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Research article

ENDEMIC PLANT DIVERSITY IN SELECTED SACRED GROVES OF KASARAGOD DISTRICT, KERALA

K. Subrahmanya Prasad[1*] and K. Raveendran[1]

[1]Dept. of Botany, Sir Syed College, Taliparamba – 670 142, Kerala

[1*]Corresponding author (Research Associate, Dept. of Botany, Sir Syed College, Taliparamba – 670 142, Kerala, India). E. mail prasadks.1090@rediffmail.com

ABSTRACT: Sacred groves are one of the finest examples of traditional *in situ* conservation practices and act as treasure house of endemic, endangered and rare plants. Endemic species of any geographical region throw light on the biogeography of the area, areas of extinction and evolution of the flora. Six famous sacred groves of Kasaragod District, Kerala were selected for documentation of floristic diversity with special reference to endemic as well as RET plants and to know threats to them. Present inventory accounted for a total of 81 endemic angiosperms, of which 23 qualify for RET categories. Their role in germplasm conservation is evident from the fact that only three plants are common to all the groves and 52 endemic plants are restricted to any one of the groves. Out of 23 RET plants 15 are highly traded for medicinal purposes. Like other groves of Kerala, these also facing the threat of extinction from increasing anthropogenic activities and there is an urgent need of complete protection and public awareness for the existence of these near-climax communities.

Key words: Sacred groves, Kasaragod, Endemic plants, Threats, Conservation.

INTRODUCTION

Sacred groves are one of the finest examples of traditional *in situ* conservation practices, which dates much prior to the modern concept of wildlife reserves. These are patches of natural near-climax vegetation, managed as a part of local cultural tradition. Sacred groves are found in a wide range of ecological situations, from coast to the Ghats [1]. The area of a sacred grove varies from a few trees to about 20 hectares. Each grove has a patron deity and folklore associated with it [2]. Extensive studies conducted from biological conservation point of view indicated that they are the treasure house of medicinal, rare, endemic and endangered plants [3 – 7]. These act as last shelters of natural forests and are the indicators of the rich vegetation that had existed in the past. These are the store houses of germplasm of wild yams, pepper, mango and a variety of ayurvedic as well as folk medicinal plants [8]. Sacred groves are important because about 60 % of the regenerating species in them are medicinally important and nearly 40% medicinal plants are unique to them [9]. In Kerala sacred groves are mainly distributed in plains, numbering about 2000 [10] of which 252 are in Kasaragod [11]. At present most of the sacred groves are on a path of gradual decline owing to various socio-economic factors [8]. Like other groves of Kerala sacred groves of Kasaragod also facing the threat of extinction from increasing anthropogenic activities.

Endemic plants are the population with narrow ecological restrictions. Endemic species of any geographical region, throw light on the biogeography of the area, areas of extinction and evolution of the flora [12]. Identification and documentation of RET species is important in the conservation of biodiversity as these have specific ecological niches [13]. Present studies were mainly aimed at the exploration of endemic, RET and medicinal plant diversity of sacred groves and also to know the threats to them.

METHODOLOGY

Area selected for study is Kasaragod district of Kerala within the geographical limits 11° 18' to 12° 48' N latitude and 74° 52' to 75° 26' E longitude. Topographically the area consists of a narrow coastal belt, undulating midland and mountainous high range. The climate is typical warm-humid tropical type with mean temperature range of 22 – 37^{o} C and relative humidity between 70% and 90%. Studies were conducted from January 2007 to December 2009. Six famous sacred groves namely *Kammadam*, *Karakka*, *Kayyur*, *Mapittacchery*, *Paliyeri* and *Paramel Kavu* with an extent of over 2 acres were selected for detailed study, of which *Kammadam Kavu* has an area of about 55 acres. Extensive field visits were carried out to document the floristic diversity. The plants were collected and identified with the aid of regional floras [14 – 20] and herbaria. The voucher specimens were deposited at the SSC herbaria. Personal cross-interview of knowledgeable local people with questionnaire and authentic literature reference [21 – 28] were performed to ascertain the economic importance of the plants.

RESULTS AND DISCUSSION

The vegetation of these groves is of secondary semi-evergreen type. Endemic plants, their distribution and status are shown in Table 1. Critical observation of endemic plant diversity in these groves revealed the presence of 81 endemic angiosperms of which 49 are well known for their healing properties. Of these 23 falls under RET categories as there are 11 vulnerable, 8 rare, 2 endangered plants, critically endangered *Syzygium travancoricum* Gamble and nearly threatened *Tabernaemontana heyneana* Wall. Among 81 endemic plants, *Dalbergia horrida* (Dennst.) Mabb., *Holigarna arnottiana* Hook. f. and *Mussaenda belilla* Buch-Ham. are common to the groves studied while 52 are restricted to any one of the groves. *Kammadam* sacred grove, one of the largest sacred groves of Kerala forms most important gene pool due to the presence of 45 endemic and 13 RET species. *Karakka*, *Kayyur*, *Mapittacchery*, *Paliyeri* and *Paramel Kavu* accounted for 18, 14, 14, 18 and 32 endemic plants respectively. Of the 23 RET species 15 are highly traded for medicinal purposes. Plant composition in each grove and their importance is given in Table 2.

Table 1. Distribution of endemic plants

Sl No	Botanical name	Status	K	KR	KY	MP	P	PA
1	*Actinodaphne bourdillonii* Gamble	LC	X					
2	*Aglaia barberi* Gamble	R	X		X			
3	**Aglaia elaeagnoidea* (A. Juss.) Benth.	LC						X
4	**Amorphophallus commutatus* (Schott) Engl.	LC	X					
5	**Ampelocissus indica* (L.) Planch	R	X					
6	*Aneilema ovalifolium* (Wight) Hook. f.	R	X					
7	**Artocarpus hirsutus* Lam.	V	X				X	
8	*Aspidopterys canarensis* Dalz.	V	X				X	
9	**Begonia canarana* Miq.	R, E	X					
10	**Briedelia scandens* (Roxb.) Willd.	LC	X		X			X
11	**Bulbophyllum sterile* (Lam.) Suresh	LC		X			X	X
12	**Calamus thwaitesii* Bec. & Hook. f.	LC	X					
13	**Calophyllum calaba* L.	R	X					
14	*Chionanthus mala-elengi* (Dennst) P.S.Green	LC	X					
15	**Cinnamomum malabatrum* (Burm. f.) Blume	LC	X					
16	**Curcuma oligantha* Trimen	LC	X	X	X	X		X
17	*Cyanotis papilionacea* (L.) Schult. f.	LC						X
18	**Dalbergia horrida* (Dennst.) Mabb.	LC	X	X	X	X	X	X
19	**Dendrobium ovatum* (L.) Kranz.	LC						X

20	*Derris brevipes* (Benth) Baker	LC		X			X	
21	**Diospyros candolleana* Wight	LC						X
22	*Eranthemum capense* L.	LC			X	X		
23	*Euphorbia katrajensis* Gaje.	LC						X
24	*Ficus beddomei* King	LC						X
25	**Flacourtia montana* Graham	LC	X					
26	*Flagellaria indica* L.	R					X	
27	*Genianthus laurifolius* (Roxb.) Hook. f.	R	X					
28	*Globba ophioglossa* Wight	LC	X					
29	*Glochidion johnstonei* Hook. f.	LC	X					
30	**Gloriosa superba* L.	V		X		X		
31	**Grewia umbellata* Mast.	LC				X		
32	*Gymnema hirsutum* Wight & Arn.	LC						X
33	**Gymnostachyum febrifugum* Benth.	LC	X					
34	*Helicanthes elastica* (Dest.) Danser	LC			X			
35	**Holigarna arnottiana* Hook. f.	LC	X	X	X	X	X	X
36	**Hopea parviflora* Bedd.	LC					X	
37	**Hopea ponga* (Dennst.) Mabb.	V		X				X
38	**Hydnocarpus pentandra* (Buch.-Ham.) Oken.	V	X	X	X	X	X	
39	**Impatiens minor* (DC) Bennet	LC		X		X	X	X
40	**Ixora brachiata* Roxb. ex DC.	LC	X		X	X		X
41	*Ixora leucantha* Heyne ex G. Don	LC	X			X		X
42	*Ixora polyantha* Wight	LC	X		X			
43	**Jasminum malabaricum* Wight	LC		X			X	X
44	**Justicia betonica* L.	LC	X					
45	*Justicia trinervia* Vahl.	LC						X
46	**Knema attenuata* Hook. f. & Thoms.	LC	X				X	
47	**Lagerstroemia microcarpa* Wight	LC	X					
48	**Lepidagathis keralensis* Madhu. & Singh	LC						X
49	**Leucas biflora* (Vahl.) R. Br.	LC			X			
50	**Loeseneriella arnottiana* (Wight) A. C. Smith	LC	X	X				X
51	**Memecylon randerianum* S M & M R Almeida	LC	X	X		X		X
52	*Miquelia dentata* Bedd.	R	X					
53	*Morinda reticulata* Gamble	R				X		
54	**Moullava spicata* (Dalz.) Nicols	LC	X		X			
55	*Murdannia semiteres* (Dalz.) Sant.	LC		X				X
56	**Mussaenda belilla* Buch.-Ham.	LC	X	X	X	X	X	X
57	*Myristica fatua* Houtt.	E					X	
58	**Myristica malabarica* Lam.	V	X				X	
59	**Naregamia alata* Wight & Arn.	LC		X				X
60	*Oberonia brunoniana* Wight	LC						X
61	**Ochlandra travancorica* (Bedd.) Benth. ex. Gamble	LC	X					
62	**Ochreinauclea missionis* (Wall. ex G. Don.) Ridsd.	V					X	
63	*Phoebe lanceolata* Nees.	LC	X					
64	**Psychotria dalzellii* Hook. f.	LC						X
65	*Psychotria flavida* Talbot.	LC	X					

66	**Quisqualis malabarica* Bedd.	LC	X					
67	*Reissantia indica* (Willd.) Halle	LC						X
68	*Rotala macrandra* Koehne	LC					X	
69	**Salacia fruticosa* Heyne ex Lawson	LC	X					
70	**Santalum album* L.	V		X				
71	*Smithia salsuginea* Hance	LC						X
72	**Stachyphrynium spicatum* (Roxb.) Schum.	LC	X		X			
73	**Strobilanthes ciliatus* Nees	V	X					
74	*Strobilanthes integrifolius* (Dalz.) O. Ktze.	LC						X
75	**Syzygium travancoricum* Gamble	C E					X	
76	**Tabernaemontana heyneana* Wall.	N T	X	X		X		X
77	**Terminalia paniculata* Roth.	LC	X					X
78	**Tinospora sinensis* (Lour.) Merr.	V						X
79	**Vateria indica* L.	V		X				
80	**Ventilago denticulata* Willd.	LC	X					
81	*Zingiber cernuum* Dalz.	LC	X					

where '*' stands for medicinal, R – rare, E – endangered, V – vulnerable, CE – critically endangered, NT – near threatened, LC – least concerned, K – *Kammadam*, KR – *Karakka*, KY – *Kayyur*, MP – *Mapittacchery*, P – *Paliyeri* and PA – *Paramel Kavu*.

Table 2. Plant composition and percentage of economically important plants

Category	K	KR	K Y	MP	P	PA
Vascular plants	234	146	132	121	141	167
Trees	75	31	30	28	32	38
Shrubs	42	23	24	23	20	34
Herbs	44	61	31	39	47	51
Climbers	73	31	47	31	42	44
Medicinal plants	161 (69%)	108 (74%)	112 (85%)	96 (79%)	101 (72%)	109 (65%)
Edible plants	48 (21%)	32 (22%)	41 (31%)	37 (31%)	31 (22%)	38 (23%)
Endemic plants	45 (19%)	18 (12%)	14 (11%)	14 (12%)	18 (13%)	32 (19%)

where, K – *Kammadam*, KR – *Karakka*, KY – *Kayyur*, MP – *Mapittacchery*, P – *Paliyeri* and PA – *Paramel Kavu*.

CONCLUSION

The percentage of medicinal plants in these groves varies from a minimum of 65 in *Paramel Kavu* to a maximum of 85 in *Kayyur*. The maximum percentage of endemic plants is 19 both in *Kammadam* and *Paramel Kavu*. This much richness in species diversity makes these groves biological hotspots. Like other groves of Kerala anthropogenic activities like collection of firewood, dumping of waste and many antisocial elements are the major threats for the gene pool of these fragile ecosystems. Their presence in agriculture lands, grazing, fragmentation and erosion of religious beliefs are also the added influence of anthropogenic activities. Thus conservation of biodiversity of these sacred groves is an urgent need. For effective conservation fencing of the outer perimeter to prevent tress passing, total ban on the exploitation of natural resources from them, allowing entry to those who come for worship and posting security to guard the entry point are recommended.

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