



iJRASET

International Journal For Research in
Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 7 Issue: III Month of publication: March 2019

DOI: <http://doi.org/10.22214/ijraset.2019.3170>

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Floristic Composition and Ethnobotanical Documentation of a Sacred Grove, Vallikkattu Kavu-Kozhikode District, Kerala

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Abstract: Sacred groves are the patches of biodiversity conservation. They are the biodiversity hotspot under ritual and religious concepts. Biodiversity is the variety of living beings on the earth. Vegetation is the total plant species occur in an area. The untouched patch of vegetation in the homestead is known as the sacred groves. The sacred groves of Kerala are commonly called as 'Kavu'. The groves play a major role in the conservation of biodiversity as well as the water storage, soil erosion control. They have a vital role in the social, cultural, economical and religious systems. The floristic analysis showed that the Vallikkattu Kavu registered with 106 species. The documented plants belong to 101 genera and 53 families. By analyzing the conservation categories of plants, the study reveals that there are 12 Red Listed Species found in the grove. They require immediate conservation.

Keywords: Sacred Groves, Biodiversity, Kavu, Floristic Analysis, Red Listed Plants

I. INTRODUCTION

The distributions of biological resources are different in different regions of the world. They show variation in all taxonomic and special scales. There are some major global patterns in the distribution of the biological sources. Due to various reasons these distribution patterns arranged into small patches which form a mosaic of biodiversity. Biodiversity is the variety of living beings on the earth. It is the degree of variation of life. They are the fundamental building blocks of environment. They are the combination of various living organisms and various ecosystems. The declining of the biodiversity is due to various reasons like the loss, fragmentation and degradation of habitat, uncontrolled spread of invasive species, unwanted and unsustainable developmental processes, uncontrolled use of natural resources, climatic change, pollution and changes in the texture of aquatic and environmental systems. An ecosystem consists of biotic factors with the abiotic components. There is an energy flow occur in between the biotic factors of the ecosystem. So the ecosystems are dynamic in nature. Vegetation is the total plant species in a particular area. Vegetation controls the flow of numerous biogeochemical cycles. They serve as the energy source for the species in the planet. Plants are the photosynthetic multi-cellular organisms which found in both aquatic and terrestrial habitat. They are the producers of atmospheric oxygen. They are very important in the food chain. Angiosperms or flowering plants dominate the earth by last 70 million years. The classifications of angiosperms are done on the basis of their habit, habitat, nature of stem, life-span, size and nutrition. They play a crucial role in the existence of human beings. Sacred groves are the untouched patches of forests which play a vital role in the conservation of nature and biodiversity. They are dedicated to the serpent Gods and Goddesses. They are the store house of various economically and medicinally important plant species which are either endemic or exotic nature. Ethnobotany is the study of different uses of plants described by a particular group of indigenous peoples. Ethnobotany includes the fields such as ethnomedicine and agriculture. Non- westernized culture has a vital role in the ethnobotany. IUCN Red List is the comprehensive global conservation status of plant and animal species. They provide an idea about the conservation status of each plant and animal. The present study has been carried out in Vallikkattu Kavu, Kozhikode, Kerala. The study forecast the floristic composition in the study area by focusing on the medicinal and Red Listed Species.

A. Objectives

- 1) To collect basic information and ecological status and function of sacred grove.
- 2) To make the floristic study of the selected grove.
- 3) To list out the red listed plants in the study area.
- 4) To analyse the ecological importance of the sacred grove.
- 5) To identify the threats and problems faced by the selected grove.
- 6) To formulate the action plans for the conservation of grove.

II. MATERIALS AND METHODS

A. Study Area

Vallikkattu Kavu (Fig: 1) is situated in Pattarpalam of Thalakkulathur Panchayath, Palangad village in Kozhikode district. It lies between geographical coordinates of 11°23'17"N to 75°47'10"E. it covers an area about 25 acres. Topographically, the area falls the side of a laterite hillock. The sacred grove is now under the control of Malabar Devaswam Board. The main diety of the sacred grove is Goddess Durga and sub-dieties are God Ganapathy, God Vettakkoru Makan and Goddess Bhadrakali.

There is a perennial stream flowing down from the top of the mountain through the grove which ends in a pond which is just outside to the sacred grove. The water is used for the irrigation and bathing purposes by the local peoples.

B. Floristic Survey

The study includes the documentation of floral wealth of the sacred grove and its role in the conservation of biodiversity. Most of the information about the grove was collected from the local people and temple authorities by questionnaire. An extensive floristic survey was carried out in this sacred grove. During the study, plant species belonging to various families were recorded. Field notes and photographs of vegetation were also taken during the field visit. Plants were identified with the help of authentic book like 'Flora of presidency of Madras' (Gamble, 1935), 'Flowering plants of Kerala, A Hand book' (T S Nair, *et al*, 2006) and consulting with taxonomic experts and comparing with already identified specimens.

C. Ethnobotanical Studies

During the field visits the various uses of plants were gathered from the older generation in and around the grove, the books and Journals available at the college library and other such libraries were referred for the same.

D. Documentation of Red Listed Species

Among the identified species, various categories of Red Listed plants are identified by using the IUCN Red List.

Questions for the questionnaire

- 1) What is the history and myth behind the sacred grove?
- 2) What are the rituals in the grove and the timing of poojas?
- 3) What are the medicinal plants found in the grove and their uses?
- 4) Which are the plants used for other purposes other than that of medicine?
- 5) How the water resources of the grove influence the water bodies of the village?
- 6) What are the threats and problems faced by the grove?
- 7) What are actions and measures taken for the protection of the grove?
- 8) Which are the common animals in the grove

Figure 1: Location of study area- Vallikkattu Kavu, Kerala



III. RESULTS

The present study on the species composition and ethnobotanical uses of various plants in the study area has been recorded during November 2018 to January 2019.

A. Vascular Flora Of Vallikkattu Kavu

During the study, a total 106 vascular plants (Table 1) falling under 101 genera and 53 families were documented. With respect to their habitat, there are 28 trees, 22 shrubs, 19 climbers, 36 herbs and 1 epiphyte. Among the 106 plants dicot comprises 92 plants and monocot comprises 14 plants. The dominant families are Asteraceae, Fabaceae, Rubiaceae and Euphorbiaceae with 7, 6, 5 and 5 species respectively.

Table- 1: Flora of Vallikkattukavu

S. no	Botanical name	Family	Conservation status	Endemic status	Medicinal status	Habit
1	Naravelia zeylanica	Ranunculaceae	-	-	M	C
2	Magnolia champaka	Magnoliaceae	NT	-	M	T
3	Polyalthia korinti	Annonaceae	-	-	M	S
4	Uvaria narum	Annonaceae	-	-	M	C
5	Anamirta cocculus	Menispermaceae	-	-	M	C
6	Hydnocarpus pentandra	Flacourtiaceae	V/G	W.G	M	T
7	Hopea purviflora	Dipterocarpaceae	EN	SW.G	-	T
8	Vatica chinensis	Dipterocarpaceae	-	-	-	T
9	Hibiscus hispidissimus	Malvaceae	-	-	M	S
10	Sida rhombifolia	Malvaceae	-	-	M	H
11	Bombax ceiba	Bombacaceae		-	M	T
12	Grewia nervosa	Tiliaceae	EN	-	M	S
13	Hugonia mystax	Linaceae	-	-	M	C
14	Biophytum reinwardtii	Oxalidaceae	-	-	M	H
15	Glycosmis pentaphylla	Rutaceae	-	-	M	S
16	Murraya paniculata	Rutaceae	-	-	M	T
17	Zanthoxylum rhetsa	Rutaceae	-	-	M	T
18	Gomphia serrata	Ochnaceae	-	-	M	S
19	Naregamia alata	Meliaceae	-	P.I	M	S

20	Dichapetalum gelonioides	Dichapetalaceae	-	-	M	S
21	Ziziphus oenoplia	Rhamnaceae	-	-	M	C
22	Leea indica	Vitaceae	-	-	M	T
23	Cardiospermum helicacabum	Sapindaceae	-	-	M	C
24	Holigarna arnottiana	Anacardiaceae	EN	SW.G	M	T
25	Mangifera indica	Anacardiaceae	-	-	M	T
26	Connarus monocarpus	Connaraceae	-	-	M	C
27	Dalbergia horrida	Fabaceae	-	SW.G	M	C
28	Desmodium heterophyllum	Fabaceae	-	-	M	H
29	Desmodium triquetrum	Fabaceae	-	-	M	H
30	Bauhinia acuminata	Fabaceae	-	-	M	S
31	Bauhinia phoenicea	Fabaceae	-	W.G	M	C
32	Mimosa pudica	Fabaceae	-	-	M	H
33	Bryophyllum pinnatum	Crassulaceae	-	-	M	H
34	Calycopteris floribunda	Combretaceae	-	-	M	C
35	Syzygium caryophyllum	Myrtaceae	-	-	M	S
36	Melastoma malabathricum	Melastomataceae	-	-	M	S
37	Memecylon umbellatum	Melastomataceae	-	-	M	S
38	Osbeckia virgata	Melastomataceae	-	-	M	S
39	Ludwigia prostrata	Onagraceae	-	-	M	H
40	Passiflora foetida	Passifloraceae	-	-	M	C
41	Chasalia curviflora	Rubiaceae	-	-	M	S
42	Ixora coccinea	Rubiaceae	-	-	M	S
43	Mitracarpus hirtus	Rubiaceae	-	-	M	H
44	Ophiorrhiza pectinata	Rubiaceae	-	-	M	S

45	Pavetta indica	Rubiaceae		-	M	S
46	Acmella paniculate	Asteraceae	-	-	M	H
47	Elephantopus scaber	Asteraceae	-	-	M	H
48	Mikania micrantha	Asteraceae	-	-	M	C
49	Senecio vulgaris	Asteraceae	-	-	M	H
50	Syndrella nudiflora	Asteraceae	-	-	M	H
51	Ageratum conyzoides	Asteraceae	-	-	M	H
52	Chromolaena odorata	Asteraceae	-	-	-	S
53	Mimusops elengi	Sapotaceae	-	--	M	T
54	Jasminum malabaricum	Oleaceae	-	W.G	M	C
55	Olea dioica	Oleaceae	-	I	M	T
56	Jasminum flexile	Oleaceae	-	-	M	C
57	Alstonia scholaris	Apocynaceae	-	-	M	T
58	Holarrhena pubescens	Apocynaceae	-	-	M	T
59	Ichnocarpus frutescens	Apocynaceae	-	-	M	C
60	Tabernaemontana alternifolia	Apocynaceae	LR-NT	SW.G	M	T
61	Strychnos nux-vomica	Loganiaceae	-	-	M	T
62	Ipomoea obscura	Convolvulaceae	-	-	M	C
63	Scoparia dulcis	Scrophulariaceae	-	-	M	H
64	Torenia bicolor	Scrophulariaceae	-	W.G	M	H
65	Spathodea companulate	Bignoniaceae	-	-	M	T
66	Asystasia gangetica	Acanthaceae	-	-	M	H
67	Justicia procumbens	Acanthaceae	-	-	M	H
68	Clerodendrum infortunatum	Verbanaceae	-	-	M	S
69	Lantana camara	Verbanaceae	-	-	M	S
70	Premna serratifolia	Verbanaceae	-	-	M	S
71	Stachytarpheta jamaicensis	Verbanaceae	-	-	M	S
72	Hyptis suaveolens	Lamiaceae	-	-	M	S
73	Leucas lavandulifolia	Lamiaceae	-	-	M	H
74	Pogostemon pubescens	Lamiaceae	-	SW.G	-	H
75	Ocimum sanctum	Lamiaceae	-	-	M	H
76	Achyranthes aspera	Amaranthaceae	-	-	M	H

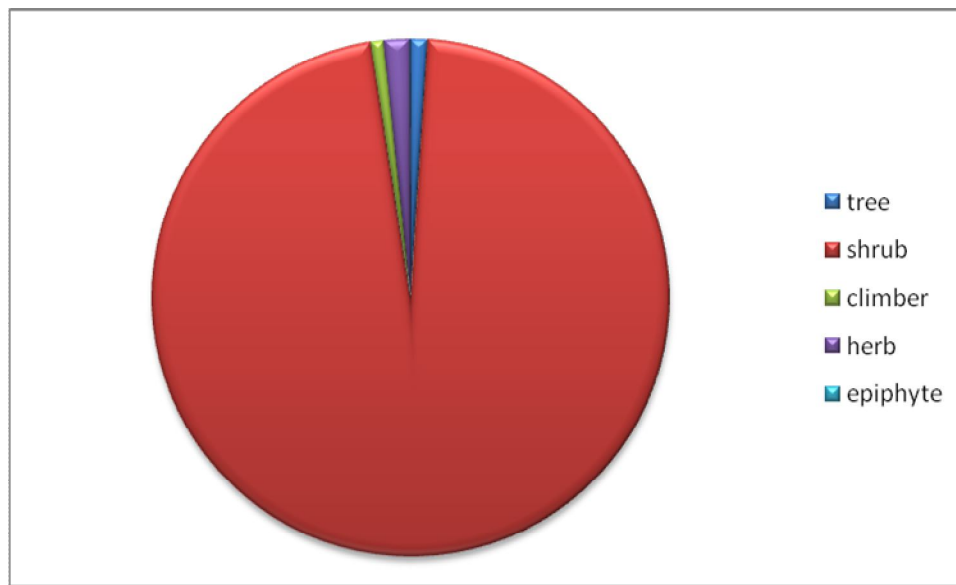
77	Peperomia pellucida	Piperaceae	-	-	M	H
78	Piper nigrum	Piperaceae	NT/K	-	M	C
79	Piper longum	Piperaceae	LC/K	-	M	H
80	Gymnacrancher farquhariana	Myristicaceae	-	-	M	T
81	Myristica fatua	Myristicaceae	EN	SW.G	M	T
82	Myristica malabarica	Myristicaceae	V	W.G	M	T
83	Santalum album	Santalaceae	V/G	-	M	T
84	Scleropyrum pentandrum	Santalaceae	-	-	M	T
85	Glochidion zeylanicum	Euphorbiaceae	-	-	M	T
86	Macaranga peltata	Euphorbiaceae	-	-	M	T
87	Phyllanthus airy-shawii	Euphorbiaceae	-	-	M	H
88	Tragia involucrate	Euphorbiaceae	-	-	M	H
89	Microstachys chamaelea	Euphorbiaceae	-	-	M	H
90	Laportea interrupta	Urticaceae	-	-	M	H
91	Artocarpus heterophyllus	Moraceae	-	-	M	T
92	Artocarpus hirsutus	Moraceae	V/G	SW.G	M	T
93	Dioscorea cirrhosa	Dioscoreaceae	-	-	M	C
94	Acampe praemorsa	Orchidaceae	-	-	-	EC
95	Floscopa scandens	Commelinaceae	-	-	M	H
96	Caryota urens	Arecaceae	-	-	M	T
97	Areca catechu	Arecaceae	-	-	M	T
98	Colocasia esculenta	Araceae	-	-	M	H
99	Lagenandra meeboldii	Araceae	-	W.G	M	H
100	Pothos scandens	Araceae	-	-	M	C
101	Typhonium roxburghii	Araceae	-	-	M	H
102	Cyperus haspan	Cyperaceae	-	-	M	H
103	Kyllinga nemoralis	Cyperaceae	-	-	M	H
104	Centotheca lappacea	Poaceae	-	-	M	H
105	Pennisetum pedicellatum	Poaceae	-	-	-	H
106	Cymbopogon flexuosus	Poaceae	-	-	M	H

- 1) EN- endangered; LC/K- Least Concern, Kerala; LR-NT- Low Risk, Near Threatened; NT- Near Threatened; NT/K- Near Threatened ,Kerala; V- Vulnerable; V/G- Vulnerable , Globally
- 2) W.G- Western Ghats; SW.G- Southern Western Ghats; PI - Peninsular India.
- 3) M- Medicinal
- 4) C- Climber; H- Herb; S- Shrub; T- Tree

Table- 2: Habit Wise Distribution Of Plants

	Habit	Number of plants	Percentage
1	Tree	28	26.41%
2	Shrub	22	20.75%
3	Climber	19	17.92%
4	Herb	36	33.96%
5	Epiphyte	1	0.94%

Chart- 1: Habit Wise Distribution Of Plants



B. Red Listed Plants Of The Sacred Grove

Among the documented 106 species, 12 species are Red Listed. The Red Listed plants divided into various categories like endangered; Least Concern, Kerala; Low Risk/ Near Threatened: Near Threatened: Near Threatened, Kerala; Vulnerable and Vulnerable, Globally.

Myristica fatua, Holigarna arnottiana, Hopea purviflora and Grewia nervosa are the listed endangered species.

Table- 3: Red Listed Plants Of The Sacred Grove

Sl. No.	Plant name	family	Conservation category
1	Magnolia champaka	Magnoliaceae	Near threatened
2	Hydnocarpus pentandra	Flacourtiaceae	Vulnerable, globally
3	Hopea purviflora	Dipterocarpaceae	Endangered
4	Grewia nervosa	Tiliaceae	Endangered
5	Holigarna arnottiana	Anacardiaceae	Endangered
6	Tabernaemontana alternifolia	Apocynaceae	Low Risk, Near Threatened
7	Piper nigrum	Piperaceae	Near Threatened, Kerala
8	Piper longum	Piperaceae	Least concern, Kerala
9	Myristica fatua	Meristicaceae	Endangered
10	Myristica malabarica	Meristicaceae	Vulnerable
11	Santalum album	Santalaceae	Vulnerable, globally
12	Artocarpus hirsutus	Moraceae	Vulnerable, globally

C. Threats To The Sacred Grove

Various kinds of anthropogenic stresses are faced by the grove. It leads to the biodiversity loss and natural imbalance. The various stresses include,

- 1) *Antisocial Activities*: Various antisocial activities like dumping of plastic waste are common. The animals consume the plastic leads to various health issues to them.
- 2) *Invading Exotic Species*: Various invading exotic species like *Mikania micrantha*, *Chromolaena odorata*, *Lantana camara* and *Pennisetum pedicellatum* causes imbalance in the natural vegetation.
- 3) *Mining*: Increasing mining leads to the loss of soil, vegetation and biodiversity.
- 4) *Attack to Fauna*: Killing of animals by poison attack become a crucial problem in the grove.

IV. DISCUSSION

The floristic composition and ethnobotanical survey of Vallikkattu kavu was done over a short period of November 2018 to January 2019. The floristic analysis showed that the Vallikkattu kavu registered with 106 species. The species comes under various habits like trees, shrubs, climbers, herbs and epiphytes. Innumerable plant and tree species of medicinal importance and wild relatives of cultivars are being conserved in these valuable resource pockets due to religious faith (Kannan and Kunhikannan, 2012).

The red listed species in the study area consist of 12 species. According to Deepamol and Khaleel (2009) sacred groves are the home of local flora, fauna, gene pool and a mini biosphere reserve. Sacred groves which support endemic species should be declared as 'hot spot' for conservation. Various anthropogenic activities are the main threats to the sacred groves. The stresses lead to the imbalance in the natural vegetation of the sacred groves. The flora and fauna are mainly disturbed by the various anti-social activities, invading exotic species and various developmental activities like mining.

The conservation of sacred groves leads to the conservation of entire nature and its vegetation. Various control measures can be taken for the conservation of sacred groves. Regular monitoring and supervision is the main factor.

Sacred groves are the patches of biodiversity conservation. They are the biodiversity hotspot under ritual and religious concepts.

V. CONCLUSION

The current study as an attempt to assess the diversity, ethnobotanical and conservation status of the Vallikkattu kavu, Kozhikode district, Kerala was studied for a period of three months. The study enlighten to the urgent conservation of sacred grove. It provides information regarding the floral wealth, cultural history, social and ecological role of the sacred grove.

In the present study various methods are adapted like field survey, review of literature, interview for socio-economic importance, as the grove covers lands which are mostly used for their medicinal properties. Grove flora includes 106 plants which contain 101 genera and 53 families. The flora covers various categories like tree, shrub, climber, herb and epiphytes with 28, 22, 19, 36 and 1 respectively. Sacred groves are remained as the land of conservation of endemic flora. They are the source of various medicinally and economically important plants. The grove and plants needs urgent conservation due to the high stress from the human activity. The grove plays a major role in the water conservation and logging. They are the source of water bodies about 1km away from the sacred grove. The roots of *Myristica* plants play a major role in the soil erosion control. They hold soil during rainy season and maintain the soil profile. The groves face various anthropogenic activities. They result in the loss of biodiversity and nature imbalance. Some of the major threats to the sacred groves are the anti social activities like dumping of plastic waste, invading exotic species, mining and attack to the animals. Due to the disappearance of traditional believe system and fragmentation of united families' leads to the fragmentation and disappearance of these patches of biodiversity conservation.

The grove is a hotspot of biodiversity conservation. So the grove needs urgent conservation. The conservation strategies include regular monitoring, restriction of entry, protection fauna by providing food for them, made the grove and the surrounding as eco friendly. Only through the participation of peoples in and around the grove is mandatory for the conservation of grove and its vegetation. By the protection of the grove we can conserve nature for tomorrow.

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