IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

A Comparative Study of RET Plant Diversity in Two Sacred Groves of Kasaragod District, Kerala, India

Dr. Subrahmanya Prasad K[1], Dr. Agretious Thomas K[2]

[1,2]Assistant Professor, Dept. of Botany, Nehru Arts and Science College Kanhangad, Kasaragod District, Kerala, India

Abstract: Sacred groves are one of the finest examples of traditional *in situ* conservation practices and act as treasure trove of RET plants. Two famous sacred groves of Kasaragod district of Kerala differing in physiographic features were selected for present study. Studies were aimed at the exploration and comparison of endemic and RET plant diversity of these groves. Present inventory accounted for a total of 83 RET plant species coming under 75 genera and 48 families. Their role in germplasm conservation is evident from the fact that only 26 such plants are common to these groves, while others are restricted to any one of the groves. Correct botanical name, family, vernacular name and present status of these plants is provided. This paper also discusses the threats faced by these sacred groves and need for conservation.

Index Terms **– RET plants, sacred groves, Kasaragod district, Kerala**

I. INTRODUCTION

Topographically, Kerala consists of a narrow coastal belt, undulating midland and mountainous highland. Along the coast and the midland there occur several small patches of natural vegetation dedicated to certain local deities. These patches of pristine vegetation are known as sacred groves (Kavu). Sacred groves have existed in India from time immemorial as patches of densely wooded areas, venerated on religious grounds (Deepa *et al*., 2016). 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 lord Shastha and the place is called 'Kavu' or 'Sarpakavu' or 'Shasthakavu'. These are one of the informal approaches of conserving the biological diversity of a region and play an important role in preservation of depleting biological resources (Bhandari & Chandrasekhar, 2003). They represent the near-climax vegetation, managed as a part of local cultural tradition, faith and strict taboo. Sacred groves are one of the finest examples of traditional *in situ* conservation practices for conserving local biodiversity.

The area of a sacred grove varies from a few trees to some acres, and found in a wide range of ecological conditions, from coast to the Ghats (Gadgil & Vartak, 1976). Each grove has a patron deity and folklore associated with it (Harikrishnan *et al*., 1997). Sacred groves act as the ancient method of water harvesting and resource sharing system, making them unique ecosystem (Oommen *et al*., 2000; Karunakaran *et al*., 2005). Sacred groves act as shelters of medicinal, rare, endemic and endangered plants and birds (Chandran *et al*., 1998; Pushpangadan *et al*., 1998; Deb *et al*., 1997). These act as indicators of the rich vegetation that had existed in the past. These are store houses of germplasm of wild yams, pepper, mango and a variety of medicinal plants (Bhandari & Chandrasekhar, 2003). The number of Sacred groves in India is likely to be between 100,000 and 150,000 (Malhotra, 1998). Maximum number of sacred groves has been reported from Himachal Pradesh, Kerala, Maharashtra and Karnataka (Malhotra *et al.*, 2000).

Sacred groves in Kerala are located mainly in Kasaragod, Kannur, Kozhikode, Thrissur, Palakkad, Ernakulam and Alappuzha districts. According to the estimate of Gokhale *et al*., (1998) there are about 2000 sacred groves all over Kerala; of which 117 are in Kasaragod district (Jayarajan, 2004). Sacred groves in Kerala preserve more than 800 species of angiosperms (20% of total flowering plants recorded from the state). Out of which 19% plants are medicinal and 40% are rare and endangered (Chandrashekara & Sankar, 1998). Majority of these are distributed in the plains. At present, majority of the sacred groves are on a path of gradual decline owing to various socio-economic factors (Bhandari & Chandrasekhar, 2003). Hence, documentation of floristic diversity of these sacred groves and their conservation becomes need of the hour. The present study was conducted with the aim of documentation of vascular plant diversity in coastal and midland sacred groves of Kasaragod District. During the study, special emphasis was given to compare the rare, endemic, endangered and threatened plant diversity of these two sacred groves.

II. MATERIALS AND METHODS

The study was conducted in two famous sacred groves namely Edayilakkad Sarpakavu and Cheemeni Shasthakavu of Kasaragod district, Kerala. Of these, the Sarpakavu is situated in the coastal belt while the Shasthakavu is in a lateritic hill. Sociological and physiographical dimensions of these groves are given in the Table No. 1.

Table No. 1 – Social and Physiographic details of the sacred groves

Dimensions	Sarpakavu	Shasthakavu
Taluk	Hosdurg	Hosdurg
Panchayath	Valiyaparamba	Kayyur-Cheemeni
Custodian	State Government	Temple Trust
Deity	Nagam	Shasthavu
Soil	Sandy soil	Lateritic soil
Area in Ha	6.460	3.830
Latitude	12^0 7’ 28” N	12^0 14’ 49” N
Longitude	75^0 10’ 13” E	75^0 14’ 7” E
Altitude	10 m above MSL	100 m above MSL

Floristic composition of each grove was explored and documented during field visits conducted over different seasons from June 2019 to May 2020. Voucher specimens were collected and the plants were documented with photographs. Important field characters about each plant and local names available were also noted. Each species in fresh condition were critically studied and were later identified with the aid of regional floras and checklists (Gamble & Fischer, 1936; Manilal & Sivarajan, 1982; Mathew, 1984; Ramachandran & Nair, 1988; Bhat, 2003, 2014; Anilkumar *et al*., 2005; Nayar *et al*., 2006; Sunil & Sivadasan, 2009; Sasidharan, 2011). The specimens were made into herbarium sheets as per standard herbarium methods given by Jain & Rao (1977). The voucher specimens are deposited at NAS College Kanhangad herbarium. Lists of rare, endemic, endangered and threatened plants were prepared with the help of published works of IUCN (2019), Ravikumar & Ved (2000) and Sasidharan (2011).

III. RESULTS AND DISCUSSION

Present study documented a total of 96 vascular plants from Sarpakavu and 163 species from Shasthakavu. Analysis of floristic diversity of Sarpakavu shows the presence of 91 angiosperms and 5 pteridophytes. Among angiosperms, 84 are dicotyledons and only 7 monocotyledons. Vascular flora of Shasthakavu consists of 163 species coming under 143 genera and 72 families. Out of 163 plants, angiosperms dominate with 158 species followed by 4 pteridophytes and *Gnetum edule* (Willd.) Blume, the lone gymnosperm. Among angiosperms, 144 are dicotyledons and 14 monocotyledons.

These two sacred groves provide shelter for 83 RET plant species coming under 75 genera and 48 families. There are 36 endemic plants followed by 3 endangered, 4 vulnerable, 6 rare, 3 near threatened, 2 low risk, 35 least concern plants, data deficient *Mangifera indica* L. and *Madhuca insignis* (Radlk.) H.J. Lam. coming under extinct category. Of these 83 RET plants, only 26 are found in both the sacred groves, while 22 are unique to Sarpakavu and 35 found only in Shasthakavu (Table No. 2).

Table No. 2 – RET Plants of Edayilakkad Sarpakavu and Cheemeni Shasthakavu

Sl. No.	Botanical Name	Family	Vernacular Name	Status	ED	CH
1	*Acacia caesia* (L.) Willd.	Mimosaceae	Velutha incha	LC		X
2	*Acronychia pedunculata* (L.) Miq.	Rutaceae	Orilatheepettimaram	LC		X
3	*Adenanthera pavonina* L.	Mimosaceae	Manjadi	LC	X	X
4	*Ageratum conyzoides* L.	Asteraceae	Kattappa	LC	X	X
5	*Aglaia elaeagnoidea* (A. Juss.) Benth.	Meliaceae	Poochappazham	E, LC	X	X
6	*Amorphophallus commutatus* (Schott) Engl.	Araceae	Kattuchena	E, VU	X	X
7	*Antidesma ghaesembilla* Gaertn.	Euphorbiaceae	Kattupulinchi	LC	X	
8	*Aporosa cardiosperma* (Gaertn.) Merr.	Euphorbiaceae	Aechil, Vetti	VU	X	X
9	*Artocarpus hirsutus* Lam.	Moraceae	Anjili	E, VU	X	X
10	*Aspidopterys canarensis* Dalzell	Malpighiaceae	Kannaram valli	E, VU		X
11	*Briedelia stipularis* (L.) Blume	Euphorbiaceae	Cherupanachi	E	X	X
12	*Bulbophyllum sterile* (Lam.) Suresh	Orchidaceae	Mookittakkaya	E	X	X
13	*Calamus hookerianus* Becc.	Arecaceae	Kallanchooral	E	X	
14	*Caryota urens* L.	Arecaceae	Aanappana	LC		X
15	*Celastrus paniculatus* Willd.	Celastraceae	Jyothishmathi	VU		X
16	*Celtis tetrandra* Roxb.	Ulmaceae	Poochakkurumaram	LC		X
17	*Celtis timorensis* Span.	Ulmaceae	Poochakkurumaram	LC		X
18	*Cinnamomum malabatrum* (Burm.f) J. Presl	Lauraceae	Vazhana	E	X	
19	*Connarus wightii* Hook.f.	Connaraceae	Kurinjil	E		X
20	*Dalbergia horrida* (Dennst.) Mabb.	Papilionaceae	Aanamullu	E	X	X
21	*Dichapetalum gelonioides* (Roxb.) Engl.	Dichapetalaceae	Cherumaram	LC		X

22	*Dioscorea wallichii* Hook.f.	Dioscoreaceae	Kattukizhangu	LC		X
23	*Dipteracanthus prostratus* (Poir.) Nees	Acanthaceae	Velipadakkam	E	X	X
24	*Euonymus indicus* B. Heyne ex Wall.	Celastraceae	Malamkuratha	E, LC	X	
25	*Ficus drupacea* Thunb.	Moraceae	Kallal	LC	X	X
26	*Ficus exasperata* Vahl.	Moraceae	Parakam	LC		X
27	*Garcinia morella* (Gaertn.) Desr.	Clusiaceae	Chigiri	NT		X
28	*Garcinia talbotii* Raizada ex Santapau	Clusiaceae		E		X
29	*Geissaspis cristata* Wight & Arn.	Papilionaceae	Muthirapullu	LC		X
30	*Genianthus laurifolius* (Roxb.) Hook.f.	Asclepiadaceae		R		X
31	*Gloriosa superba* L.	Liliaceae	Menthonni	VU	X	
32	*Glycosmis pentaphylla* (Retz.) DC	Rutaceae	Kuttipanal	LC		X
33	*Gnetum edule* (Willd.) Blume	Gnetaceae	Karuthodal	LC		X
34	*Gomphia serrata* (Gaertn.) Kanis	Ochnaceae	Chavetti	LC	X	X
35	*Grewia gamblei* J. R. Drumm.	Tiliaceae		E, EN	X	
36	*Gymnostachyum febrifugum* Benth.	Acanthaceae	Nilamucchala	E	X	X
37	*Holigarna arnottiana* Hook.f.	Anacardiaceae	Cheru	E	X	
38	*Holigarna ferruginea* Marchand	Anacardiaceae	Cheru	E	X	
39	*Hopea parviflora* Bedd.	Dipterocarpaceae	Urippu	E, LC	X	
40	*Hopea ponga* (Dennst.) Mabb.	Dipterocarpaceae	Irumbakam	E, EN	X	
41	*Hydnocarpus pentandra* (Buch.-Ham.) Oken	Flacourtiaceae	Marotti	E, VU	X	
42	*Hymenodictyon obovatum* Wall.	Rubiaceae	Malamkalli	E		X
43	*Impatiens minor* (DC) Bennet	Balsaminaceae	Mashithandu	E	X	X
44	*Ixora brachiata* Roxb.	Rubiaceae	Marachekki	E		X
45	*Ixora polyantha* Wight	Rubiaceae	Kattuchethi	E	X	
46	*Jasminum malabaricum* Wight	Oleaceae	Kattumulla	E		X
47	*Leea indica* (Burm.f.) Merr.	Leeaceae	Njazhuku	LC	X	
48	*Lindernia crustacea* (L.) F. Muell	Scrophulariaceae		LC	X	
49	*Litsea ghatica* Saldanha	Lauraceae	Elukootti	E		X
50	*Madhuca insignis* (Radlk.) H.J. Lam.	Sapotaceae	Iluppa	E, R, EX	X	
51	*Madhuca neriifolia* (Moon) H.J. Lam.	Sapotaceae	Iluppa	LR	X	
52	*Mallotus philippensis* (Lam.) Muell. Arg.	Euphorbiaceae	Kurangumanjal	LC		X
53	*Mangifera indica* L.	Anacardiaceae	Mavu	DD	X	X
54	*Memecylon randerianum* S.M. Almeida & M.R. Almeida	Melastomataceae	Kaikkathechi	E	X	X
55	*Mimosa pudica* L.	Mimosaceae	Thottavadi	LC	X	X
56	*Mimusops elengi* L.	Sapotaceae	Elengi	LC	X	X
57	*Morinda umbellata* L.	Rubiaceae	Neyvalli	R	X	
58	*Murdannia semiteres* (Dalzell) Santapau	Commelinaceae		E, LC	X	X
59	*Mussaenda frondosa* L.	Rubiaceae	Vellila	E	X	X
60	*Naregamia alata* Wight & Arn.	Meliaceae	Nilanaragam	E	X	X
61	*Nothapodytes nimmoniana* (J. Graham) Mabb.	Icacinaceae	Peenari	LR		X
62	*Olax imbricata* Roxb.	Olacaceae	Mannankoran kodi	R		X
63	*Olea dioica* Roxb.	Oleaceae	Edana	E	X	X
64	*Pavetta hispidula* Wight & Arn.	Rubiaceae	Vella pavetta	R	X	
65	*Pennisetum polystachyon* (L.) Schult.	Poaceae	Poochaval pullu	LC	X	X
66	*Phaulopsis imbricata* (Forssk.) Sweet	Acanthaceae		LC		X
67	*Pseudarthria viscida* (L.) Wight & Arn.	Papilionaceae	Moovila	VU		X
68	*Remusatia vivipara* (Roxb.) Schott	Araceae	Marachembu	R	X	
69	*Salacia fruticosa B.* Heyne ex M. A. Lawson	Hippocrateaceae	Ponkarandi	E		X
70	*Santalum album* L.	Santalaceae	Chandanam	VU		X
71	*Schleichera oleosa* (Lour.) Merr.	Sapindaceae	Poovam	LC		X
72	*Scleria lithosperma* (L.) Sw.	Cyperaceae	Nakkupullu	LC	X	
73	*Senna alata* (L.) Roxb.	Caesalpiniaceae	Aanathakara	LC	X	
74	*Strychnos dalzellii* C. B. Clarke	Loganiaceae	Vallikanjiram	E	X	
75	*Syzygium caryophyllatum* (L.) Alston	Myrtaceae	Njara	EN	X	X
76	*Syzygium cumini* (L.) Skeels	Myrtaceae	Njaval	LC		X
77	*Tabernaemontana alternifolia* L.	Apocynaceae	Koonampala	E, NT		X
78	*Tinospora sinensis* (Lour.) Merr.	Menispermaceae	Kattamruthu	NT	X	X
79	*Trema orientalis* (L.) Blume	Ulmaceae	Pottamaram	LC		X
80	*Wrightia tinctoria* (Roxb.) R.Br.	Apocynaceae	Danthappala	LC		X
81	*Xylia xylocarpa* (Roxb.) Taub.	Mimosaceae	Irul	LC		X

82	*Zanthoxylum rhetsa* (Roxb.) DC.	Rutaceae	Mullilam	LC		X
83	*Ziziphus oenoplia* (L.) Mill.	Rhamnaceae	Choorimullu	LC	X	X

CH – Cheemeni, DD – Data Deficient, E – Endemic, ED – Edayilakkad, EN – Endangered, EX – Extinct, LC- Least Concern, LR – Low Risk, NT – Near Threatened, R – Rare, VU – Vulnerable.

Detailed study of RET plants of Sarpakavu showed the presence of 48 such plants coming under 45 genera and 33 families. These include 26 endemic, 3 endangered, 5 vulnerable, 4 rare, 17 least concern, near threatened *Tinospora sinensis* (Lour.) Merr., extinct *Madhuca insignis* (Radlk.) H.J. Lam., data deficient *Mangifera indica* L. and low risk facing *Madhuca neriifolia* (Moon) H.J. Lam. plants (Fig. No. 1). *Madhuca insignis* (Radlk.) H.J. Lam. is a plant which was thought to be extinct was rediscovered after a long gap of 120 years from Udupi district of Karnataka in 2003. Later extended distribution of this species were reported from Dakshina Kannada district of Karnataka in 2004, Kasaragod district of Kerala in 2013 and Shimoga district of Karnataka in 2014 (Shenoy *et al*., 2014). Perusal of IUCN Red list (IUCN, 2019) reveals that this plant is still under extinct category (EX) of IUCN. This indicates the urgent need for further explorations, validation and timely updation of present status of plants.

Analysis of RET plants of Shasthakavu showed the presence of 61 such plants coming under 57 genera and 40 families. Further there are 26 endemic, 7 vulnerable, endangered *Syzygium caryophyllatum* (L.) Alston., 29 least concern, 2 rare, 3 near threatened, 2 low risk and data deficient *Mangifera indica* L. plants (Fig. No. 2). Comparative account of floristic details and status of plants present in these sacred groves is given in Table No. 3.

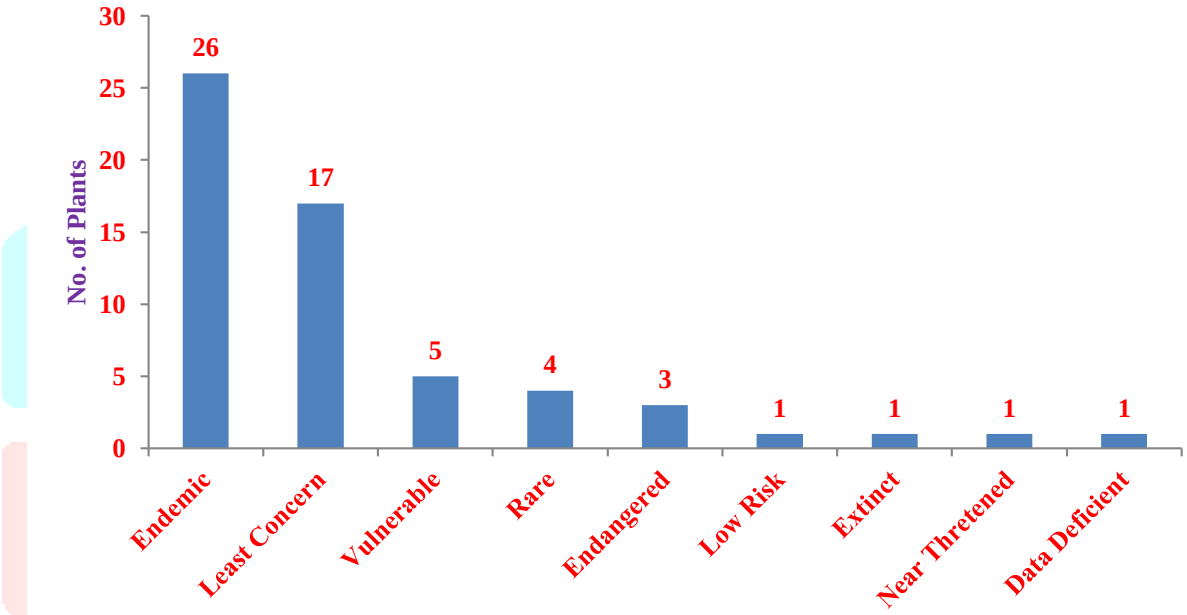

Fig. No. 1 - RET Plants of Sarpakavu

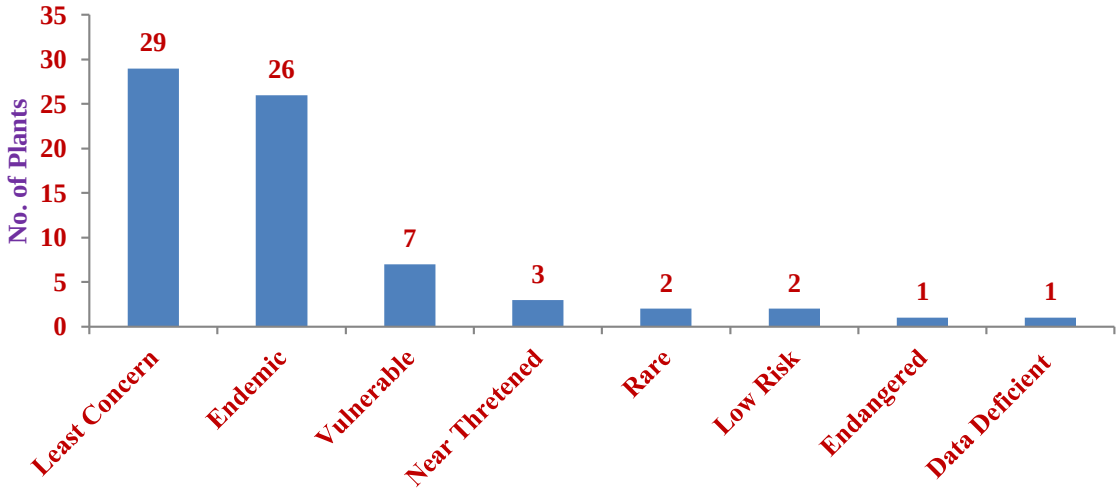

Fig. No. 2 - RET Plants of Shasthakavu

Table No. 3 – Comparative account of Sarpakavu and Shasthakavu

Details	Sarpakavu	Shasthakavu
Vascular Plants (Species)	96	163
Angiosperms	91	158
Dicotyledons	84	144
Monocotyledons	07	14
Gymnosperms	0	1
Pteridophytes	5	4
RET Plants	48 (50%)	61 (37.4%)
Endemic Plants	26 (27.1%)	26 (15.9%)
Vulnerable	5 (5.2%)	7 (4.3%)
Least Concern	17 (17.7%)	29 (17.8%)
Rare	4 (4.2%)	2 (1.2%)
Endangered	3 (3.1%)	1 (0.6%)
Near Threatened	1 (1.04%)	3 (1.8%)
Low Risk	1 (1.04%)	1 (0.6%)
Data Deficient	1 (1.04%)	1 (0.6%)
Extinct	1 (1.04%)	0

Important RET Plants of Edayilakkad Sarpakavu and Cheemeni Shasthakavu

Amorphophallus commutatus

Aporosa cardiosperma

Artocarpus hirsutus

Aspidopterys canarensis

Celastrus paniculatus

Gloriosa superba

Hopea ponga

Hydnocarpus pentandra

Madhuca insignis

Pseudarthria viscida

Santalum album

Syzygium caryophyllatum

The land area of Sarpakavu is higher (6.46 ha) when compared to that of Shasthakavu (3.83 ha). The endemic plant percentage is 27.1% in Sarpakavu and 15.9% in Shasthakavu. There are 26 endemic plants each in both the groves and only 14 endemic plants are common. Rare plant number and percentage are also much higher in Sarpakavu with 4 (4.2%) plants when compared with Shasthakavu having 2 (1.2%) rare plants. These rare plants are unique as there is none in common. Same is in the case of endangered plants also. Sarpakavu has 3 endangered plants while Shasthakavu has only one endangered plant, *Syzygium caryophyllatum* (L.) Alston. *Syzygium caryophyllatum* (L.) Alston. is found in both the groves. Number of vulnerable plants is more in Shasthakavu as there are 7 such plants against 5 in Sarpakavu. 3 vulnerable species are found in both the groves. Among different IUCN categories, maximum representation comes under the category least concern as there are 29 and 17 such plants in Shasthakavu and Sarpakavu respectively. Among these, only 10 plants are of common occurrence. There are 3 near threatened plants in Shasthakavu and only one in Sarpakavu. *Tinospora sinensis* (Lour.) Merr. is the near threatened plant in common. *Madhuca neriifolia* (Moon) H.J. Lam. is the plant coming under low risk category with its presence at Sarpakavu while *Nothapodytes nimmoniana* (J. Graham) Mabb. is the plant under same category at Shasthakavu. Sarpakavu offers refuge to *Madhuca insignis* (Radlk.) H.J. Lam, which is still under extinct category in IUCN red list.

From the present inventory, it is clear that though these two groves differ much in their physiographic features they are rich in floristic diversity. Only 26 RET plants are common to both the groves while others are unique. Present study reveals the fact that these sacred groves act as a nursery and repository of many plants coming under endemic, rare, endangered and threatened categories. Sarpakavu, a coastal sacred grove even though poor in total number of plants but much richer in terms of RET plant diversity. Percentage of endemic, rare, endangered, vulnerable and low risk plants is higher in Sarpakavu than in Shasthakavu. Shasthakavu, a midland sacred grove is richer in terms of total number of species as well as plants coming under least concerned and near threatened categories. These groves are serving as seed banks for a variety of wild germplasm and can help in future afforestation programmes, education and research. Plants facing risk of extinction, if preserved in these groves, may have great potential for diverse uses in future.

Like all other sacred groves of Kerala, these two sacred groves are also facing a number of threats. Exposed areas of the groves are already inhabited by exotic weeds such as *Ageratum conyzoides* L., *Blumea laevis* (Lour.) Merr., *Caladium bicolor* (Aiton) Vent., *Cayratia trifolia* (L.) Domin., *Celosia argentea* L., *Centrosema molle* Mart. ex Benth., *Chromolaena odorata* (L.) R. M. King & H. Rob., *Corchorus aestuans* L., *Crassocephalum crepidioides* (Benth.) S. Moore, *Hyptis suaveolens* (L.) Poit., *Lantana camara* L., *Pedilanthus tithymaloides* L., *Pennisetum polystachion* (L.) Schult., *Stylosanthes fruticosa* (Retz.) Alston etc. If unchecked these will become a great threat to the wild germplasm in the near future. Both the groves are inhabited by monkeys, making them places of tourist attraction. Dumping of waste and plastic by the visitors is another threat. Sarpakavu has public road on one side while Shasthakavu has road on three sides. Pollution from the vehicles also adds to the threats. Shasthakavu is having rubber plantations on one side and pesticide pollution from this monoculture plantation is another threat to this sacred grove.

Sacred groves were preserved because of fear of deity and cultural importance. The rules and taboos used to protect the groves are crumbling and nowadays sacred groves are on a path of losing their prominence. Due to urbanization and industrialization there is rapid depletion or shrinkage of sacred groves. Loss of faith, introduction of monoculture plantations, entry of exotic weeds, construction of public roads, tress passing, tourism, grazing, dumping of waste, tree felling, over exploitation and sanskritisation are other major threats faced by these sacred groves. Hence, it is necessary to evolve strategies for effective conservation and management of these two sacred groves, namely Edayilakkad Sarpakavu and Cheemeni Shasthakavu.

IV. ACKNOWLEDGEMENTS

The authors are thankful to the Principal and Management, Nehru Arts and Science College Kanhangad for providing the necessary facilities. Authors express their sincere thanks to the stake holders of Edayilakkad Sarpakavu and Cheemeni Shasthakavu for giving permission for the visit and detailed study.

V. REFERENCES

[1] Anil Kumar, N., Sivadasan, M. and Ravi, N. 2005. Flora of Pathanamthitta. Daya Publishing House, Delhi.

[2] Bhandari, M. J. and Chandrasekhar, K. R. 2003. Sacred Groves of Dakshina Kannada and Udupi Districts of Karnataka. Current Science, 85(12): 1655 – 1656.

[3] Bhat, K. G. 2003. Flora of Udupi. Indian Naturalist (R), Udupi.

[4] Bhat, K. G. 2014. Flora of South Kanara. Taxonomy Research Centre, Poornaprajna College, Udupi.

[5] Chandran, M. D. S., Gadgil, M. and Hughes, J. D. 1998. Sacred groves of the Western Ghats. pp: 211 – 232. In: Conserving the Sacred for Biodiversity Management. (Ed. By Ramakrishnan, P. S., Saxena, K. G. and Chandrashekara, U. M.) Oxford & IBH, New Delhi.

[6] Chandrashekara, U. M. and Sankar, S. 1998. Structure and functions of sacred groves: Case studies in Kerala. pp: 323 – 335. In: Conserving the Sacred for Biodiversity Management. (Ed. by Ramakrishnan, P. S., Saxena, K. G. and Chandrashekara, U. M.) Oxford & IBH, New Delhi.

[7] Deb, D. K., Deuti. and Malhotra, K. C. 1997. Sacred grove relic as bird refugia. Current Science. 73 (10): 279 – 280.

[8] Deepa, M. R., Sheema Dharmapal, P. and Udayan, P. S. 2016. Floristic diversities and medicinal importance of sacred groves in Thrissur district, Kerala. Tropical Plant Research. 3 (1): 230 – 242.

[9] Gadgil, M. and Vartak, V. D. 1976. The sacred groves of Western Ghats in India. Economic Botany. 30: 152 – 160.

[10] Gamble, J. S. and Fischer, C. E. C. 1936. Flora of Presidency of Madras Vol. I – III. Adlard & Son Ltd., London.

[11] Gokhale, Y., Velankar, R., Chandran, M. D. S. and Gadgil, M. 1998. Sacred woods, grasslands and water bodies as self-organized systems of conservation. pp: 365 – 398. In: Conserving the Sacred for Biodiversity Management. (Ed. by Ramakrishnan, P. S., Saxena, K. G. and Chandrashekara, U. M.) Oxford & IBH, New Delhi.

[12] Harikrishnan Nair, G., Gopikumar, K., Pramod, G., Krishnan and Sunil Kumar, K. K. 1997. Sacred groves of India – Vanishing greenery. Current Science. 72 (10): 697 – 698.

[13] IUCN. 2019. The 2019 IUCN Red list of Threatened species. IUCN, Gland, Switzerland.

[14] Jain, S. K. and Rao, R. R. 1977. Field and Herbarium Methods. Today & Tomorrow Printers and Publishers, New Delhi.

[15] Jayarajan, M. 2004. Sacred Groves of North Malabar. Discussion paper No. 92, KRPLLD.

[16] Karunakaran, P. V., Balasubramanian, M. and Ramesh, B. R. 2005. Conservation and Management of Sacred Groves in Kerala as Community Reserves. Institute of Forest Genetics and Tree Breeding, Coimbatore, India, pp: 233 – 238.

[17] Malhotra, K. C. 1998. Anthropological dimensions of sacred groves in India: an overview. pp: 423 – 438. In: Conserving the Sacred for Biodiversity Management. (Ed. by Ramakrishnan, P. S., Saxena, K. G. and Chandrashekara, U. M.) Oxford & IBH, New Delhi.

[18] Malhotra, K. C., Gokhale, Y. and Chatterjee, S. 2000. Cultural and Ecological Dimensions of Sacred groves in India. Indira Gandhi Rashtriya Manav Sangrahalaya, Bhopal.

[19] Manilal, K. S. and Sivarajan, V. V. 1982. Flora of Calicut. Bishen Singh Mahendra Pal Singh, Dehradun.

[20] Mathew, K. M. 1984. The Flora of Tamilnadu Carnatic Vol. I – III. The Rapinat Herbarium, St. Joseph's College, Thiruchirapalli.

[21] Nayar, T. S., Rasiya Beegam, A., Mohanan, N. and Rajkumar, G. 2006. Flowering Plants of Kerala. TBGRI, Palode.

[22] Oommen, S., Ved, D. K. and Krishnan, R. 2000. Tropical Indian Medicinal Plants Propagation Methods.

Foundation for Revitalisation of Local Health Traditions (FRLHT), Bangalore, India.

[23] Pushpangadan, P., Rajendraprasad, M. and Krishnan, P. N. 1998. Sacred groves of Kerala- A synthesis on the State. pp: 193 – 209. In: Conserving the Sacred for Biodiversity Management. (Ed. by Ramakrishnan, P. S., Saxena, K. G. and Chandrashekara, U. M.) Oxford & IBH, New Delhi.

[24] Ramachandran, V. S. and Nair, V. J. 1988. Flora of Cannanore. BSI, Calcutta.

[25] Ravikumar, K. and Ved, D. K. 2000. 100 Red-Listed Medicinal Plants of Conservation Concern in Southern India. FRLHT, Bangalore.

[26] Sasidharan, N. 2011. Flowering Plants of Kerala. ver. 2. 0. KFRI, Peechi, Kerala.

[27] Shenoy, H. S., Rajasekharan, P. E., Karpakal, S. and Anand, M. 2014. Extended distribution of *Madhuca insignis* (Radlk.) H. J. Lam. (Sapotaceae) – A critically endangered species in Shimoga district of Karnataka. Zoo's Print. 29 (6): 21 – 23.

[28] Sunil, C. N. and Sivadasan, M. 2009. Flora of Alappuzha District, Kerala, India. Bishen Singh Mahendra Pal Singh, Dehradun.