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Ethnobotanical Survey of the Sacred Grove, Sree Oorpazhachi Kavu, Kannur District, Kerala, India

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Abstract Sacred groves are one of the finest examples of traditional in situ conservation practices. These are patches of natural near-climax pristine vegetation of trees and associate groups of organism, managed as a part of local cultural tradition. In order to explore the medicinal values of the sacred groves an ethno-floristic survey in sacred groves was done to identify medicinal plants used by locals for several diseases. It revealed that Sree Oorpazhachi Kavu consist of a total of 86 vascular plants falling under 75 genera and 38 families. Out of which, the angiosperm dominate with 83 members, while 2 were pteridophytes and *Cycas circinalis* is the only gymnosperm. Leguminosae emerges as the largest family that contributes about 12 species. The listed plant species are mainly used to cure the common diseases such as fever and headache, cough, cold, many skin diseases, wound, diabetics, diarrhoea, dysentery, cancer, ulcer, brain haemorrhage, urinary infection, bronchitis, rheumatoid, arthritis, asthma, inflammatory swellings, anemia, vomiting, liver diseases, constipation, high blood pressure, obesity, malaria, muscle pain, stomach ache, irregular menstruation, eye diseases, leprosy, toothache, hair loss, eczema, kidney stone etc. Scared groves remain unexplored and no comprehensive studies in ethno-botanical issues, so the conservation of medicinal plants diversity of these groves is therefore most important.

Keywords: *sacred grove, conservation, diarrhea, rheumatoid, medicinal plants*

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1. Introduction

Biodiversity is the most valuable natural resources without which the overall development of man is not possible. Conservation and management of biodiversity is one of the foremost needs as vast expanses of vegetation continue to be under the threat of denudation and degradation all over the world [1]. Since time immemorial conservation of natural resources has been an integral part of several indigenous communities. Natural worship has been a key force in determining human attitudes towards conservation and sustainable utilization of biodiversity.

In the course of time science and technology developed and industries were established and expanded to meet the increasing demand of people, furthermore habitat alteration, over exploitation, pollution and introduction of exotic species also threatened the global biological resources. This adversely affected the biological balance and socio-economic status of people. Therefore, for the conservation of biodiversity many laws were enacted from time to time. The smallest group often harbours some old and magnificent specimen of trees and climbers [2]. The larger groves are treasure trove for the naturalist, supporting many threatening species in the area and are becoming extinct with deforestation sacred trees such as Banyan, Peepal and other species of *Ficus* supports a variety of life forms.

In India sacred groves are known by several names – Kavu, Nagakkavu, Sarpakkavu in Kerala, Deorais or Deoban in Maharashtra, Orans or Kenri in Rajasthan, Devarakadu, Pavithavana or Sindhravana in Karnataka and Sarara in Bihar. Methods of conservation vary in different states according to their intrinsic nature, distribution and local beliefs [3]. However such sacred groves are not restricted to India alone. They are also found in Afro-Asian countries like Syria, Nigeria and Turkey.

Kerala is one of the states in India where the sacred groves are widely distributed from the West coast to the Eastern high lands. In Kerala there are about 2000 sacred groves [4] of which 352 are in Kannur district [5]. Generally local communities call these natural islands of vegetation-'kavus'. These kavus are still preserved by mythological beliefs. Theyyam is an indigenous ritualistic art performed mainly in these kavus. The practice works on the local beliefs is that residing deities from these sacred groves are summoned to the performing mans body. The sacred art form has for centuries secured the groves from destruction. At present most of the sacred groves are on a path of gradual decline in occurring various socio-

economic factors [6]. Some of the sacred groves need immediate attention as they contain rare and threatening plants. Preservation of these groves is crucial need to this era. Assessment of biodiversity proves extremely practical for determining decreasing natural diversity, effect of exotic species, migration and threat to the species [7].

Threats to the grove include urbanization, over-exploitation of resources (like overgrazing and excessive firewood collection) and environmental destruction due to religious practices. Other threats to the sacred groves include invasion by invasive species, like *Chromolaena odorata*, *Lantana camara* and *Prosopis juliflora*. Dead wood collection, biomass gathering, lopping of tender branches and green leaves and goats, crisscrossing footpaths, cattle grazing, collection of wild fruits and vegetables, medicinal plants, fruit eating bats and collection of fire fly during the rainy seasons are some of the anthropogenic disturbances affecting the ecology of sacred groves. In some sacred groves mining of sand and clay and brick making, posing a threat to the ecology and conservation of sacred groves. Many instances conflicts among the sacred grove managers resulted in loss of biodiversity in certain sacred groves. It is largely believed that disputes among sacred grove managers pose a threat to sacred grove diversity. Therefore, there is an urgent need to strengthen the traditional concepts of sacred grove conservation by identifying the key issues and providing the solutions through appropriate rehabilitation packages.

Biodiversity is the ecological processes in a balanced state, which is necessary for human survival. Therefore, the biodiversity rich sacred groves are of immense ecological significance. They also play an important role in conservation of flora and fauna. This study explores the medicinal plants used by the local people for the treatment of various ailments, and the resulting record of these plants and their uses provides baseline data for future phytochemical and pharmacological studies.

2. Materials and Methods

2.1. Study Area

Sree Oorpazachi kavu is a prominent Hindhu temple in the Edakkad gramapanchayat, Kannur District, Kerala. This kavu is situated in Malikaparambha, Near Nadal railway gate (Figure 1 and Figure 2 C). This kavu lies between 11.825307 N latitude and 75.435736 E longitude. The climate is very hot and humid with maximum and minimum temperature ranging from 25°C to 31°C. The total annual rainfall is 615mm. This grove is spread about 5 acre and the kavu is situated in 2 acre.

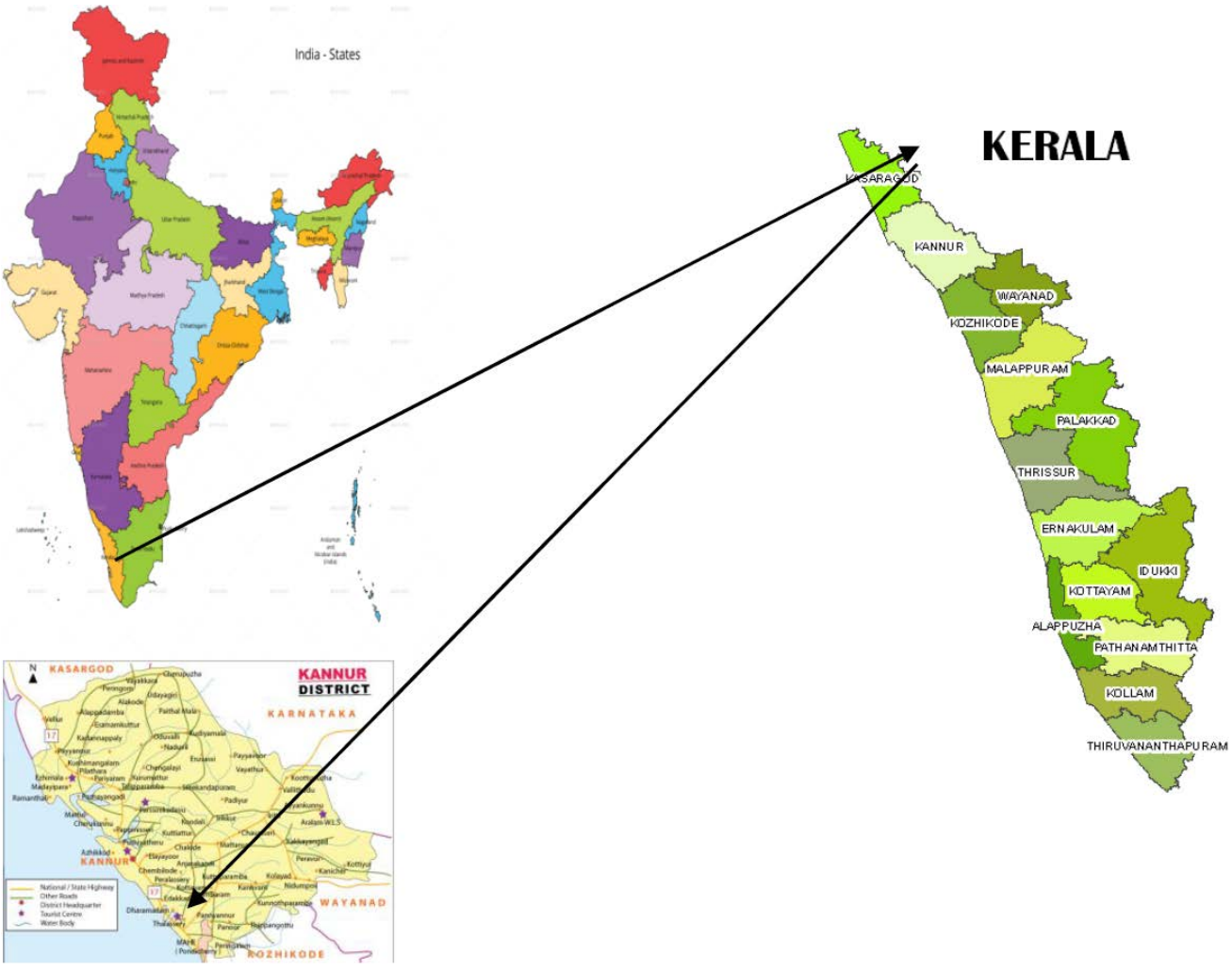

Figure 1. Map showing then location of the study area, Sree Oorpazachi kavu, Edakkad

Figure 2. Oorpazhachi Kavu, Kannur district. A.Nagasthanam, B. Place where Daivathar vellattam (ritualistic oracle dance) performed, C. Oorpazhachi kavu, D. Pond, E. Aalthara

Sree Oorpazachi kavu (ooril pazakiya eachil kavu or oorilpazakiya achi kavu), the name of this kavu renders itself to two etymological interpretations. The former meaning pazakiya (ancient) kavu (grove) surrounded by Eachil (a tree) and the latter meaning pazakiya (ancient) achi (mother goddess) kavu (grove). The three main deities of the temple are goddess Bhagavathy, Sree Oorpazachi Daivathar and Vettakkorumakan, Melekkottath Shankara Narayanan and Nagasthanam. There is also a shrine of Thondachan at the Mele Kottam (upper citadel). The temple has a rare significance because of the Shaiva Vaishnava Sanctum within the same temple enclave. A beautiful pond is also present near this Kavu (Figure 2 D).

Daivathar Vellattum (ritualistic oracle dance) (Figure 2 B) is performed daily at noon, as a prayer to the Lord. It is a rare sight because it hardly happens in the other temples in the district. Vettakkorumakan Kaliyattom is also performed occasionally. On the South west direction of the temple at Kanni moola is the Naagasthanam (Sacred groves of the snakes) (Figure 2 A). Annual festivals include Shivarathri Mahotsavam (during February) and Mandala Vilakku (41 holy days during November and December). Glory of sacred landmarks in and around the temple precincts include the importance of Eachil (*Aporosa cardiosperma*) at Mele Kottam (upper citadel). The Arayal (*Ficus religiosa*):one near the Melekuttippadi (entrance barrier). The different species of trees belonging to the genus *Ficus* (*Ficus carica, Ficus microcarpa, Ficus benghalensis*). All these *Ficus* sp. are conserved by them by making Arayal Thara (Figure 2E) Ponchembakam (*Magnolia champaca*), chandanam (*Santalum album*), *Psidium guajava* and other herbal plants in around kaavil thazhe (lower temple precincts) and mele kuttippadi (entrance barrier) and nagasthaanam (sacred grove of the serpent gods).

It is generally believed from oral tradition that the Vilwangalam Swaamiyar visited Oorpazhachikavu. Lord Krishna in his infant form had chided the Swaamiyar to meet again in the Ananthan forest. Consequently, the Swaamiyar become a peripatetic devotee in search of Krishna and in one such journey had paused at a distance that was just 24 minutes (1 Naazhika) in walking range north of Oorpazhachi Kavu, owing to an injury in his leg by a thorn. Due to the resultant overwhelming pain he rested there and was subsequently met by two Brahmin by travelers. These by-travelers applied herbs to soothe the Swaamiyar's pain and advised him to rest in the nearby Oorpazhachi Kavu for the night.

Around sunset when the exhausted Swaamiyar reached the premises of Oorpazhachi kavu, he was told that it was a Shivite temple. Owing to his oath that he will not partake food from any Shivite sanctuary, he bathed in the nearby pond and soon fell asleep on the banks of the pond due to the overwhelming exhaustion. Later that night two Brahmins came to the bank of the pond and invited him to Oorpazhachi Kavu for food.

When the Swaamiyar informed them of his oath not to consume any food from Shivite sanctuaries, they informed him that Oorpazhachi Kavu is a Vaishnavite sanctuary. Although suspicious, the Swaamiyar entered the temple

and to his surprise envisioned in the sanctum sanctorum a divine persona with Shankhu-Chakra-Gadhaa-padmam, Chandra-kala and Ganga and a crown of peacock-feathers. After proper salutations of this surprising deity, the two Brahmins offered him food in the Thidapally (place where food is prepared to be offered to the deities) after which these Brahmins disappeared.

The Swaamiyar was thus simply wonders truck and impressed with the miraculous illusion (Maaya) experienced by him in the premises of the deities of Oorpazhachi-Kavu. Next day, during morning ablutions the Swaamiyar once again injured his leg, this time by striking a stone. Therefore, after the appropriate propitiation of the three deities at Oorpazhachi Kavu, the Swaamiyar applied the Vilakkilenna at the site of his injury and to his surprise was relieved of the pain immediately.

Impressed by his experiences here, his faith in the deities of this Kavu manifold. Therefore, before continuing with his journey further, he dispersed "blessed-sand" (japicha manal) within the walled premises of the temple, inside the Manikkinar-well and the old pond and stated that as long as these sand particles remain there, the fame, money and the curative properties of the Vilakkilenna will remain. Reminiscent of this, even today, one observes unique customary practices during sweeping or weeding of the walled premises of this temple [8].

2.1.1. Floristic Survey

This study envisages the estimation of floral wealth of the sacred groves and its role in conservation. Field surveys were carried out to know their exact location, extent, presiding deity etc. Whenever we visited sacred grove, the neighbouring 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 of each grove was ascertained by discussion with local people and latter confirmed with temple records. A brief floristic survey of this sacred grove has been carried out.

Plants are identified with the help of Madras Presidency [9], Flora of Cannanore [10] and also by using available field keys and taxonomic bulletins. The identification was further confirmed with the help of taxonomic experts in Botany.

2.1.2. Ethnobotanical Studies

Semi structured interviews and group conversation with local people were conducted to gather information on medicinal uses of plant species. The elder persons were interviewed to collect firsthand information with respect to plant species or their parts, preparation recipes, doses, method of administration, types of diseases treated etc. were critically and patiently inquired. Plants used for medicinal uses were mostly personally observed and documented. A special care was taken to note local plant names in the sacred grove. Some books were also referred for the studies [11]. The plant species have been arranged alphabetically. Their botanical names, with author citation followed, local names and medicinal use are given.

3. Result

In total of 86 vascular plants falling under 75 genera and 38 families were documented. All species were vascular plants, which include 83 angiosperm members, 2 were pteridophytes and *Cycas circinalis* is the only gymnosperm (Table 1 and Figure 3). With respect to their habit, there are 33 trees, 27 herbs, 21 shrubs, 5 climbers (Figure 4). Among angiosperm dicot comprises 32 families 69 genera and 80 species. Nearly 38 % ethnomedicinal plants are trees (Table 1 & Figure 4).

Table 1. Ethnomedicinal use of the species in Sree Oorpazachi kavu, Edakkad, Kannur

SL NO.	SPECIES	FAMILY	HABIT	MEDICINAL USES	VERNACULAR NAME
1	*Abrus precatorius* L.	Leguminosae	Herb	Tea is made from the leaves and used for fever, cough and cold. Also possess antibacterial, antifungal and anti-inflammatory property.	Kunjikuru
2	*Acacia caesia* (L.)Willd.	Leguminosae	Tree	Used to treat skin diseases, hemorrhoids and traumatic injuries.	Irula or Eenga
3	*Adenanthera pavonina* L.	Leguminosae	Tree	A red powder made from wood is used as antiseptic paste. Seeds are used to treat boils and inflammations.	Manjaadi
4	*Aegle marmelos* (L.) Correa	Rutaceae	Shrub	Used as antidiarrhoel, antimicrobial, antiviral and anti-inflammatory.	Koovalam
5	*Aerva lanata* (L.) Juss. ex Schult.	Amaranthaceae	Herb	Used as diuretic with anti inflammatory, anti bacterial and mild analgesic effect.	Cherula
6	*Alstonia macrophylla* Wall. ex G.Don	Apocynaceae	Tree	Used as a bitter and astringent herb for treatment of skin disorder, malarial fever, snake bite etc.	Eezhilam pala
7	*Alternanthera brasiliana* (L.) Kuntze	Amaranthaceae	Herb	Plant is said to be aphrodisiac. Anti-viral agent.	Ponnangaani
8	*Anamirta cocculus* (L.) Wight &Arn.	Menispermaceae	Climber	Used to treat ulcer, inflammation, chronic skin disease etc.	Fish Berry
9	*Andrographis paniculata* (Burm. fil.) Nees	Acanthaceae	Herb	Used for the treatment of array of diseases such as cancer, diabetes, high blood pressure etc.	Kiriyath
10	*Antidesma montanum* Blume	Phyllanthaceae	Tree	Used to treat headache, scurf and swellings.	Mountain currant
11	*Aporosa cardiosperma* (Gaertn.) Merr.	Phyllanthaceae	Tree	Used to treat fever, skin disease, diabetes, infertility etc.	Eachil
12	*Artocarpus heterophyllus* Lam.	Moraceae	Tree	Ashes of leaves are used for treating ulcer, diarrhoea, boils, stomachache etc. Root decoction can reduce fever and treat skin disease and asthma.	Plaavu
13	*Averrhoa bilimbi* L.	Oxalidaceae	Tree	Used for anti-diabetic, anti-hypertensive, anti-thrombotic and anti-cancer.	Bilmbi

SL NO.	SPECIES	FAMILY	HABIT	MEDICINAL USES	VERNACULAR NAME
14	*Blumea oxyodonta* DC.	Asteraceae	Herb	To cure thread worms .Also used as a remedy against contusion.	Blumea camphor
15	*Boerhavia diffusa* L.	Nyctaginaceae	Herb	Used to treat accumulation of fluids in the body. Used in the treatment of anemia and liver diseases. Anti-inflammatory agent.	Thazhuthaama
16	*Caesalpinia pulcherrima* (L.) Sw.	Leguminosae	Shrub	Used for the treatment of inflammation, ulcers, fever and tumors.	Rajamalli
17	*Calotropis gigantea* (L.) W. T. Aiton	Asclepiadaceae	Shrub	Used for digestive disorder, used for painful conditions like toothache, cramps and joint pains.	Erikk
18	*Canavalia africana* Dunn	Leguminosae	Herb	Used in treatment of vomiting, abdominal dropsy, kidney related lumbago, asthma, obesity etc and inflammatory diseases and swellings.	Kattu-valamara
19	*Capsicum annum* L.	Solanaceae	Shrub	Used for the relief of muscle spasms. Used to treat diabetic neuropathy.	Pachamulak
20	*Capsicum frutescens* L.	Solanaceae	Shrub	Used for rheumatoid arthritis and other painful condition. Used for digestion problems.	Kanthari
21	*Carallia brachiata* (Lour.) Merr.	Rhizophoraceae	Tree	Bark is used in wound healing, treating itch, oral ulcer and inflammation of throat.	Vankana
22	*Carica papaya* L.	Caricaceae	Herb	Used for the treatment of arthritis and good source of fibre.	Pappaya
23	*Caryota urens* L.	Arecaceae	Tree	Used to treat seminal weakness and urinary disorders.	Aanapana or Chundapana
24	*Cassia fistula* L.	Leguminosae	Tree	Used to treat inflammatory swellings and as a cleaning agent for ulcers and wounds.	Kanikkonna
25	*Centrosema virginianum* (L.)	Leguminosae	Climber	It act as a mood enhancer. Help to reduce anxiety.	Shankupushpam
26	*Chassalia curviflora* (Wall.) Thwaites	Rubiaceae	Shrub	Roots and leaves are used for their anti-hepatotoxic and anti-oxidant effects.	Vellakurinji
27	*Chromolaena odorata* (L.) R.M.King & H.Rob.	Asteraceae	Shrub	Antibiotic, antimalarial and febrifuge. Used to treat skin wounds and eye pains.	Communist pacha
28	*Clerodendrum infortunatum* L.	Verbanaceae	Shrub	Used as antipyretic, laxative, antidiabetic. Used to treat malaria, scabies, snake bite and tumor.	Peringalam
29	*Codiaeum variegatum* (L.) Rumph. ex A.Juss.	Euphorbiaceae	Shrub	Used for treatment of cancer, constipation, diabetes and digestive problems.	Kozhivaalan
30	*Coleus amboinicus* Lour.	Lamiaceae	Herb	Used to treat malarial fever, hepatopathy renal and vesicles calculi, cough, chronic asthma etc.	Panikoorkka
31	*Cyanthillium cinereum* (L.) H.Rob.	Asteraceae	Herb	Therapeutic potential against asthma and cholera.	Poovamkurunthal
32	*Cycas circinalis* L.	Cycadaceae	Tree	Used to cure rheumatoid arthritis and muscle pain.	Eenth
33	*Cyperus rotundus* L.	Cyperaceae	Herb	It is an antimalarial sedative used to treat diarrhoea.	Karimuttan
34	*Desmodium incanum*	Leguminosae	Shrub	Treatment of haemorrhages. The plant is used to treat wounds and cuts.	Cherupulladi
35	*Desmodium scorpiurus* (Sw.) Desv.	Leguminosae	Herb	Used in the treatment of rheumatism, pyrexia, dysentery, cough, malaria and hepatitis.	Scorpion Tick Trefoil
36	*Dicliptera paniculata* (Forssk.) I.Darbysh.	Acanthaceae	Herb	The aerial part extract is effective for healing the bacterial borne diseases as well as against aspergillosis.	Kattupuzhukkolli
37	*Euphorbia hirta* L.	Euphorbiaceae	Herb	Used for breathing disorders, dengue fever. Used for mucus in the nose and throat, throat spasms, hay fever and tumors.	Murikooti
38	*Ficus benghalensis* L.	Moraceae	Tree	Treat diarrhoea, prevent tooth decay and gum diseases.	Arayaal
39	*Ficus carica* L.	Moraceae	Tree	Used in traditional medicine to treat various ailment like gastrointestinal, respiratory and cardiovascular disorder.	Athi
40	*Ficus heterophylla* L. f.	Moraceae	Tree	Leaf paste is applied as a poultice on areas affected by rheumatism or on ear infections.	Vallitherakam
41	*Ficus microcarpa* L. f.	Moraceae	Tree	Used in the treatment of diabetes, ulcers, burning sensations, hemorrhages, leprosy, itching, liver disease and toothache.	Kallithi
42	*Ficus religiosa* L.	Moraceae	Tree	Used traditionally as antiulcer, antibacterial, antidiabetic and in treatment of skin disease.	Peepal
43	*Flacourtia montanum* J. Graham	Salicaceae	Tree	It has anti-inflammatory and antioxidant activities.	Muripacha
44	*Flueggea leucopyrus*Willd.	Phyllanthaceae	Shrub	Used to treat many diseases including epilepsy, malaria, heavy menstruation and sterility.	Bushweed
45	*Gardenia jasminoides* J.Ellis	Rubiaceae	Shrub	Used for swelling, liver disorder and diabetes. Wide range pharmocological activities.	Gandharajan
46	*Hibiscus rosa-sinensis* L.	Malvaceae	Shrub	Used in hair loss and gastric ulcers.	Chembarathi
47	*Holigarna arnottiana* Wall. *ex* Hook. f.	Anacardiaceae	Tree	Treatment of inflammation of arthritis, hemorrhoids, tumor, cancer and skin diseases.	Black varnish tree
48	*Ixora coccinea* L.	Rubiaceae	Shrub	An infusion of leaves or flower of several species is used to treat fever, headache, colic etc. used as a sedative.	Chekki
49	*Ixora javanica* (Blume) DC.	Rubiaceae	Tree	Useful for many ailments like hepatic disorder, cancer, pain and inflammation.	Asoka-thetti
50	*Justicia adhatoda* L.	Acanthaceae	Shrub	Leaves, root, flower and bark are used in cough, cold, asthma and bronchitis.	Aadalodakam

SL NO.	SPECIES	FAMILY	HABIT	MEDICINAL USES	VERNACULAR NAME
51	*Lagerstroemia speciosa* (L.) Pers.	Lythra	Tree	Used to lower blood sugar in the body. It is also used as an anti-diabetic drug.	Manimaruthu
52	*Leucas aspera* (Willd.) Link	Lamiaceae	Herb	Used in traditional medicine for snake bites. It has antifungal prostaglandin inhibitory and antitoxidant.	Thumba
53	*Lindernia crustacea* (L.) F. Muell.	Linderniaceae	Herb	Used to treat urinary infection, bronchitis and fever.	Pimpernel
54	*Lindernia tenuifolia* (Colsm.)Alston	Linderniaceae	Herb	Used to treat fingernail infection.	Chelichulli
55	*Lygodium flexuosum*(L.) Sw.	Lygodiaceae	Climber	Used as an expectorant. Used to treat rheumatism, sprain, scabies, eczema and cut wounds.	Valli-panna
56	*Macaranga peltata* (Roxb.) Müll.Arg.	Euphorbiaceae	Tree	Treat stomachache, dysentery, cough and fever and also to treat wounds and ulcers.	Uppila
57	*Magnolia champaca* (L.) Baill. *ex* Pierre	Magnolaceae	Tree	Used to treat cough, bronchitis, hypertension, fever and rheumatism.	Ponchembakam
58	*Mallotus philippensis* (Lam.)Mull.Arg.	Euphorbiaceae	Tree	It has antifungal, antidiabetic and antibacterial property.	Kamala tree
59	*Mangifera indica*L.	Anacardiaceae	Tree	Used as an antiseptic, astringent etc. Also used to treat diarrhea, dysentery and anemia.	Maavu
60	*Mimusops elengi* L.	Sapotaceae	Tree	Roots are used as diuretic, astringent, cardio tonic and stomach ache.	Magizhampoo
61	*Musa paradisiaca* L.	Musaceae	Herb	Used to treat ulcers, dysentery and bronchitis.	Vaazha
62	*Notholithocarpus densiflorus* Fryer, Janet L.	Fagaceae	Shrub	Acrons were sucked on to treat to coughs	Tanoak
63	*Ocimum sanctum* L.	Lamiaceae	Herb	Used for the treatment of bronchitis, malaria, diarrhoea, skin disease and kidney stone.	Thulasi
64	*Passiflora foetida* L.	Passifloraceae	Climber	Dry leaves are used for sleeping problem as well as for the treatment of itching and cough.	Passion fruit
65	*Passiflora vitifolia* Kunth	Passifloraceae	Climber	It helps to treat anxiety and insomnia and also used to treat boils, wounds, earaches and liver problems.	Poonakkai
66	*Pentaclethra macrophylla* Benth.	Leguminosae	Tree	Used to treat gonorrhea and convulsion. Extracts of seed, fruit, pulp have a inflammatory and antihelminthic activities.	Agathi
67	*Peperomia pellucida*(L.) Kunth	Piperaceae	Herb	Used to treat abdominal pain, abscesses, achne, boils, colic, fatigue and rheumatic joint pain.	Pepper
68	*Phyllanthus niruri* L.	Euporbiaceae	Herb	Used to treat jaundice, diabetics, chronic dysentery, cough, skin disease, ulcer etc.	Keezhaarnelli
69	*Pongamia pinnata* (L.) Pierre	Leguminosae	Tree	Flower is used to treat bleeding hemorrhoids or piles. Fruit aid treatment of abdominal tumors, female genital tract infections and ulcers.	Pongam
70	*Psidium guajava* L.	Myrtaceae	Tree	Improve locomotors coordination and liver damage inflammation.	Paerakka
71	*Rauvolfia serpentina* (L.) Benth. ex Kurz	Apocynaceae	Shrub	Used to treat hypertension and also for maintaining blood pressure.	Sarppagandhi
72	*Ruellia patula* Jacq.	Acanthaceae	Herb	Used in the treatment of gonorrhea, syphilis, eye sore, renal infection, cough, wounds, stomach ache and kidney stone.	Upudali
73	*Santalum album* L.	Santalaceae	Tree	Used for treating the common cold, cough, bronchitis, fever, and sore mouth and throat. It is also used to treat urinary tract infections.	Chandanam
74	*Saraca asoca* (Roxb.)Willd.	Leguminosae	Tree	Used to rejuvenate the complexion, reduce, freckles and calm down.	Aasokam
75	*Selaginella* sp.	Selaginellacae	Herb	Used for curing wounds and irregular menstruation. Also used to treat internal wounds.	Sheevothi
76	*Sida acuta* Burm.F.	Malvaceae	Shrub	Used to treat asthma and renal inflammation. Useful in treating urinary disease and blood disorder.	Kurundhotti
77	*Sida cordifolia* L.	Malvaceae	Shrub	Used to treat asthma, tuberculosis, common cold, flue etc. It is a stimulant, painkiller and used in cancer chemotherapy.	Aanakkurundhotti (Vellooram)
78	*Solanum capsicoids* All.	Solanaceae	Herb	Used to treat skin complaints, used as a remedy against toothache.	Manithakkali
79	*Solanum torvum* Sw.	Solanaceae	Herb	Considered to be anti-tumorigenic, antioxidant, anti-inflammatory, diuretic and antipyretic.	
80	*Sterculia guttata* Roxb.	Malvaceae	Tree	Extracts from its seed used mainly as insecticides against in mosquito larvae and leaves are used as repellent.	Kithakondi
81	*Strychnos nux-vomica* L.	Loganiaceae	Tree	Used to treat diseases of digestive tract, disorders of the heart and circulatory system, diseases of eye and lungs.	Kaanjiram
82	*Tabernaemontana divaricata* (L.) R. Br. ex Roem. & Schult.	Apocynaceae	Shrub	It offers benefits such as antiepileptic and antioxidant.	Nandhyar vattam
83	*Tridax procumbens* L.	Asteraceae	Herb	Used for wound healing. Used as a anticoagulant, antifungal, insect repellent. Used to treat skin disease in folk medicine.	Thekkuthi

SL NO.	SPECIES	FAMILY	HABIT	MEDICINAL USES	VERNACULAR NAME
84	*Trophis racemosa* (L.) Urb.	Moraceae	Tree	Bark is used as astringent and taken as tonic to improve appetite and treat diarrhea. Used for its aphrodisiac qualities.	White ramoon
85	*Urena lobata* L.	Malvaceae	Herb	Used externally for treating fractures, wounds, mastitis and snakebites.	Uthiram
86	*Vitex negundo* L.	Lamiaceae	Shrub	Relieves muscle ache and joint pains. Leaf and roots are used to treat skin disease, edema and fever.	Karinochi

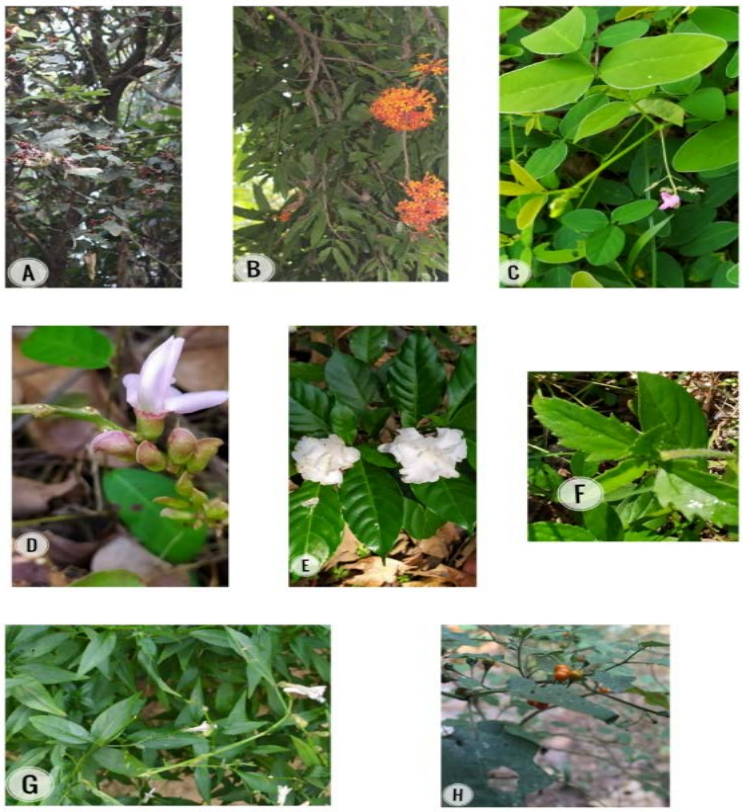

Figure 3. Species collected and identified from the Sacred grove: A. *Mallotus philippensis*, B. *Saraca asoca*, C. *Desmodium incanum*, D. *Canavalia Africana*, E. *Gardenia jasminoides*, F. *Tridax procumbens*, G. *Andrographis paniculata*, H. *Solanum torvum*

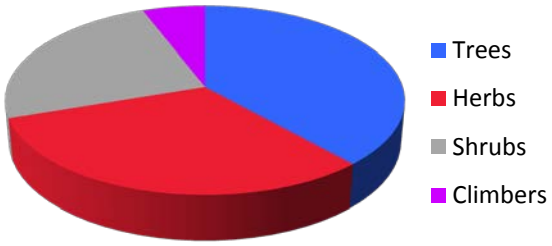

Figure 4. Habit based plant groups used in ethnobotany

The medicinal uses, parts used of various plant species present in study area are given in Table 1 and Table 2. The analysis reveals that whole plant is most significantly used (10 species), followed by leaf (9 species), stem and leaves (9 species), root , stem and leaf (8 species), root, stem, leaf and seed (8 species), root and leaf (7 species), root, stem, leaf and flower (6 species), stem, leaf, flower and seed (5 species), root (2 species), seed (2 species), leaf and flower (2 species), Stem, leaf and flower (2 species), stem, leaf and seed (2 species), root, leaf and flower (2 species), stem (1 species), root and seed (1 species), stem and seed (1 species), leaves and seed (1 species), flower and seed (1 species).

Table 2. Details of plant parts used in medicine preparation

Sl. No.	Name of plant	Root	Stem	Leaf	Flower	Seed	Whole part
1	*Abrus precatorius* L.	+	+	+	-		-
2	*Acacia caesia* (L.)Willd.	-	-	-	-	+	-
3	*Adenanthera pavonina* L.	-	+	+	-	+	-
4	*Aegle marmelos* (L.) Correa	+	+	+	-	-	-
5	*Aerva lanata* (L.) Juss. ex Schult.	+	-	+	-	-	-
6	*Alstonia macrophylla* Wall. ex G.Don	-	+	+	-	-	-
7	*Alternanthera brasiliana* (L.) Kuntze	-	-	+	-	-	-
8	Anamirta cocculus (L.) Wight &Arn.	-	-	-	-	+	-

Sl. No.	Name of plant	Root	Stem	Leaf	Flower	Seed	Whole part
9	*Andrographis paniculata* (Burm. fil.) Nees	+	-	+	-	-	-
10	*Antidesma montanum* Blume	+	-	+	-	-	-
11	*Aporosa cardiosperma* (Gaertn.)Merr.	+	-	-	-	-	-
12	*Artocarpus heterophyllus*Lam.	+	+	+	-	+	-
13	*Averrhoa bilimbi* L.	-	-	+	+	-	-
14	*Blumea oxyodonta* DC.	-	-	+	-	-	-
15	*Boerhavia diffusa* L.	+	+	+	+	+	+
16	*Caesalpinia pulcherrima* (L.) Sw.	+	+	+	+	+	+
17	*Calotropis gigantea* (L.) W. T. Aiton	+	-	+	+	-	-
18	*Canavalia africana* Dunn	-	-	+	-	-	-
19	*Capsicum annum* L.	-	-	-	+	+	-
20	*Capsicum frutescens* L.	-	-	-	-	+	-
21	*Carallia brachiata* (Lour.) Merr.	-	+	+	-	-	-
22	*Carica papaya* L.	-	-	+	-	+	-
23	*Caryota urens* L.	+	+	-	+	-	-
24	*Cassia fistula* L.	+	+	+	+	+	+
25	*Centrosema virginianum* (L.)	+	-	-	+	-	-
26	*Chassalia curviflora* (Wall.) Thwaites	+	-	+	-	-	-
27	*Chromolaena odorata*(L.) R.M.King & H.Rob.	+	+	+	+	+	+
28	*Clerodendrum infortunatum* L.	+	-	+	-	-	-
29	*Codiaeum variegatum* (L.) Rumph. ex A.Juss.	+	+	+	-	-	-
30	*Coleus amboinicus* Lour.	-	-	+	-	-	-
31	*Cyanthillium cinereum* (L.) H.Rob.	+	+	+	+	+	+
32	*Cycas circinalis* L.	-	+	+	-	+	-
33	*Cyperus rotundus* L.	+	-	-	-	-	-
34	*Desmodium incanum*	+	+	+	+	+	+
35	*Desmodium scorpiurus* (Sw.) Desv.	+	+	+	+	+	+
36	*Dicliptera paniculata* (Forssk.) I.Darbysh.	-	-	+	-	-	-
37	*Euphorbia hirta* L.	+	+	+	+	+	+
38	*Ficus benghalensis* L.	-	+	+	-	-	-
39	*Ficus carica* L.	-	+	+	-	-	-
40	*Ficus heterophylla* L. f.	-	-	+	-	-	-
41	*Ficus microcarpa* L. f.	+	+	+	-	-	-
42	*Ficus religiosa* L.	+	+	+	-	-	-
43	*Flacourtia montanum* J. Graham	+	-	+	-	-	-
44	*Flueggea leucopyrus* Wild.	-	-	+	-	-	-
45	*Gardenia jasminoides* J.Ellis	+	+	+	-	+	-
46	*Hibiscus rosa-sinensis* L.	-	-	+	+	-	-
47	*Holigarna arnottiana* Wall. ex Hook. f.	-	+	+	-	-	-
48	*Ixora coccinea* L.	+	+	+	+	-	-
49	*Ixora javanica* (Blume) DC.	+	-	+	+	-	-
50	*Justicia adhathoda* L.	+	+	+	+	-	-
51	*Lagerstroemia speciosa* (L.) Pers.	+	+	+	-	-	-
52	*Leucas aspera* (Willd.) Link	+	+	+	+	+	+
53	*Lindernia crustacea* (L.) F. Muell.	-	+	+	-	-	+
54	*Lindernia tenuifolia* (Colsm.)Alston	-	+	+	-	-	+
55	*Lygodium flexuosum*(L.) Sw.	-	-	-	-	-	+
56	*Macaranga peltata* (Roxb.) Müll.Arg.	+	+	+	-	-	-
57	*Magnolia champaca* (L.) Baill. ex Pierre	-	+	+	+	+	-
58	*Mallotus philippensis* (Lam.)Mull.Arg.	+	+	+	-	+	-
59	*Mangifera indica* L	+	+	+	+	+	-
60	*Mimusops elengi* L.	-	+	+	+	+	-
61	*Musa paradisiaca* L.	-	+	+	+	-	-
62	*Notholithocarpus densiflorus* Fryer, Janet L.	-	+	-	-	-	-
63	*Ocimum sanctum* L.	+	+	+	+	+	+
64	*Passiflora foetida* L.	+	+	+	+	-	+
65	*Passiflora vitifolia* Kunth	+	+	+	+	-	+
66	*Pentaclethra macrophylla* Benth.	+	+	+	-	+	-
67	*Peperomia pellucida*(L.) Kunth	-	+	+	-	-	+
68	*Phyllanthus niruri* L.	+	+	+	-	+	+

Sl. No.	Name of plant	Root	Stem	Leaf	Flower	Seed	Whole part
69	*Pongamia pinnata* (L.) Pierre	+	+	+	+	+	-
70	*Psidium guajava* L.	-	+	+	-	+	-
71	*Rauvolfia serpentina* (L.) Benth. ex Kurz	+	+	+	-	-	-
72	*Ruellia patula*Jacq.	-	-	+	-	-	-
73	*Santalum album* L.	-	+	-	-	-	-
74	*Saraca asoca* (Roxb.)Willd.	-	+	+	+	+	-
75	*Selaginella sp.*	-	-	-	-	-	+
76	*Sida acuta* Burm.F.	+	-	+	-	-	+
77	*Sida cordifolia* L.	+	+	+	-	+	+
78	*Solanum capsicoids* All.	+	-	-	-	+	-
79	*Solanum torvum* Sw.	-	+	+	+	+	+
80	*Sterculia guttata* Roxb.	-	+	-	-	+	-
81	*Strychnos nux-vomica* L.	+	+	+	-	+	+
82	*Tabernaemontana divaricata* (L.) R. Br. ex Roem. & Schult.	+	+	+	+	-	-
83	*Tridax procumbens* L.	-	-	+	-	-	-
84	*Trophis racemosa* (L.) Urb.	-	+	+	-	-	-
85	*Urena lobata* L.	+	+	+	+	+	-
86	*Vitex negundo* L.	+	+	+	-	-	-

+: Presence; -: Absence.

The listed plant species are mainly used to cure the common diseases such as fever and headache, cough, cold, many skin diseases, wound, diabetics, diarrhoea, dysentery, cancer, ulcer, brain haemorrhage, urinary infection, bronchitis, rheumatoid arthritis, asthma, inflammatory swellings, anemia, vomiting, liver diseases, constipation, high blood pressure, obesity, malaria, muscle pain, stomach ache, irregular menstruation, eye diseases, leprosy, toothache, hair loss, eczema, kidney stone etc.

4. Discussion

People of Kerala cultivate some of the common medicinal plants in their home gardens either for medicinal use or for use as vegetables. Many people of Kannur district also still depend on herbal medicine. The traditional knowledge system of folk, oral tradition and also published and unpublished literature are the important source of locating potential of bioresources. Kerala people use some of the plants, plant products, animal products, minerals etc for domestic purposes. Utilizing their traditional knowledge which has been developed by forefathers through trial and error methods and passed on to them through oral tradition from one generation to another. Unfortunately due to the lack of written documents most of the traditional knowledge about medicinal plants and their uses survived only by words of mouth from one generation to another and are being slowly lost. Moreover the herbal healers had the strong tendency to keep their knowledge secret without any documentation.

Among these 86 plant species noted many species are used in the abdominal problem such as diarrhoea, dysentery, stomach ache and stomach problems. Some other species are used to treat skin diseases and respiratory diseases such as fever, cold and cough. Below 20% of the plant act as a drug (anti-septic, anti-bacterial, anti-inflammatory, laxative, anti-pyretic, anti-diabetic, anti-oxidant etc). *Ixora coccinea, Santalum album, Aporosa cardiosperma, Justicia adhatoda, Ruellia patula, Abrus precatorius* are commonly used for fever, cough and cold. *Clerodendrum infortunatum, Holigarna arnottiana, Lygodium flexuosum* are commonly used for skin diseases. *Cassia fistula, Macaranga peltata, Lygodium flexuosum* are active medicinal plant for wound healing. *Cyperus rotundus, Ocimum sanctum, Mangifera indica, Ficus benghalensis* are very important plants for the abdominal problems. The most extensively used plant part in the preparation of medicine for various ailments is whole plant followed by leaf. The collection of whole plant is higher compared to other plant parts [12]. Collection of underground plant parts and whole plant is of grove consequences from both ecological as well as survival point of view of the species [13].

Another reason of using leaves by the local people and tribes as a medicine could be concerning conservation of the plants as digging out roots might be the cause of death of the plant and pulling the species in a vulnerable condition. Most of the remedies used for disease healing were prepared from single plant. Sometimes combination of other parts of the same plant has been reported [14].

Ingredients used and mode of application varied significantly depending on the plant species and plant parts used. Most of the formulations used were in the form of paste, kashayam, juice and powder [15].

The multiple disturbance factors like anthropogenic pressure, pollution, urbanization, soil erosion, logging, agriculture conversion of forest into land and road construction, invasion, over grazing, encroachment, developing industries, shifting social and cultural perspectives which put these medicinal plant resources under threat category. Near the sacred grove there is a Nagathara and near to that area many plants are present. Because of the belief no one is permitted to enter in this area. So through this taboos and myths many of the endangered plants are protected in this kavu.

The importance of sacred grove in the conservation of biological diversity has been well recognized. About 5 species of *Ficus* sp. such as, *Ficus benghalensis, Ficus carica, Ficus heterophylla, Ficus microcarpa* and *Ficus religiosa* are very common this kavu. The *Ficus*

benghalensis in sacred grove plays a role of key stone species providing a niche for the large number of birds and plants [16]. According to several reports there is a conservation of rare endemic and endangered species in sacred grove [2] recorded 73 species in sacred grove of Kerala in which 13 are endemic to South Western Ghats, 3 are endemic to Western Ghats and 1 is endemic to Peninsular India. Gadgil and Chandran [17] noticed a small population of endangered primates. It is also reported that threatened tree species were more abundant in the sacred groves [18].

The sacred groves are good sources of a variety of medicinal plants, fruits, fodder, fuel wood, spices. The study of interrelation between the human beings, plants and animals in their surrounding environment (ethnobiology) is very revealing. The role of sacred grove in the conservation of regional medicinal plants has been emphasized in several studies from different parts of the world.

5. Conclusion

There is a clear need to document traditional knowledge on medicinal plant usage before it becomes lost to future generations. Plants with multiple uses require special attention in restoration and conservation planning. The usefulness and protection of all the reported ethnomedicinal plants need to be evaluated by phytochemical and pharmacological studies. Awareness generation, participatory management planning, local awareness and thorough evaluation of these plant resources are the key factors for long term survival of the grove. It is equally important to understand traditions and beliefs as well as to have scientific awareness in order to protect and conserve these unique forest patches.

Dumping of wastes, collection of firewood, trespassing must be checked so as to protect the species in their habitat. Further 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 process like energy flow, food chain, food web, cycling of materials which would result in geological balance and stability of ecosystem.

There is an urgent need for recognizing the traditionally valued natural systems at various levels and planning for their better management, ultimately aiming to conserve biodiversity.

The efficacy and safety of all the reported ethnomedicinal plants needs to be evaluated for phytochemical and pharmacological studies, especially the plants with high informant consensus factor, use value and fidelity level should be given priority to carry out bioassay and toxicity studies.

There is disappearance of the traditional belief systems, which are fundamental to the concept of sacred groves. Thus the degraded sacred grove can be restored only by raising awareness among the rural people regarding the importance of sacred grove 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.

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