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Floristic composition and diversity of Sree Andalur sacred grove, Kannur District, Kerala

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Abstract
Sacred groves are virgin forests and acts as site for conservation of bio-resources and shows near climax vegetation of trees and associate groups of organisms, managed as a part of local cultural tradition. The present work was carried out in Sree Andalur Sacred Grove, Kannur district, Kerala. Geographically the place lies between 11˚47′40.797″ N latitude and 75˚28′37.9842″ E longitudes. The Thazhe Kavu, part of the Andalur Kavu, has the remnants of a sacred grove. About 101 plant species belonging to 40 families were collected from here. Plants were enumerated with botanical names, family, habit and local names. It includes 15 Trees, 37 Shrubs, 40 Herbs and 9 Climbers. The collected plants were preserved as herbarium.

Keywords: sacred grove, Kannur, floristic diversity, Thazhe Kavu, herbarium

1. Introduction
Sacred grove is primitive holy place which may have an image and may gradually become an elaborate temple. They have been preserved as sustainable resources and are considered as valuable gene pools and the first major effort to recognize and conserve biodiversity [2, 4, 5]. Many plants are often grown along and within the temples and can be considered as "sacred plants" [1]. In groves all forms of vegetation including trees, shrubs, herbs and climbers are conserved [9]. There have been reported many groves from different continents of the world such as Africa, Asia, Europe. In North East India most of the sacred groves has been reported from Arunachal Pradesh, Meghalaya and Manipur [11]. Due to urbanization, industrialization and rationalization, scarcity of land leading to the depletion of the cover and shrinkage of these areas as a result the large chunk of the areas are diverted for other activities and only a small portion maintained near the temple [6].
Total number of sacred groves in Kerala to be around 2000 and have found 722 species of flowering plants [13]. Sacred groves in Kerala preserve more than 800 species of angiosperms (20% of total flowering plants recorded from the state). These Kavus are very much associated with Theyyam festivals. Conservation of sacred groves is essential for maintaining local biodiversity, the comprehensive health of a landscape and preserving the socio-cultural integrity of local communities are most important. The main objectives of these studies were to conduct a survey of the sacred grove, collection and identification of plants and to study the floristic composition of plants.

2. Materials and Methods
2.1 Study area
The study area Sree Andalurkavu located nearly 20 km away from Kannur town of Kannur district, Kerala. It is commonly called Andalurkavu which covers an area about 3.5 acres. The study area is located in northern part of Kerala, commonly known as Malabar area. Field surveys were made to explore the floristic composition and diversity of Andalurkavu Kannur. Geographically Andalur lies between 11˚47′40.797″ N latitude and 75˚28′37.9842″ E longitudes. The Thazhe Kavu, part of the Andalur Kavu, has the remnants of a sacred grove. Andalur is well known for the ancient function of Theyyam. This old temple is in the name of Lord Rama and the main festival is celebrated in mid-February: the first week of the month Kumbam of the Malayalam calendar.

2.2 Field study
The present study was conducted between the periods from July 2017 to April 2018. During the field visit, the various plants were identified on the basis of spot identification. More information was collected from local people and care takers of sacred grove. Field visit was conducted several times and collect the details of the plants. The Botanical identities of the plants have been confirmed with Flora of presidency of Madras [8], Flora of Coimbatore [3], An Excursion Flora of Central Tamil Nadu, India [12], The Flora of Kerala [15] and also with Taxonomical experts.

3. Results and Discussion
Sacred groves are considered as store house of rare, endemic and endangered plants because of floristic wealth and biodiversity conservation. Floristic compositon in Sree Andalurkavu has been reported. 101 species of angiosperms coming under 90 genus and 40 families were recorded and listed out (Table 1). The plants listed above were distributed as 15 trees (14.85%), 37 shrubs (36.63%), 40 herbs (39.60%) and 9 climbers (8.91%), (Table 3). Plants were enumerated with botanical names, family, habit and local names (Table 1). Similar study was done in Iriveri Sree Pulideva Temple at Kannur district [16]. They reported 87 plants belonging to 46 familes In the present study Leguminosae (Fabaceae) family with 3 sub families (Papilionoideae, Caesalpinioiseae, Mimosoideae) is the dominant family: followed by

Acanthaceae with 13 species; Rubiaceae and Asteraceae with 8 species; Convolvulaceae, Verbinaceae and Amaranthaceae with 4 species each. Besides 2 families represented by 3 species, 9 families represented by 2 species, and 20 families represented by single species each (Table 2) [10] explored floristic studies in Vadavadhi Karuppar sacred grove at Thanjavur district. Totally 117 plant species belonging to 51 families and 102 genera were recorded in this grove [14]. Collected 59 species of flowering plants in 55 genera and 30 families from Karaikal district. Habit wise analysis of flora shows comparatively higher percentage of herbs (38.3%) were predominant followed by shrubs (25.0%), trees (23.3%) and climbers (11.6%). Herbs (39.60%) are more abundant in the grove, followed by shrubs (36.63%), trees (14.85%) and climbers (8.91%). *Ficus benghalensis* L. and *Ficus mollis* Vahl are large trees. They maintain the ecosystem balance in the grove. Hence their protection is very much necessary. The floristic composition of the sacred groves indicates the pre – existence of climax vegetation in the area [17, 7]. Identified 50 plant species from 8 sacred groves of Nemmara, Palakkad district. Human activities like gracing and cutting trees are prohibited in these groves.

Sacred groves are considered as store house of rare, endemic and endangered plants because of floristic wealth and biodiversity conservation. The grove is associated with water bodies and thus contains large number of floras and faunas. Invasive plants like *Chromolaena odorata* (L.) King & Robins. adversely affect the growth of other plants in the grove. Plastic wastes are deposited in the grove. These are the big threats to biodiversity conservation.

Table 1: List of plants present in the study area

S. No.	Binomial Name	Family	Habit	Common Name English/Malayalam
1.	*Abrus pulchellus* Wall. ex Thwaites	Fabaceae	Climber	Valiya kattumuthira / Showy rosary pea
2.	*Acacia auriculiformis* A. cunn. ex Benth	Mimosaceae	Tree	Wattles/Acacia
3.	*Acmella ciliata* (Kunth) Cass.	Asteraceae	Herb	Palluvedanachedi/ Toothache plant
4.	*Adenanthera pavonina* L.	Mimosaceae	Tree	Manjadi/Red sandalwood
5.	*Aerva lanata* (L.) Juss. ex Schult.	Amaranthaceae	Herb	Cherula/ Mountain knotgrass
6.	*Alternanthera brasiliana* (L.) Kuntze	Amaranthaceae	Herb	Chuvannacheera/ Brazilian joy weed
7.	*Alternanthera tenella* Colla	Amaranthaceae	Herb	Calico plant
8.	*Anacardium occidentale* L.	Anacardiaceae	Tree	Parankimavu/Cashewnut
9.	*Andrographis paniculata* (Burm. f.) Wall. ex Nees	Acanthaceae	Herb	Kiriyath/King of bitters
10.	*Asystasia dalzelliana* Sant.	Acanthaceae	Herb	Violet Asystasia
11.	*Asystasia gangetica* (L.) T.Anderson	Acanthaceae	Herb	Valli-upudal/ Ganges primrose
12.	*Barleria prionitis* Linn.	Acanthaceae	Shrub	Karimkurunni / Porcupine flower
13.	*Barleria prattensis* Santapau	Acanthaceae	Shrub	Pink Barleria
14.	*Bauhinia acuminata* L.	Caesalpiniaceae	Shrub	Vellamandharam/ White orchid
15.	*Bauhinia purpurea* Linn.	Caesalpiniaceae	Shrub	Rakthamandharam/ Buttefly tree
16.	*Biophytum reinwardtii* (Zucc.) Klotzsch	Geraniaceae	Herb	Mukkutti/ Reinwardt's tree plant
17.	*Blumea membranacea* Wall. ex. DC	Asteraceae	Herb	Boothamkolli
18.	*Boerhaavia diffusa* L.	Nyctaginaceae	Herb	Thazhuthama/ hogweed
19.	*Calliandra haematocephala* Hassk.	Fabaceae	Shrub	Red powder-puff Plant
20.	*Calycopteris floribunda* Lam.	Combretaceae	Shrub	Pullanni/ Paper flower climber
21.	*Canscora diffusa* (Vahl) R.Br.	Gentianaceae	Herb	Jeerakapullu
22.	*Cassia alata* L.	Fabaceae	Shrub	Aanathakara/ Candle bush
23.	*Cassia fistula* L.	Fabaceae	Tree	Kanikkonna/ Golden shower tree
24.	*Catharanthus roseus* (L). G.Don	Apocyanaceae	Herb	Nithiakalyani/ Periwinkle
25.	*Centratherum intermedium* (Link) Less.	Asteraceae	Herb	Lark Daisy
26.	*Centrosema molle* Benth.	Fabaceae	Climber	Kattucherupayar/ Butterfly pea
27.	*Chassalia curviflora* (Wall ex Kurz) Thw.	Rubiaceae	Shrub	Karutha-amalppori
28.	*Chamaecrista mimosoides* (L.) Greene	Caesalpiniaceae	Shrub	Theemullu
29.	*Chromolaena odorata* (L.) King & Robins.	Asteraceae	Shrub	Communist Pacha
30.	*Cinnamomum zeylanicum* Blume.	Lauraceae	Tree	Karuvappatta/ Cinnamon
31.	*Cleome rutidosperma* DC.	Capparidaceae	Herb	Fringed spider flower
32.	*Clerodendron infortunatum* L.	Verbenaceae	Shrub	Vatta perivilam/ Hill glory bower
33.	*Clerodendrum serratum* (L.) Moon.	Verbenaceae	Shrub	Cherutekku/ Fragrant cleodendron
34.	*Clitoria terneata* L.	Fabaceae	Climber	Shangupushpam/ Blue pea vine
35.	*Coffea arabica* L.	Rubiaceae	Shrub	Kaappi/Coffee plant
36.	*Commelina diffusa* N. Burman	Commelinaceae	Herb	Climbing Day Flower
37.	*Crossandra infundibuliformis* (L.) Nees	Acanthaceae	Shrub	Kanakambaram/ Funnel flower
38.	*Crotalaria pallida* Aiton	Fabaceae	Shrub	Kilukkampettichedi/ Smooth Rattlebox
39.	*Cyathula prostrata* (L.) Blume	Amaranthaceae	Herb	Small pricky chaff-flower plant
40.	*Cyperus rotundus* L.	Cyperaceae	Herb	Coco grass
41.	*Desmodium heterophyllum* (Willd.) DC.	Fabaceae	Shrub	Spanish clover
42.	*Desmodium triquetrum* DC.	Fabaceae	Shrub	Adakkapaanal/ Trefle gros
43.	*Eclipta alba* L.	Asteraceae	Herb	Bhirngaraja/ False daisy
44.	*Euphorbia heterophylla* L.	Euphorbiaceae	Herb	Green poinsettia

45.	*Euphorbia hirta* L.	Euphorbiaceae	Herb	Amampatchaiaraisi/ Pill bearing spurge
46.	*Ficus benghalensis* L.	Moraceae	Tree	Peraal/ Indian banyan
47.	*Ficus mollis* Vahl	Moraceae	Tree	Vishakkaya
48.	*Fioria vitifolia* (L.) Mattei	Malvaceae	Shrub	Kattuvelluram/ Grape leaved mallow
49.	*Gloriosa superba* L.	Liliaceae	Climber	Menthonni/ Flame lily
50.	*Grewia nervosa* (Lour.) G.Panigrahi.	Tiliaceae	Shrub	Cherikotta/ Shiral
51.	*Hibiscus surattensis* Linn.	Malvaceae	Shrub	Assam susor
52.	*Hygrophyla spinosa* T. Anders	Acanthaceae	Herb	Voyal-chullai/ Marsh barbell
53.	*Ipomoea aquatica* Forsk.	Convolvulaceae	Climber	Water-spinach
54.	*Ipomoea cairica* (L.) Sweet	Convolvulaceae	Climber	Railway Creeper
55.	*Ixora coccinea* L.	Rubiaceae	Shrub	Chekki/ Flame of the woods
56.	*Ixora finlaysoniana* Wall. ex D. Don.	Rubiaceae	Shrub	Vellachekki/ White Ixora
57.	*Justicia japonica* Thumb.	Acanthaceae	Herb	Squirrel tail
58.	*Lantana camara* L.	Verbenaceae	Shrub	Aripoo/ Big-sage
59.	*Leea indica* (Burm.f.) Merr.	Vitaceae	Shrub	Njallu/ Tree-vine
60.	*Leucas lavandulifolia* J. E. Sm.	Lamiaceae	Herb	Thumba
61.	*Macaranga peltata* (Roxb.) Muell.-Arg.	Euphorbiaceae	Tree	Uppila
62.	*Mangifera indica* Linn.	Anacardiaceae	Tree	Manga/Mango Tree
63.	*Manilkara zapota* (L.) P.Royen	Sapotaceae	Tree	Sapota/Sapota tree
64.	*Melestoma malabathricum* L.	Melastomaceae	Shrub	Athirani/ Indian-rhododendron
65.	*Merremia vitifolia* (Burm. f.) Hall. f.	Convolvulaceae	Climber	Manja kolambi valli/ Grape-leaf wood rose
66.	*Mimosa pudica* L.	Mimosaceae	Herb	Thottavaadi/ Sensitive plant
67.	*Mitracarpus hirtus* (L.) DC.	Rubiaceae	Herb	Thaval/ Tropical girdlepod
68.	*Mollugo pentaphylla* L.	Aizoaceae	Herb	Parpadakapullu/ Five leaved carpetweed
69.	*Monochoria vaginalis* Presl.	Pontederiaceae	Herb	Naalppamaram/ Pickerelweed
70.	*Murraya paniculata* (L.) Jack	Rutaceae	Shrub	Maramulla/ Orange jasmine
71.	*Mussaenda frondosa* L.	Rubiaceae	Shrub	Vellila/ white rag plant
72.	*Ocimum tenuiiflorum* L.	Lamiaceae	Shrub	Thulasi/ Holy basil
73.	*Oldenlandia corymbosa* Linn	Rubiaceae	Herb	Diamond flower
74.	*Olea dioica* Roxb.	Oleaceae	Tree	Edala/ Rose sandalwood
75.	*Passiflora foetida* L.	Passifloraceae	Climber	Poochapalam/ Passion flower
76.	*Pennisetum polystachyon* Schult	Poaceaeae	Herb	Mission grass
77.	*Pseuderanthemum malabaricum* Gamb.	Acanthaceae	Shrub	Malabar false eranthemum
78.	*Rhinacanthus nasutus* (L.) Kurz	Acanthaceae	Shrub	Nagamulla/ Snake jasmine
79.	*Ruellia tuberosa* L.	Acanthaceae	Herb	Waterkanon
80.	*Rungia pectinata* Nees.	Acanthaceae	Herb	Tavasmurungi/ Small flowered Rungia
81.	*Saraca asoka* (Roxb.) de Wilde	Caesalpiniaceae	Shrub	Ashokam/Ashoka tree
82.	*Scoparia dulcis* L.	Scrophulariaceae	Herb	Kallurukki/ Sweet broomweed
83.	*Setaria pumila* (Poir.) Roem. & Schult.	Poaceaeae	Herb	Kambilippullu/Yellow foxtail
84.	*Sida acuta* Burm. f.	Malvaceae	Shrub	Anakurunthotti/ Broom weed
85.	*Spermacoce articularis* L. f.	Rubiaceae	Herb	Jointed buttonweed
86.	*Sphagneticola trilobata* (L.) Pruski	Asteraceae	Herb	Singapore daisy
87.	*Stachytarpheta jamaicensis* L.	Verbenaceae	Herb	Brazilian Tea
88.	*Strychnos nux-vomica* L.	Loganiaceae	Tree	Kanjiram/ Snake wood
89.	*Syzygium caryophyllatum* (L.) Alston	Myrtaceae	Tree	Kattunjaval
90.	*Tabernaemontana divaricata* (L.) R.Br. ex Roem. & Schult.	Apocynaceae	Shrub	Nambyarvattam/ Crape jasmine
91.	*Tecoma stans* (L.) Juss. ex Kunth.	Bignoniaceae	Shrub	Yellow Bells
92.	*Terminalia catappa* L.	Combretaceae	Tree	Badam/Almond
93.	*Thunbergia erecta* (Benth.) T.Anderson	Acanthaceae	Shrub	Blue bell
94.	*Torenia bicolor* Dalz.	Scrophulariaceae	Herb	Kakkapoovu
95.	*Tridax procubens* L.	Asteraceae	Herb	Railpoochedi/ Coatbuttons
96.	*Triumfetta rhomboidea* Jacq.	Tiliaceae	Shrub	Ottukayal/ Diamond burbark
97.	*Turnera ulmifolia* L.	Turneraceae	Herb	Cheravathali/ Yellow buttercups
98.	*Vepris bilocularis* Engl.	Rutaceae	Tree	Karagil
99.	*Vernonia cinerea* Less.	Asteraceae	Herb	Poovamkurunal/ Little ironweed
100.	*Xenostegia tridentata* (L.) D.F. Austin & Staples	Convolvulaceae	Climber	Chandrakranti/ African morning vine
101.	*Ziziphus oenoplia* (L.) Mill.	Rhamnaceae	Straggling shrub	Thuthali/ Jackal jujube

Table 2: Families having maximum number of Species present in the study area

S. No.	Family	Number of Species
1.	Acanthaceae	13
2.	Fabaceae	9
3.	Rubiaceae	8
4.	Asteraceae	8
5.	Caesalpiniaceae	4
6.	Convolvulaceae	4
7.	Verbenaceae	4
8.	Amaranthaceae	4
9.	Malvaceae	3
10.	Mimosaceae	3
11.	Euphorbiaceae	3
12.	Tiliaceae	2
13.	Rutaceae	2
14.	Anacardiaceae	2
15.	Combretaceae	2
16.	Apocyanaceae	2
17.	Scrophulariaceae	2
18.	Lamiaceae	2
19.	Moraceae	2
20.	Poaceae	2

Table 3: Percentage distribution of plant species in the study area

S. No.	Habit	Number Of Plants	Distribution (%)
1.	Tree	15	14.85
2.	Shrub	37	36.63
3.	Herb	40	39.60
4.	Climber	9	8.91

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