	8.966	0.400	11.931	3.977
5	<i>Branchiaria remota</i> (Retz.) Haines	10	5	0.5	1.1	2.564	0.974	0.259	3.798	1.266
6	<i>Bruguiera cylindrical</i> (L.) Bl.	10	5	0.5	4.1	2.564	0.974	0.966	4.505	1.501
7	<i>Calamus rotang</i> L.	10	4	0.4	4.5	2.564	0.779	1.061	4.404	1.468
8	<i>Caryota urens</i> L.	10	1	0.1	153	2.564	0.194	36.076	38.835	12.945
9	<i>Clerodendrum inerma</i> (L.) Gaertn	10	4	0.4	3.5	2.564	0.779	0.825	4.169	1.389
10	<i>Cyanthillium cinereum</i> (L.) H.Rob. - GBIF	10	2	0.2	1.8	2.564	0.389	0.424	3.378	1.126
11	<i>Cyperus malaccensis</i> L am.	10	8	0.8	7.9	2.564	1.559	1.862	5.986	1.995
12	<i>Cyperus rotundus</i> L.	10	8	0.8	7.9	2.564	1.559	1.862	5.986	1.995
13	<i>Cyrtococcum trigonum</i> (Retz.) A. Camus	10	12	1.2	0.4	2.564	2.339	0.094	4.997	1.665
14	<i>Derris trifoliata</i> Lour.	10	1	0.1	1.2	2.564	0.194	0.282	3.041	1.013
15	<i>Emilia sonchifolia</i> (L.) DC. ex Wight	10	1	0.1	1.7	2.564	0.194	0.400	3.159	1.053
16	<i>Eupatorium odoratum</i> L.	10	6	0.6	2.4	2.564	1.169	0.565	4.299	1.433
17	<i>Fimbristylis ferruginea</i> (L.) Vahl	10	1	0.1	45	2.564	0.194	10.610	13.369	4.456
18	<i>Ischaemum ciliare</i> Retz.	20	22.5	4.5	6.2	5.128	8.771	1.461	15.362	5.120
19	<i>Ixora coccinea</i> L.	20	5.5	1.1	2.1	5.128	2.144	0.495	7.767	2.589
20	<i>Kandelia candel</i> L.	10	53	5.3	4.4	2.564	10.331	1.037	13.932	4.644
21	<i>Lindernia crustacea</i> (L.) F. Muell.	20	18.5	3.7	0.7	5.128	7.212	0.165	12.505	4.168
22	<i>Lindernia tenuifolia</i> (Colsm.) Alston	10	18	1.8	1.2	2.564	3.508	0.282	6.355	2.118
23	<i>Ludwigia hyssopifolia</i> (G. Don) Exell	10	16	1.6	1.5	2.564	3.118	0.353	6.0367	2.012
24	<i>Morinda citrifolia</i> L.	10	1	0.1	37	2.564	0.194	8.724	11.483	3.827
25	<i>Ocimum sanctum</i> Linn.	10	2	0.2	2.2	2.564	0.389	0.518	3.472	1.157
26	<i>Oplismens burmannii</i> (Retz.) P Beauz	10	49	4.9	6.8	2.564	9.551	1.603	13.719	4.573
27	<i>Pandanus odorifer</i> (Forssk) Kuntze	10	1	0.1	48	2.564	0.194	11.318	14.077	4.692
28	<i>Panicum repens</i> L.	10	87	8.7	1.1	2.564	16.959	0.259	19.782	6.594
29	<i>Phyllanthus virgatus</i> G. Forst.	10	4	0.4	1.3	2.564	0.779	0.306	3.650	1.216
30	<i>Premna serratifolia</i> L.	20	1	0.2	4	5.128	0.389	0.943	6.461	2.153
31	<i>Rhizophora apiculata</i> Blume	10	1	0.1	2.5	2.564	0.194	0.589	3.348	1.116
32	<i>Rhizophora mucronata</i> Lam.	10	1	0.1	39.5	2.564	0.194	9.313	12.072	4.024
33	<i>Spermacoce pusilla</i> Wall.	10	36	3.6	0.7	2.564	7.017	0.165	9.746	3.248
34	<i>Torenia crustacea</i> (L.) Cham. &Schtdl.	10	24	2.4	1.2	2.564	4.678	0.282	7.525	2.508
35	<i>Tylophora indica</i> (Burm.f.) Merr.	10	3	0.3	2.4	2.564	0.584	0.565	3.714	1.238

The quantitative ecological characters such as frequency, abundance, density and basal cover and synthetic characters such as relative frequency, relative density, relative dominance, importance value index and relative value of importance for all the study species present Thekkumbad Thazhe Kavau are given in Table 4 respectively.

In Thazhe Kavau the species, *Ischaemum ciliare*, *Ixora coccinia*, *Lindernia crustacea* and *Premna serratifolia* shows high frequency values. The lowest frequency was shown by about 31 species in ThazheKavau.

The *Panicum repens*, *Kandelia candel*, *Aegiceras corniculatum* and *Sperma cocepusilla* were present abundantly in Thazhe Kavau. The lowest abundance is shown by 10 species.

The species, *Panicum repens*, *Kandelia candel*, *Oplismens burmannii* have higher density among Thazhe Kavau, about 9 species represent the lowest density in this area.

Based on the basal cover *Caryota urens* have got the highest basal cover of 153mm²/m in Thazhe Kavau. Similarly, in Thazhe Kavau, next to *Caryota urens*, *Pandanu sodorifer* was having higher basal area. In this site *Aspidopteris canarensis*, *Scleria lithosperma* and *Hopea ponga* were registered highest Relative frequency, Relative density and Relative basal cover respectively. Similarly, *Ischaemum ciliare*, *Ixora coccinia*, *Lindernia crustacean*, *Premna serratifolia* were registered highest relative frequency. *Panicum repens* and *Caryota urens* were shown highest relative density and relative basal cover respectively.

In Thekkumbad Thazhe Kavau, the species *Caryota urens* securing higher IVI of 38.835. The other species like *Panicum repens*, *Ischaemum ciliare* were also showing next higher IVI. The species of least significance (lowest IVI) were shown by species like *Derris trifoliolate*, *Emilia sonchifolia* and *Rhizophora apiculata*. Based on IVI score made by this species it is understood that there are poorly established species in the communities of the study sites of sacred groves.

Though the groves are rich in phyto-diversity, they are facing anthropogenic pressures of various sorts. Changes in socioeconomic conditions and land use patterns over years threatened both the form and size of the groves. There is a considerable change in the nature of vegetation and species composition in both the sacred groves, as being stated by local inhabitants. Destruction of natural resources is evident in both the groves and the reasons can be attributed to the construction of temple complexes within the sacred groves. The Weakening of faith and belief on the groves, break up of joint families (Tharavadu system) into nuclear families and the lack of man power to manage family sacred groves are the most important threats being faced by the sacred groves [14]. Anthropogenic activities such as the construction of roads or rivulets by the municipality and other developmental activities by local authorities lead to shrinkage and change in the extent of the grove's vegetation. The increase in demand of land for various developmental activities has become an important aspect for the reduction in size of the grove. The situation is becoming increasingly dreadful [15]. Apart from anthropogenic pressures, the sacred groves are facing biotic pressures mainly from alien

invasive species which are reported to be detrimental to the natural native flora worldwide [16,17,18].

6. Conclusion

It is suggested that the studied sacred grove must be given conservation priority to protect valuable endangered medicinal species. Despite the seasonal changes, the anthropogenic interferences were determined to be most influencing factor to affect the species composition and the quantitative ecological attributes of many sensitive species. Therefore, construction activities, over grazing, collection of fire- wood, tress passing, dumping of waste and many antisocial elements must be checked so as to protect the species in their habitats. Further, the ecosystem- specific management plans must be developed to protect the individual species in these sacred groves. Protection of such activities aid in the regulation of ecological processes like energy flow, food chain and food web and cycling of materials which would result in ecological balance and stability of ecosystem.

There is a disappearance of the traditional belief systems, which were fundamental to the concept of sacred groves. Thus, the degraded sacred groove can be restored only by raising awareness among the rural people regarding the importance of sacred grooves and its conservation. Also, the local people are encouraged to grow indigenous tree species plantation. There is an urgent need for recognizing these traditionally valued natural systems at various levels and planning for their better management, ultimately aiming to conserve biodiversity. In this context, traditional values that help in conservation should be properly recognized and acknowledged.

The sacred grove areas, organization of awareness campaigns on the functional role is another strategy which also helps to attract more stakeholder gropes to participate and jointly chalk out the plant to manage and conserve the existing systems in the light of any possible threats like encroachment and habitat destruction in future.

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