



Research article

## Floristic diversities and medicinal importance of selected sacred groves in Thrissur district, Kerala

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**Abstract:** Sacred groves are forest fragments of varying sizes, existing outside conventional forest areas in and around human habitation. It acts as safe sites for reproduction of variety of floral and faunal resources. An exploratory survey of different sacred groves of Thrissur District (10.52° N to 76.21° E), namely Adipparambukavu, Daivathinkavu, Kanisherykavu, Kottaichalippattukavu and Kottarathkavulead to the collection of 119 species coming under 104 genera and 51 families, representing 08 vulnerable, 12 endemic and 03 near threatened species. It includes 17.64% herbs, 19.33% shrubs, 41.18% trees and 21.85% climbers. Maximum diversity is present in Kanisherykavu (57 plant species and 36 families) and minimum diversity is present in Adipparambukavu (27 plant species belonging to 18 families). Fabaceae and Moraceae were the dominant families present in these sacred groves. Among these Kottarathkavu is well protected and is under the observation of Kerala Forest Department. It also harbours several valuable and medicinal plants beneficial for mankind. These groves serve as seed banks for future afforestation and can further help in education and research. Since sacred groves are gradually declining immediate attempts are needed to scientifically document and explore them to ensure their long term conservation.

**Keywords:** Traditional lore - Climax vegetation - Conservation - Bioresources.

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### INTRODUCTION

Sacred groves have existed in India from time immemorial as patches of densely wooded areas, venerated on religious grounds. In Kerala it is a common practice among Hindus to assign a part of their land near the 'Tharavadu' or house as the abode of goddess Durga or serpent god Naga or Shasta and the place is called 'Kavu' or 'Sarpakavu'. These are one of the informal approaches of conserving the biological diversity of a region and play an important role in preservation of depleting resource elements such as medicinal plants and occur in India and in other parts of Asia and Africa (Bhandary & Chandrashekar 2003). Total number of sacred groves in India varies between 100,000 and 150,000 (Malhotra 1998) and harbour good number of rare and endemic plants, medicinal herbs and shrubs. These sacred plants have been using since time immemorial by local tribals and traditional practitioners (Mehra *et al.* 2014, Bajpai *et al.* 2016). In sacred groves the number of herbs and shrubs are more in the disturbed zone (Nair 1992). Due to urbanization and industrialization coupled with rationalization, scarcity of land leading to the depletion of the cover and shrinkage of 'kavu' as a result the large chunk of the areas are diverted for other activities and only a small portion is left with especially adjacent to the temple (Devaraj *et al.* 2005). Onyekwelu & Olusola (2014) reported sacred groves were preserved by fear of deity, cultural importance and place of worship. Tree felling within groves was regarded as abomination and sacrifices must be offered before any tree was felled. The rules and taboos used to protect the groves are crumbling, which must be addressed if they are to continue playing important role in in-situ biodiversity conservation. Sacred groves lose their prominence nowadays, but are still relevant in Indian rural landscapes inhabited by traditional communities (Ray *et al.* 2014). Sacred groves act as the ancient method of water harvesting and resource sharing system and are pockets of almost climax vegetation (Karunakran *et al.* 2005).

They are mostly available in remote tribal areas of the district and become threatened due to loss of traditional lores and beliefs.

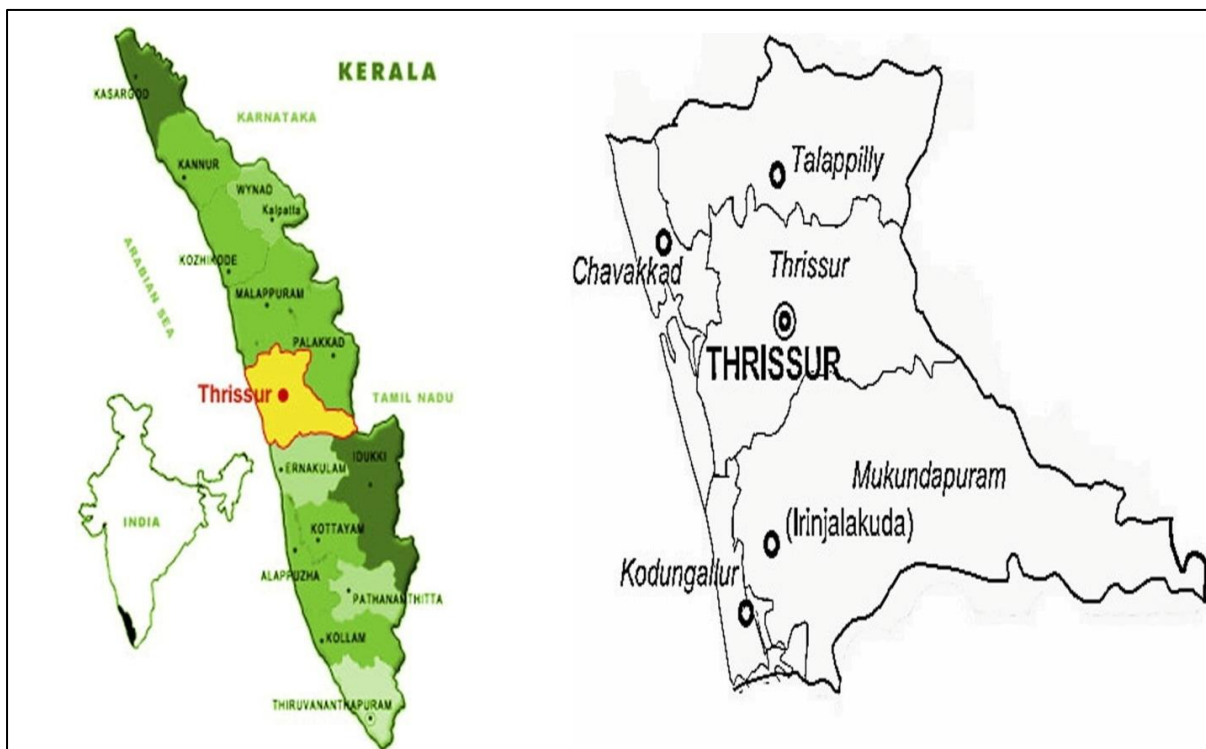
These groves have distinct floral characters making it unique ecosystem (Oommen *et al.* 2000). It also harbours 100% valuable and medicinal plants beneficial for mankind. Groves help to maintain water table in that areas. Filling up of ponds and removal of sacred groves, which used to help maintain the ecological balance play a major role for the drop in ground water table (The Hindu Business Line 2004). Sacred groves in Kerala preserve more than 800 species of angiosperms (20% of total flowering plants recorded from the state). Out of which 150 plants are medicinal and 40% are rare and endangered (Chandrashekara & Sankar 2000). These groves serve as seed banks for future afforestation and can further help in education and research. Hence it is necessary to evolve strategies for effective conservation and management of sacred groves.

Sacred groves in Kerala are located mainly in Kasargod, Kannur, Kozhikode, Thrissur, Palakkad, Ernakulam and Alappuzha districts. About 761 sacred groves have been reported so far from Kerala State (Balasubramanyan & Induchoodan 1999), which bears many threatened species (Nair & Mohanan 1981). The present study was conducted to know the status of plant diversity in the sacred groves of Thrissur district of the State and uses of these plants by the local people.

## MATERIALS AND METHODS

### Study Area

The study was conducted in the sacred groves of Thrissur district, Kerala state, located between 10° 52' N latitude and 76° 21' E longitude with an area of 120.26 Km<sup>2</sup> (Fig. 1). Study area includes Adippambukavu, Daivathinkavu, Kanisherykavu, Kottaichalippattukavu and Kottarathkavu (Fig. 2). The management of these kavu is under the control of different families. The main deity is Nagam. Other deities are also present. Protection of these kavu is mainly due to the presence of deities.



**Figure 1.** Location of sacred groves in Thrissur district, Kerala.

### Data collection

Floristic composition of each grove was analysed during field visits conducted over different seasons between April 2013 and September 2015, specimens were collected in each species and tagged. All the Angiosperms including trees, shrubs, herbs and climbers were considered for the study. Important field observation like habit, phenology of the plant, colour, texture and smell of leaves, local names and local uses available were also noted. Each species in fresh condition was critically studied with the help of floras like, *Flora of Presidency of Madras* (Gamble 1915–1936); *Flowering plants of Thrissur district* (Sasidharan & [www.tropicalplantresearch.com](http://www.tropicalplantresearch.com)

Sivarajan 1996) and provisional determination was made. The plants were identified with the help of floras and finally by comparing with the reference collections available in the herbarium of Kerala Forest Research Institute (KFRI), Peechi. The species were often poisoned, processed and labeled, by standard herbarium methods given by Jain & Rao (1977). The voucher specimens are deposited at Sree Krishna College, Guruvayur. IUCN categories are used to evaluate the plants and arranged in to RET species (IUCN 2012).



**Figure 2.** Selected sacred groves in Thrissur district: **A**, Adipparambukavu; **B**, Daivathinkavu; **C**, Kanisserykavu; **D**, Kottaichalippattukavu; **E**, Kottarathkavu.

## RESULTS

**Table 1.** Location and Deities of Sacred groves studied.

Sacred groves	Taluk	Panchayath	Area in Ha.	Latitude/ Longitude	Deity
Adipparambukavu (ADP)	Kodungallur	Valappad	0.741	10.3982° N, 76.0918° E	Nagayakshi, Sarpam
Daivathinkavu (DAV)	Kodungallur	Kaippamangalam	0.494	10.3167° N, 76.1333° E	Rakshassu, Nagam
Kanisherykavu (KNS)	Talappilly	Porkulam	1.359	10.65° N, 76.08° E	Nagam, Bhagavathy
Kottaichalippattukavu (KTC)	Chavakkad	Vadanappilly	0.741	10.4667° N, 76.0833° E	Annapoorneswari, Veerabhadran
Kottarathdharmadai vamkavu (KTR)	Kodungallur	Kaippamangalam	0.741	10.3167° N, 76.1333° E	Darmadaivam, Nagam, Manikandabhootham

The present study conducted in the sacred groves of Adipparambukavu, Daivathinkavu, Kanisherykavu, Kottaichalippattukavu and Kottarathkavu (Table 1). In these groves 119 species of angiosperms coming under 104 genera and 51 families representing 8 vulnerable, 12 endemic and 3 near threatened species were collected (Table 2).

**Table 2.** Number of Angiosperms in Sacred groves.

Sacred groves	Species	Genus	Family	Endemic Plants	Vulnerable Plants
Adipparambukavu (ADP)	27	24	18	3	3
Daivathinkavu (DAV)	31	31	20	4	2
Kanisherykavu (KNS)	57	53	36	5	2
Kottaichalippattukavu (KTC)	39	38	29	6	3
Kottarathkavu (KTR)	40	38	26	9	5

Out of 119 species *Hydnocarpus pentandra*(Buch.-Ham.) Oken, *Leea indica* (Burm. f.) Merr. and *Pothos scandens* L. are common in these five sacred groves. *Caryota urens* L. and *Chassalia curviflora* (Wall ex Kurz) Thw. are common in Adipparambukavu, Daivathinkavu, Kanisherykavu and Kottarathkavu. *Derris scandens* (Roxb.) Benth. and *Holigarna arnottiana* Hook. f. are common in Adipparambukavu, Daivathinkavu, Kottaichalippattukavu and Kottarathkavu. *Aphanamixis polystachya* (Wall.) Parker, *Artocarpus hirsutus* Lam., *Calophyllum calaba* L., *Dalbergia latifolia* Roxb., *Gloriosa superba* L., *Hydnocarpus pentandra* (Buch.-Ham.) Oken, *Saraca asoca* (Roxb.) de Wilde and *Smilax zeylanica* L. are Vulnerable, *Artocarpus hirsutus* Lam., *Briedelia stipularis* (L.) Blume, *Calophyllum calaba* L., *Chionanthus mala-elengi* (Dennst.) P.S. Green ssp. *mala-elengi*, *Holigarna arnottiana* Hook. f., *Hydnocarpus pentandra* (Buch.-Ham.) Oken, *Memecylon talbotianum* Brandis, *Mussaenda frondosa* L., *Olea dioica* Roxb., *Pandanus kaida* Kurz, *Sida rhomboidea* Roxb. ex Fleming and *Tabernaemontana alternifolia* L. are endemic and *Garcinia gummi-gutta* (L.) Robs., *Magnolia champaca* (L.) Baill. ex Pierre and *Tinospora sinensis* (Lour.) Merr. are near threatened species present in these sacred groves (Sasidharan & Sivarajan 1996, Ravikumar et al. 2000). *Aeginetia indica* L. in Orobanchaceae is a root parasite present in Kanisherykavu. It includes 17.64% herbs, 19.33% shrubs, 41.18% trees and 21.85% climbers. All 119 species of plants are medicinal. Food plants of these groves includes *Anacardium occidentale* L., *Artocarpus heterophyllus* Lam., *Artocarpus hirsutus* Lam., *Chrysophyllum cainito* L., *Citrus medica* L., *Cocos nucifera* L., *Colocasia esculenta* (L.) Schott, and *Passiflora edulis* Sims (Fig. 3).

Such kind unique plant wealth shows the importance of conservation of sacred groves. Fabaceae and Moraceae were the dominant families present in these sacred groves (Table 3). Among these Kottarathkavu is well protected and is under the observation of Kerala Forest Department. Maximum number of Endemic plants present in Kottarathkavu (6.72%). Adipparambukavu and Kottarathkavu are protected with compound wall. These groves have distinct floral characters making it unique ecosystem.

**Table 3.** Species recorded from sacred groves and medicinal uses.

S. N.	Botanical name (Family)	Col. No.	Sacred grove(s)	Habit	Plant part(s) used	Uses
1	<i>Abrus precatorius</i> L. (Fabaceae)	1	ADP, KTC, KTR	C	Leaves, Roots, Seeds	Hair growth, fever, difficult breathing, thirst, eye and skin disease.

2	<i>Adenanthera pavonina</i> L. (Mimosaceae)	2	ADP, KNS	T	Bark, Leaves, Seeds, Heartwood	Ulcers, pharyngopathy, burning sensation, hyperdipsia, vomiting, fever, giddiness, dysentery, pain in joints, warts and emetic.
3	<i>Aeginetia indica</i> L. (Orobanchaceae)	153	KNS	H	Whole plant	Renal cancer, diabetes, acute nephritis, chronic liver diseases, cough, and arthritis.
4	<i>Albizia odoratissima</i> (L. f.) Benth. (Mimosaceae)	3	ADP, DAV, KNS	T	Bark	Insect bites, ulcers, leprosy, skin diseases, cough, bronchitis, diabetes and burning sensation.
5	<i>Albizia saman</i> (Jacq.) F.Muell. (Mimosaceae)	155	KNS	T	Root, Seeds,	Stomach cancer, colds, diarrhoea, headache, intestinal ailments and stomach ache, sore throat, Mycobacterium tuberculosis
6	<i>Alstonia scholaris</i> (L.) R. Br. (Apocynaceae)	13	KTC, KTR	T	Bark, Leaves, Milky exudate	Malaria, asthma, skin and respiratory diseases, cardiac troubles, beri-beri, fever, abdominal disorders, leprosy, foul ulcers, bronchitis and congested liver.
7	<i>Alternanthera bettzickiana</i> (Regel) Voss (Amaranthaceae)	203	KTR	H	Leaves, Stem	Given to anaemic children in order to improve their health.
8	<i>Anacardium occidentale</i> L. (Anacardiaceae)	152	DAV	T	Fruits, Seeds, Roots, Bark	Diabetes, poisoning, ulcers, corn and aphrodisiac.
9	<i>Aphanamixis polystachya</i> (Wall.) Parker (Meliaceae)	4	ADP, KTR	T	Bark, Seeds	Liver enlargement, spleen and abdominal complaints and tumors.
10	<i>Areca catechu</i> L. (Arecaceae)	68	DAV, KNS	T	Roots, Leaves, Nut	Sore lips, lumbago, urinary disorders and anorexia. Nuts prevent decay of tooth.
11	<i>Artocarpus heterophyllus</i> Lam. (Moraceae)	60	DAV, KNS, KTR	T	Roots, Seeds, Leaves, Fruits	Boils, wounds, skin diseases, fever, ulcers, <i>vata</i> and <i>pitta</i> disorders.
12	<i>Artocarpus hirsutus</i> Lam. (Moraceae)	5	ADP, KNS, KTR	T	Fruits, Leaves, Bark	Anorexia, small pimples, cracks on the skin and sores.
13	<i>Asparagus racemosus</i> , Willd. (Liliaceae)	156	DAV, KTR	C	Tubers	Urinary diseases, gynaecological disorders, hyperacidity, gastritis, improves memory power, increases breast milk, piles, eye diseases, and leucorrhoea.
14	<i>Azadirachta indica</i> A. Juss. (Meliaceae)	201	KTC	T	Bark, Leaves, Flowers, Fruits, Seeds	Skin and eye diseases, rheumatism, intestinal worms, diabetes, small pox, chicken pox, ulcers, ringworm, scabies, leprosy, liver disorders, cough, anorexia, polyuria, wounds, fever and poisoning.
15	<i>Bambusa bambos</i> (L.) Voss (Poaceae)	244	KNS	S	Roots, Fruits Leaves, Calcareous deposits,	Haemorrhoid, diarrhoea, wounds, fever, cough, shortness of breath, vomiting, cardiac and skin diseases.
16	<i>Bambusa vulgaris</i> Schrad (Poaceae)	69	DAV	S	Resin	Infantile epilepsy, kidney troubles, coughs, excess mucous, fever and reduced risk of digestive disorders.
17	<i>Breynia vitis-idaea</i> (Burm. f.) C.E.C. Fisch. (Euphorbiaceae)	264	KTC	S	Bark, Leaves	Haemorrhage and tonsillitis.
18	<i>Briedelia retusa</i> (L.) A. Juss. (Euphorbiaceae)	238	KNS	T	Bark, Roots	Pain in lumbago and sciatica.
19	<i>Briedelia stipularis</i> (L.) Blume (Euphorbiaceae)	199	KTC, KTR	S	Leaves, Bark	Jaundice, anaemia, cough, fever, asthma and as gargle for sores in mouth.

20	<i>Butea monosperma</i> (Lam.) Taub (Fabaceae)	59	KNS	T	Bark, Flowers, Seeds, Resin	Piles, tumours, menstrual disorders, dysentery, intestinal worms, anthelmintic, rectal diseases, hepatopathy, diabetes and hydrocele.
21	<i>Calophyllum calaba</i> L. (Clusiaceae)	158	KTC	T	Kernel oil	Healing properties
22	<i>Calycopteris floribunda</i> Lam. (Combretaceae)	15	KNS	C	Leaves, Fruits	Colic, intestinal worms, leprosy, malaria, dysentery, ulcers, vomiting, skin diseases, snake-bite poisoning, thirst and diarrhoea.
23	<i>Capsicum frutescens</i> L. (Solanaceae)	159	KNS	H	Fruits	Carminative and rubefacient.
24	<i>Carallia brachiata</i> (Lour.) Merr. (Rhizophoraceae)	58	KTR	T	Bark, Fruits	Contagious ulcers and itches.
25	<i>Caryota urens</i> L. (Arecaceae)	6	ADP, DAV, KNS, KTR	T	Shoot apex, Toddy	Diarrhoea, migraine and scorpion-sting poisoning.
26	<i>Cassia fistula</i> L. (Caesalpinaceae)	245	KNS	T	Root, Leaves, Bark, Fruits, Flowers	Skin and cardiac diseases, leprosy, fever, promotes digestion, leucoderma, eczema, diabetes, jaundice, polyuria, and urticaria.
27	<i>Cayra tiapedata</i> (Lam.) A. Juss. ex Gagnep. (Vitaceae)	150	KTC, KTR	C	whole plant	Uterine reflexes and applied on cracked heels.
28	<i>Cayra tiatrifolia</i> (L.) Domin (Vitaceae)	57	KNS	C	Roots	Tumours, fever and splenopathy, ulcers, hepatopathy, cardiac disorders, Wounds dropsy and haemorrhoids.
29	<i>Centrosema molle</i> Benth. (Fabaceae)	210	KNS	C	Seed	Scorpion and snake bites. Antimicrobial, Wound Healing
30	<i>Chassalia curviflora</i> (Wall. ex Kurz) Thw. (Rubiaceae)	7	ADP, DAV, KNS, KTR	S	Roots	Cough and malaria.
31	<i>Chionanthus mala-elengi</i> (Dennst.) P. S. Green (Oleaceae)	160	KTC	T	Leaves	Giddiness, epilepsy and similar affections of the brain.
32	<i>Chromolaena odorata</i> (L.) King & Robins. (Asteraceae)	211	KNS, KTC, KTR	S	Leaves	Leaf juice is applied externally on cuts and wounds to stop bleeding
33	<i>Chrysophyllum cainito</i> L. (Sapotaceae)	8	ADP	T	Fruit	Diarrhoea
34	<i>Cinnamomum verum</i> Presl (Lauraceae)	10	ADP, DAV	T	Bark, Leaf oil	Anorexia, bronchitis, asthma, diseases of heart, mouth and teeth, chronic cold, vomiting, diarrhoea, uropathy and restoring normal skin colour.
35	<i>Citrus medica</i> L. (Rutaceae)	56	KNS	S	Fruits	Pain, piles, indigestion, vomiting, constipation, flatulence, tumours, helminthiasis, hiccough, hyperdipsia, anorexia, hepatopathy and dysentery.
36	<i>Cleome burmannii</i> Wight & Arn. (Capparaceae)	197	KNS	H	Whole plant	Anti-inflammatory
37	<i>Clerodendrum infortunatum</i> L. (Verbenaceae)	246	KNS	H	Leaves, Bark	Diabetes, leprosy, skin diseases, inflammations and proctoptosis
38	<i>Coccinia grandis</i> (L.) Voight (Cucurbitaceae)	212	KTC	C	Whole plant, Rhizomes	Polyuria, cough, diabetes, skin and liver diseases, fever, ulcers, anorexia, bronchitis, rheumatism, dysentery, vomiting, burning sensations, leprosy, asthma, jaundice and helminthiasis.

39	<i>Cocos nucifera</i> L. (Arecaceae)	12	DAV, KNS	T	Inflorescence, Fruits, Roots, Seeds	Bronchitis, hepatopathy, uterine disorders, helminthiasis, gastritis, haemorrhage, polyuria, leucorrhoea, hyperdipsia, tumours, skin diseases, dysentery, diarrhoea, dehydration and diabetes.
40	<i>Colocasia esculenta</i> (L.) Schott (Araceae)	162	KNS	H	Rhizomes	Internal haemorrhages, adenitis, somatalgia, congestion of the portal system, otalgia and general debility.
41	<i>Commelina benghalensis</i> L. (Commelinaceae)	235	KTR	H	Whole plant	Haemorrhage, leprosy and diseases of <i>vata</i> .
42	<i>Costus speciosus</i> (Koenig) J.E. Smith (Costaceae)	149	KNS	H	Rhizomes	Haemorrhage, fever, cough and other respiratory diseases, diabetes, blood and skin diseases and leprosy.
43	<i>Curculigoo rchioides</i> Gaertn. (Hyoxidaceae)	54	KNS	H	Tubers	Urinary and skin diseases, menorrhagia, piles, jaundice, asthma, diarrhoea and gonorrhoea.
44	<i>Cyclea peltata</i> (Lam.) Hook. f. & Thoms. (Menispermaceae)	18	ADP, KTC	C	Roots	Purifies blood and beneficial in treating skin diseases, poisonous affections, colic pain, fever, vomiting, diarrhoea and respiratory disorders.
45	<i>Dalbergia latifolia</i> Roxb. (Fabaceae)	53	KNS	T	Roots, Bark, Leaves	Polyuria, sciatica, chronic ulcer, leprosy, urinary bladder disorders, burning sensation, oedema, brain tonic, diarrhoea, obesity and worms.
46	<i>Delonix regia</i> (Boj. ex Hook.) Rafin. (Caesalpinaceae)	234	KTC	T	Leaves	Diseases of <i>vata</i> , constipation, inflammations, arthritis, hemiplegia and dysmenorrhoea.
47	<i>Derriss candens</i> (Roxb.) Benth. (Fabaceae)	11	ADP, DAV, KTC, KTR	C	Seeds, Leaves, Whole plant, Bark	Unripe beans loosen the bowels with gripe. Leaves reduced to plasma are good in erysipelas.
48	<i>Dioscorea bulbifera</i> L. (Dioscoreaceae)	195	KNS	C	Tubers	Ulcers, piles, leprosy, worm infestation, cardiac diseases, polyuria, urinary calculi, aphrodisiac, rejuvenator, dysentery and syphilis.
49	<i>Elephantopus scaber</i> L. (Asteraceae)	76	DAV	H	Whole plant	Diarrhoea, hemorrhage, urinary calculi, leprosy, retention of urine, bronchitis, skin disease, intermittent fevers, hepatopathy, ophthalmopathy, cough and swellings.
50	<i>Euphorbia thymifolia</i> L. (Euphorbiaceae)	168	KTC	H	Whole plant	Cough, asthma, respiratory and skin diseases, worms, poisonous affections, dyspnoea and purification of blood.
51	<i>Ficus benghalensis</i> L. (Moraceae)	247	ADP	T	Bark, Aerial roots, Buds	Skin diseases, dysentery, diarrhoea, leucorrhoea, nervous disorders and reduces blood sugar in diabetes.
52	<i>Ficus hispida</i> L. f. (Moraceae)	169	KNS	T	Bark, Fruits	Ulcers, leucoderma, psoriasis, anaemia, jaundice, and inflammations.
53	<i>Ficus racemosa</i> L. (Moraceae)	51	ADP	T	Bark	Skin and vaginal diseases and ulcers.
54	<i>Ficus religiosa</i> L. (Moraceae)	77	ADP, DAV, KTC	T	Bark	Skin and vaginal diseases and ulcers.
55	<i>Ficus tinctoria</i> G. Forst. (Moraceae)	144	ADP	T	Root, Leaves	Women during childbirth, relieve swollen eyes.
56	<i>Garcinia gummi-gutta</i> (L.) Robs. (Clusiaceae)	193	ADP, DAV	T	Leaves, Fruits, Seed oil	Ulcers, inflammations, bleeding piles, diarrhoea, cold, dysentery, indigestion, hyperdipsia, antiobesity, dropsy and worm cases.

57	<i>Gliricidia sepium</i> (Jacq.) Kunth ex Walp. (Fabaceae)	232	ADP, KTC, KTR	T	Leaves, bark, Seeds	Headache, cold and cough.
58	<i>Gloriosa superba</i> L. (Liliaceae)	50	KTC, KTR	C	Tubers	Swelling, piles, oedema, leprosy, ulcers, pain in the bladder, toxicosis, itching, antidote against cobra poison; easy and quick expulsion of the placenta after delivery.
59	<i>Grewia nervosa</i> (Lour.) Panigrahi (Tiliaceae)	217	KNS, KTC	S	Whole plant	Indigestion, eczema and itch, typhoid, dysentery and syphilitic ulceration of the mouth.
60	<i>Grewia tiliifolia</i> Vahl (Tiliaceae)	248	KTC	T	Bark, Leaves	Burning sensation, hyperdipsia, pharyngopathy, cough, skin, blood and cardiac diseases, wounds, ulcers, diarrhoea, haemorrhages and seminal weakness.
61	<i>Hemidesmus indicus</i> (L.) R.Br. (Periplocaceae)	172	KNS, KTR	C	Roots	Dyspepsia, dysentery, cough, bronchitis, gout, uterine haemorrhage, wounds, leprosy, blood and skin diseases, anaemia, jaundice, dysuria, fever, thirst, vomiting and rheumatism.
62	<i>Hibiscus hispidissimus</i> Griff. (Malvaceae)	21	KNS	S	Leaves, Roots	Improves digestion, inflammations, helminthiasis, dyspepsia and ophthalmopathy.
63	<i>Hibiscus rosa-sinensis</i> L. (Malvaceae)	218	KNS	S	Leaves, Flowers, Roots	Skin diseases, diarrhoea, piles, haemorrhage, polyuria, hair falling, menorrhagia, cough, contraceptive, fever, cystitis and irritable conditions of genito urinary tract.
64	<i>Holarrhena pubescens</i> (Buch.-Ham.) Wall. ex G. Don (Apocynaceae)	143	KTR	T	Bark, Seeds	Diarrhoea, piles, haemorrhage, leprosy, worm infestation, thirst, pain, erysipelas, hepatopathy, gastropathy, chronic bronchitis, boils, ulcers and dysentery.
65	<i>Holigarna arnottiana</i> Hook.f. (Anacardiaceae)	174	ADP, DAV, KTC, KTR	T	Fruits	Arthritis, beriberi, tumours, leucoderma, ulcers, diabetes, leprosy and warts.
66	<i>Hydnocarpus pentandra</i> (Buch.-Ham.) Oken, (Flacourtiaceae)	192	ADP, DAV, KNS, KTC, KTR	T	Seeds, Seed oil	Leprosy, skin diseases, eczema, dermatitis, tubercular laryngitis, chronic ulcers, dyspepsia, flatulence and verminosis.
67	<i>Hyptis suaveolens</i> (L.) Poit. (Lamiaceae)	154	DAV, KTC, KTR	H	Whole plant	Worm infestation, wounds and inflammations of the navel of the newborn and also emetic.
68	<i>Ichnocarpus frutescens</i> (L.) R.Br. (Apocynaceae)	175	KTC	C	Roots	Dyspepsia, diabetes, fever, skin troubles and stones in bladder.
69	<i>Indigofera cassioides</i> Rottl. ex. DC. (Fabaceae)	249	KTC	S	Roots	Coughs, pains in the chest.
70	<i>Indigofera hirsuta</i> L. (Fabaceae)	254	DAV	H	Leaves	stomach problems and yaws
71	<i>Ipomoea staphylina</i> Roem. & Schult. (Convolvulaceae)	176	KTC, KTR	C	Stem latex	Skin disease.
72	<i>Ixora coccinea</i> L. (Rubiaceae)	80	DAV, KNS, KTR	S	Roots, Leaves, Flowers	Blood purifier, antiseptic, infantile skin ailments, diarrhoea, dysentery, fever, sores, ulcers, hemoptysis, catarrhal bronchitis, eye troubles, scabies, cholera and gonorrhoea.



73	<i>Jasminum angustifolium</i> (L.) Willd. (Oleaceae)	49	KNS	C	Leaves	Poisoning, herpes, leprosy, ophthalmopathy, and wounds.
74	<i>Leea indica</i> (Burm.f.) Merr. (Leeaceae)	48	ADP, DAV, KNS, KTC, KTR	S	Roots	Diarrhoea, dysentery, hyperdipsia, ulcer and skin diseases.
75	<i>Macaranga peltata</i> (Roxb.) Muell.-Arg. (Euphorbiaceae)	267	KNS	T	Leaves, Bark, Gum	Used as vulnerary. Gum used for venereal sores.
76	<i>Magnolia champaca</i> (L.) Baill. ex Pierre (Magnoliaceae)	178	KNS	T	Bark, Flowers	Chronic gastritis, fever, strangury, cough, bronchitis, nausea, leprosy, wounds, ulcers, anorexia, colic, flatulence, helminthiasis, cephalalgia, and ophthalmia.
77	<i>Manihot carthaginensis</i> ssp. <i>glaziovii</i> (Muell.-Arg.) Allem (Euphorbiaceae)	251	DAV	S	Stem, Root	Skin infections.
78	<i>Memecylon talbotianum</i> Brandis (Melastomataceae)	123	DAV, KTC, KTR	T	Bark, Root, Seeds, Leaf	Anti-diarrhoeal, Hypoglycemic, Antimicrobial, Wound healing.
79	<i>Merremia vitifolia</i> (Burm. f.) Hall. f. (Convolvulaceae)	119	CHL, KNS	C	Whole plant, Roots	Strangury and urethral discharges. Root eaten by tribals as a stomachic.
80	<i>Mikania micrantha</i> Kunth in HBK (Asteraceae)	47	DAV, KNS	C	Leaves	Snake bites, eliminating discomfort of hornet, bee and ant stings antimicrobial activity from the leaves
81	<i>Mimosa pudica</i> L. (Mimosaceae)	139	KTC, KTR, DAV	H	Whole plant, Roots	Urinary complaints, sores, piles, diarrhoea, dyspnoea, leprosy, uterine disorders, haemorrhage, wounds, oedema, skin diseases and burning sensation.
82	<i>Mimusops elengi</i> L. (Sapotaceae)	84	ADP, KNS	T	Bark, Flowers, Fruits	Urethrorrhoea, diarrhoea, dysentery, cephalalgia, leprosy, constipation, dental, cardiac and eye diseases, burning sensation, thirst, uterine disorders, fever, headache, poisoning and aphrodisiac.
83	<i>Morinda pubescens</i> J. E. Smith (Rubiaceae)	180	KNS	T	Bark, Roots, Fruits	Eczema, fever, ulcers, glandular swellings and digestive disorders especially in children.
84	<i>Mussaenda frondosa</i> L. (Rubiaceae)	118	KNS, KTR	S	Roots, Leaves, Stem	Leprosy and eye troubles, coughs and against intestinal worms.
85	<i>Naravelia zeylanica</i> (L.) DC. (Ranunculaceae)	46	KNS	C	Whole plant	Helminthiasis, leprosy, dermatopathy, rheumatalgia, odontalgia, wounds, cephalalgia, inflammations, and ulcers.
86	<i>Ocimum tenuiflorum</i> L. (Labiatae)	86	KNS	S	Whole plant	Cough, cold, bronchitis, dysentery, improves appetite, skin and ear diseases, itches, ringworm, leprosy, intestinal worms, ulcers, poisonous affections and specific for all kinds of fevers.
87	<i>Olea dioica</i> Roxb. (Oleaceae)	252	KNS	T	Bark, Leaves	Febrifuge and emetic.
88	<i>Oplismenus compositus</i> (L.) P. Beauv. (Poaceae)	116	KTC	H	Whole plant	Relieve pain of snakebite
89	<i>Pandanus kaida</i> Kurz (Pandanaeae)	270	DAV, KTR	S	Stem, Sap, Flower	Wounds, Fevers, Pains, Epilepsy, Skin diseases, Ear diseases, Headaches, Back pains, Rheumatoid arthritis, Diabetes mellitus, Psychological disorders.

90	<i>Passiflora edulis</i> Sims (Passifloraceae)	138	KNS	C	Flower	Nervous disorders, bronchial conditions, arthritis, asthma, insomnia, gastrointestinal disorders and menopausal symptoms.
91	<i>Pavetta indica</i> L. (Rubiaceae)	114	DAV, KTC	S	Roots, Leaves	Visceral obstructions, urinary diseases, jaundice, dropsical affections, ulcerated nose and for haemorrhoids.
92	<i>Phyllanthus reticulatus</i> Poir. (Euphorbiaceae)	183	KTR	H	Bark, Leaves, Fruits	Rheumatism, dysentery and venereal diseases, burning sensation, gastropathy, obesity, ophthalmodynia, sores, burns, and skin eruptions.
93	<i>Plumeria rubra</i> L. (Apocynaceae)	44	KTC	T	Roots, Bark, Latex	Ulcers, herpes and scabies, itch, rheumatism and gum troubles.
94	<i>Polyalthia longifolia</i> (Sonner.) Thw. (Annonaceae)	188	KTR	T	Bark	Rheumatism, constipation, worm infestation, polyuria, skin diseases and fever.
95	<i>Pothos scandens</i> L. (Araceae)	137	ADP, DAV, KNS, KTC, KTR	C	Whole plant	Skin diseases, boils, swellings, wounds, ulcers, dropsy, menorrhagia, vomiting, flatulence, strangury and burning sensation.
96	<i>Racosperma auriculiforme</i> (Benth.) Pedley (Mimosaceae)	42	DAV	T	Root, Bark	Aches and pains and sore eyes, rheumatism.
97	<i>Saraca asoca</i> (Roxb.) de Wilde (Caesalpinaceae)	41	ADP	T	Bark, Flowers	Uterine disorders, cures enlargement of cervical glands, burning sensation, dyspepsia, worms and biliousness, bleeding piles, scabies and other skin diseases.
98	<i>Sarcostigma kleinii</i> Wight & Arn. (Icacaceae)	187	ADP	C	Bark, Leaves, Seed oil	Cephalalgia, gastropathy, helminthiasis, leprosy, skin diseases, epilepsy and indolent ulcers.
99	<i>Sida acuta</i> Burm. f. (Malvaceae)	108	KTC	S	Roots	Uropathy, arthritis, leucorrhoea, gonorrhoea, diarrhoea and to promote strength.
100	<i>Sida fryxellii</i> Sivar. & Pradeep (Malvaceae)	253	KTC	S	Whole plant	Antibacterial properties
101	<i>Sida rhomboidea</i> Roxb. ex Fleming (Malvaceae)	94	KTR	H	Roots, Leaves	Fever, heart diseases, burning sensations, piles and inflammations.
102	<i>Smilax zeylanica</i> L. (Smilacaceae)	31	DAV, KTC, KTR	C	Roots	Venereal diseases, rheumatism, urinarycomplaints and dysentery.
103	<i>Streblus asper</i> Lour. (Moraceae)	128	CHL, KNS	T	Bark, Roots, Seeds	Sinusitis, inflammations, elephantiasis, cough, bronchitis, ulcers, diarrhoea, dysentery, fever, swellings, hyperhidrosis, neuralgia and haemorrhages.
104	<i>Strychnos nux-vomica</i> L. (Loganiaceae)	39	KNS, KTC	T	Bark, Seeds	Intermittent fevers, dyspepsia, dysentery, paralytic and neuralgic affections, chronic rheumatism, insomnia, colic, impotence, spermatorrhoea and skin and heart disease.
105	<i>Swietenia mahagoni</i> (L.) Jacq. (Meliaceae)	105	KNS	T	Bark	Anti-pyretic, tonic and astringent; used as a substitute for <i>Cinchona</i> bark.
106	<i>Tabernaemontana alternifolia</i> L. (Apocynaceae)	135	ADP, KNS, KTR	T	Roots, Bark	Toothaches, inflammations of cornea and also as a vermicide.
107	<i>Tabernaemontana divaricata</i> (L.) R. Br. (Apocynaceae)	225	KNS	S	Flowers, Roots	Eye diseases, burning sensation, skin diseases, toothache, and joint pains.

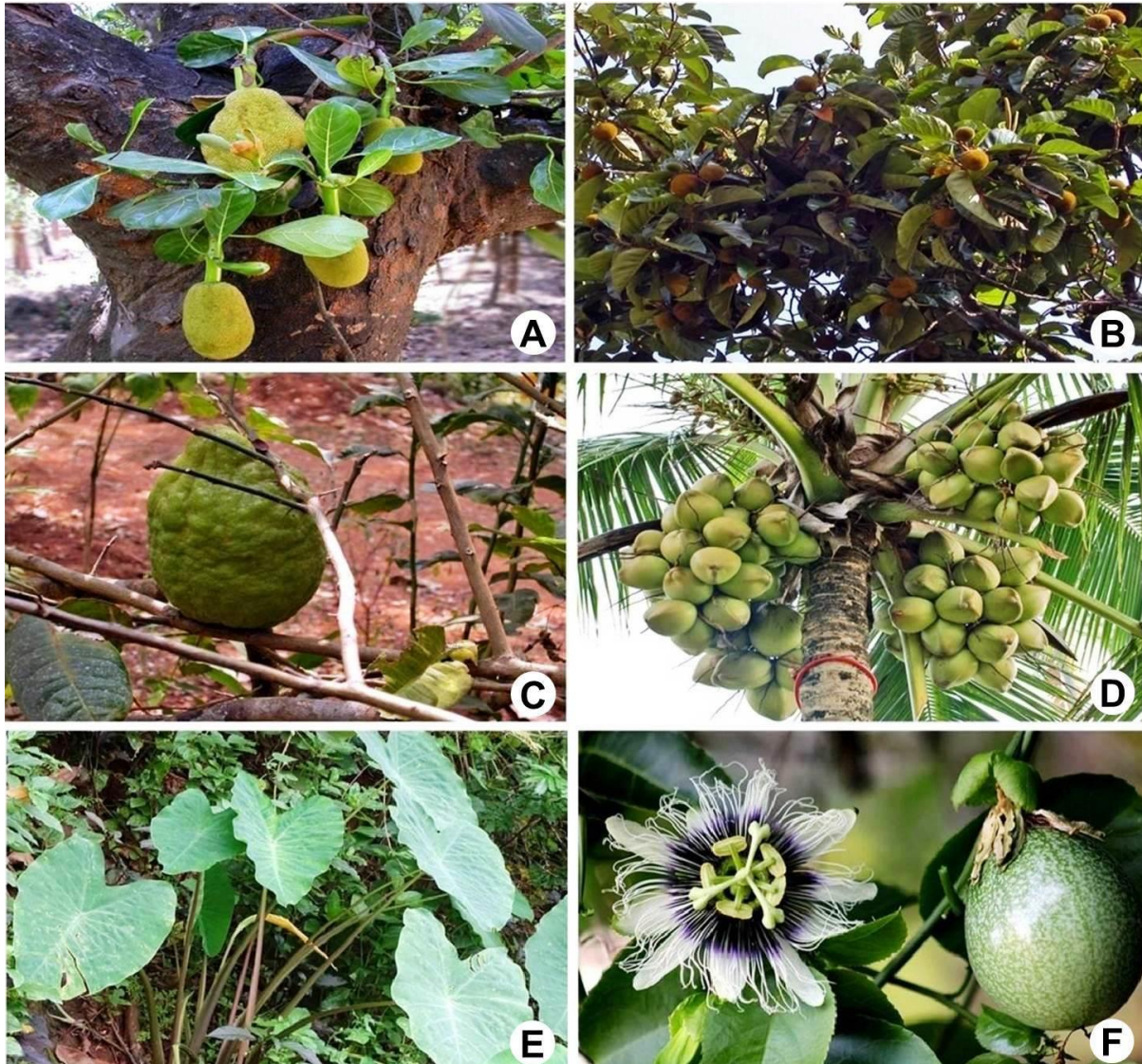
108	<i>Tectona grandis</i> L.f. (Verbenaceae)	38	KNS	T	Tender leaves, Bark, Flowers, Fruits, Seeds	Bronchitis, dysentery, skin diseases, inflammation, pruritus, ulcers, haemorrhage, haemoptysis, vesical calculi, stomatitis, dipsia, and strangury, arthritis, neuralgia and dyspepsia.
109	<i>Tephrosia purpurea</i> (L.) Pers. (Fabaceae)	104	KTR	H	Whole plant, Roots	Inflammations, skin diseases, elephantiasis, dyspepsia, stomachalgia, flatulence, asthma, bronchitis, anaemia, fever, boils, pimples, syphilis, gonorrhoea and rat poisoning.
110	<i>Tetrastigma leucostaphylum</i> (Dennst.) Alston ex Mabb. (Vitaceae)	33	ADP	C	Roots	Boils and ulcers, traumatic bleeding, snakebites
111	<i>Tiliacora acuminata</i> (Poir.) Miers. ex Hook. f. & Thoms. (Menispermaceae)	255	ADP, KTR	C	Roots	Antidote to snake poison
112	<i>Tinospora sinensis</i> (Lour.) Merr. (Menispermaceae)	37	KTC	C	Stems	Piles and ulcerated wounds, liver complaints, Chronic rheumatism and also as muscle relaxant.
113	<i>Triumfetta rhomboidea</i> Jacq.(Tiliaceae)	134	KNS	S	Whole plant	Dysentery, intestinal ulcers, diarrhoea and leprosy.
114	<i>Urena lobata</i> L. (Malvaceae)	227	KTR	S	Roots	Flatulent colic, cough, and sore throat.
115	<i>Vanda tessellata</i> (Roxb.) Hook. ex D. Don (Orchidaceae)	273	KTC	H	Roots	Dyspepsia, bronchitis, inflammations and piles.
116	<i>Vernonia cinerea</i> (L.) Less. (Asteraceae)	35	KNS	H	Whole plant	Fever, leucorrhoea, excessive bleeding, skin diseases, dysuria, bladder stones, piles, worms and haematological disorders.
117	<i>Vernonia elliptica</i> DC. (Asteraceae)	256	KTR	C	Stem, Leaf, Flower	Fever, body tonic, parasites.
118	<i>Zanthoxylum rhetsa</i> (Roxb.) DC. (Rutaceae)	133	KNS	T	Bark, Fruits	Dyspepsia, asthma, bronchitis, heart diseases, toothache, diseases of eye and ear, worm infestation, leprosy, diseases of head, rheumatism, cholera and treating pimples.
119	<i>Zingiber zerumbet</i> (L.) J.E. Smith (Zingiberaceae)	101	KNS	H	Rhizomes	Cardiac disorders, oedema, cures vomiting, piles, filariasis, anaemia, cough, dyspnoea, anorexia, fever, diarrhoea, dyspepsia, diseases, diabetes, eye and neurological diseases.

**Note:** ADP- Adipparambukavu, DAV- Daivathinkavu, KNS- Kanisherykavu, KKTC- Kottaichalippattukavu, KTR- Kottarathdharmadaivamkavu, C- Climber, H- Herb, S- Shrub, T- Tree.

## DISCUSSION AND CONCLUSION

Sacred groves are considered as store house of rare, endemic and endangered plants because of floristic wealth and biodiversity conservation. This study shows that natural vegetation is maintained inside the sacred grove and all species are medicinal. Here the percentages of tree species are large compared to herbs, shrubs and climbers. Compound walls were absent in Daivathinkavu (DAV), Kottaichalippattukavu (KTC) and Kanisherykavu (KNS). Due to this increase the external interference of human beings and cattle grazing. At the time of heavy rainfall soil erosion is common and therefore fertilized upper soil lost, these adversely affected the plant growth. Invasive weeds like *Chromolaena odorata* (L.) King & Robins and *Mikania micrantha* Kunth adversely affect the growth of other plants inside. These are major threat to conservation. Wastes including plastics deposited in groves are other threats. Plants are considered as lungs of earth. Conservation of groves means conservation of floras and faunas inside groves. Sacred groves in undisturbed state conserve biodiversity and ecological balance. Clearing of vegetation for construction of temples and roads has resulted in shrinkage of

sacred groves. Protection of sacred ponds, RET species and keystone species like *Ficus* trees, nesting birds are necessary for biodiversity conservation inside the grove. In this circumstance suitable management measures and awareness programmes about medicinal plants inside the sacred groves are necessary for sustainable utilization of the valuable bioresources.



**Figure 3.** Some important plant species with their plant part used as food present in sacred groves: **A**, *Artocarpus heterophyllus* Lam.; **B**, *Artocarpus hirsutus* Lam.; **C**, *Citrus medica* L.; **D**, *Cocos nucifera* L.; **E**, *Colocasia esculenta* (L.) Schott; **F**, *Passiflora edulis* Sims.

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#### REFERENCES

- Bajpai O, Pandey J & Chaudhary LB (2016) Ethnomedicinal uses of tree species by Tharu tribes in the Himalayan Terai region of India. *Research Journal of Medicinal Plant* 10(1): 19–41.
- Balasubramanyan K & Induchoodan NC (1999) Can the endemics of the Sacred Groves in Kerala withstand human onslaught? In: Kumaravelu G & Chaudhuri KK (eds) *Endemic and endangered plant and animal species of Eastern and Western Ghats*. Proceedings of the national seminar conducted by Research Wing, Tamil Nadu Forest Department, Chennai, pp. 59–64.

- Bhandary MJ & Chandrashekar KR (2003) Sacred Groves of Dakshina Kannada and Udupi districts of Karnataka. *Current Science* 85(12): 1655–1656.
- Chandrashekara UM & Sankar S (2000) Structure and functions of sacred groves: Case studies in Kerala. In: Ramakrishnan PS, Saxenaand KG & Chandrashekara UM (eds) *Conserving the sacred for Biodiversity Management*. Oxford and IBH Publishing Co. Pvt. Ltd., pp. 323–335.
- Devaraj P, Ramanujam MP & Ganesan T (2005) *Status report of Sacred groves of Pondicherry Region and Strategies for Conservation*. Institute of Forest Genetics and Tree Breeding PB 1061, R.S. Puram, Coimbatore 641002, India, pp. 16–21.
- Gamble JS & Fischer CEC (1915–1936) The Flora of the Presidency of Madras. Parts 1–11 (parts 1-7 by Gamble and 8-11 by Fischer), Vols. 1–3. Adlard & Sons Ltd., London.
- Jain SK & Rao RR (1977) *A Handbook of Field and Herbarium Methods*. Today & Tomorrow, New Delhi.
- Karunakran PV, Balasubramanian M & Ramesh BR (2005) *Conservation and Management of Sacred Groves in Kerala as Community Reserves*. Institute of Forest Genetics and Tree Breeding, PB 1061, R.S.Puram, Coimbatore 641002, India, pp. 233–238.
- Malhotra KC (1998) Anthropological dimensions of sacred groves in India: an overview. In: Ramakrishnan PS, Saxena KG & Chandrashekara UM (eds) *Conserving the Sacred for Biodiversity Management*. Oxford and IBH, New Delhi, pp. 423–438.
- Mehra A, Bajpai O & Joshi H (2014) Diversity, utilization and sacred values of Ethno-medicinal plants of Kumaun Himalaya. *Tropical Plant Research* 1(3): 80–86.
- Nair HG (1992) *Ecological studies of a Sacred Grove*. Project report submitted to W.W.F, New Delhi, pp. 55.
- Nair NC & Mohanan CN (1981) On the rediscovery of four threatened species from the sacred groves of Kerala. *Journal of Economic and Taxonomic Botany* 2: 233–235.
- Onyekwelu JC & Olusola JA (2014) Role of sacred grove in in-situ biodiversity conservation in rainforest zone of southwestern Nigeria. *Journal of Tropical Forest Science* 26(1): 5–15.
- Oommen S, Ved DK & Krishnan R (2000) Tropical Indian Medicinal Plants Propagation methods. Foundation for Revitalisation of Local Health Traditions (FRLHT) #50, MSH layout, 2nd stage, 3rd main Anandnagar, Bangalore- 560 024, India. pp. 26, 326.
- Ray R, Chandran MDS & Ramachandra TV (2014) Biodiversity and ecological assessments of Indian sacred groves. *Journal of Forestry Research* 25 (1): 21–28.
- Ravikumar K, Ved DK Assisted by VijayaSankar R & Udayan PS (2000) *100 Red-Listed Medicinal Plants of Conservation Concern in Southern India*. Foundation for Revitalisation of Local Health Traditions (FRLHT), 50, MSH Lay out, 2nd stage, 3rd main, Anand Nagar, Bangalore, India.
- Sasidharan N & Sivarajan VV (1996) *Flowering Plants of Thrissur Forest(Western Ghats, Kerala, India)*. Scientific Publishers, Jodhpur.
- The Hindu Business Line (2004) Available from: <http://www.thehindubusinessline.com/2004/03/18/stories/2004031800421700.htm> (accessed: 18 May 2004).