

Studies on the Phytodiversity of a Sacred Grove and its Traditional Uses in Karaikal District, U.T. Puducherry

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Abstract

India is a land of diverse natural resources with the strong traditions of nature conservation practices. The sacred groves are the representatives of climax vegetation and exhibit the diversity of species such as trees, climbers, epiphytes and other shade loving herbs. Well-preserved sacred groves are storehouses of valuable medicinal and other plants having high economic value and serve as a refuge to threatened species. The present paper deals with floristic composition of angiosperms grown in a sacred grove located in Karaikal district and to document its traditional medicinal uses. The present work also elucidates the species composition of 59 plants species of flowering plants which spreads in 55 genera and 30 families. Many rural people in the district were using the plants from the sacred grove to cure many common diseases. This kind of degraded sacred groves should be immediately restored or regenerated using appropriate technologies and by raising awareness among the rural people regarding the importance of sacred grove and its conservation.

Keywords: Sacred groves, Plant diversity, Herbal medicine, Traditional knowledge

INTRODUCTION

India is a land of diverse natural resources with the strong traditions of nature conservation practices. Such traditional practices have been invariably operating in different parts of India. The sacred groves are nothing but reserve forests of the local or rural communities who conserve these patches of vegetation in a religious faith. These groves act as 'natural vegetation preserve' and serve as an example of habitat preservation through community participation [1]. Sacred groves are the repositories of rare and endemic species and can be regarded as the remnant of the primary forest left untouched by the local inhabitants and protected then due to the belief that the deities reside in these forests.

In India, 13,720 sacred groves have been identified in various parts of India. The sacred groves are the representative of climax vegetation and exhibit the diversity of species such as trees, climbers, epiphytes and other shade loving herbs [2]. Many people have described sacred groves in different ways. However, there is an evident fact that wherever sacred groves existed, because of indigenous traditional societies has spiritual relationships with the existing physical environments. The role of sacred groves in the conservation of biodiversity has long been recognized [3-11]. Vartak and Gadgil have traced this historical link of the sacred groves to the pre-agricultural, hunting and gathering societies [12].

Hughes and Chandran [13] have presented an overview on the distribution of sacred groves around the Asia, Africa, Australia, Europe and America. Ramakrishnan [14] has also reported sacred

groves from different parts of India, known by different names given to them in ethnic terms. Many scholars have been working on conservation of sacred groves through socio-cultural practices in different parts of India [15-21]. In Tamil Nadu, 448 groves have been reported from 28 districts of the State [22]. Out of the districts studied, the eastern districts without any forest cover have more number of sacred groves than forested districts on the western side.

Well-preserved sacred groves are storehouses of many valuable medicinal and other plants having high economic value, and serve as a refuge species. Sacred groves are threatened due to anthropogenic pressures such as tourist's interference, celebration of rituals and ceremonies, over-grazing, etc. It is essential to preserve these groves by in-situ and ex-situ conservation, as these are the treasure houses of many important plant species. Earlier sacred groves were indicator of the phenomenon of ethno-environmental management. Our ancestors were fully aware that the natural resources that sustained them must be conserved for the sustenance of future generations. But, at present, fast growth of infrastructural facilities and on-farming activities is the prime cause of deteriorating quality and status of the groves. The present paper deals with floristic composition of plant species grown in a sacred grove located in Karaikal district and to document its traditional medicinal uses of plant species by rural people.

MATERIALS AND METHODS

An floristic survey was carried out in a Sacred Grove size of 0.2 Ha near Sethur village of Thirunallar commune of Karaikal district, Union territory of Puducherry (Fig 1). Karaikal district is one of four erstwhile French establishments of the Union Territory of Puducherry with long coastal border of Bay of Bengal. As a part of fertile delta, the district is completely covered with distributaries of river Kaveri.

The ethnobotanical survey was carried out among local population in their residential areas of the Sethur village. The field visit was conducted several times during year 2010 to the study area.

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Ethnobotanical data were collected according to the methodology suggested by Jain [23] through questionnaire, interviews and discussions among villagers in their local language. Our questionnaire allowed descriptive response on the plant prescribed, such as part of the plant used, medicinal uses, and detailed information about mode of preparation (i.e., decoction, paste, powder and juice), type of usage either fresh or dried and mixtures of other plants used as ingredients. The data was collected from 41 informants between the ages of 34 to 68 of both men and women in the study area. Some of them were accompanied us to the sacred grove where they showed us plants that are used as medicines.

Local healers and villagers were interviewed for preparation and administration of drugs. Herbarium voucher specimens are deposited in Department of Botany at Avvaiyar Govt College for Women, Karaikal – 609 602 U.T of Puducherry, India. Standard methods were followed for to collection of plant materials, drying, mounting, preparation and preservation of plant specimens. Plants collected during the surveys were identified with the help of published regional floras [24, 25]. The identified plant specimens were confirmed with the herbarium (MH) of Botanical Survey of India (BSI), Southern circle, Coimbatore, India. In the enumeration, data were tabulated and arranged in the sequence of serial number, botanical name, family, vernacular name and ethnomedicinal uses (Table 1-3). Ethnomedicinal values of plants were ascertained in consultation with village people using various methods [26-29]. For local uses, a cross section of village populations were interviewed and cross interviewed.

RESULTS

The present study has been carried out on the species composition of plants growing in the sacred grove near Sethur village of Thirunallar commune in the Karaikal district. Fifty nine species of flowering plants which spreads in 55 genera and 30 families were collected and identified during the study period. Habit wise analysis of flora shows comparatively higher percentage of herbs (38.3%) were predominant followed by shrubs (25.0%), trees (23.3%) and climbers (11.6%). The prevalence of microclimatic conditions provided suitable habitats for herb-dominating flora. Of the 30

families, *Euphorbiaceae* is the most of dominant families with 6 species followed by *Rubiaceae* – 5, *Acanthaceae* – 5, *Fabaceae* – 4, *Amaranthaceae* – 4 and *Areaceae*– 4. Most of the families represented in this flora are mainly of tropical in distribution (Table - 1). The 18 families represent one species each, i.e. *Menispermaceae*, *Cappariaceae*, *Malvaceae*, *Oxalidaceae*, *Meliaceae*, *Rhamnaceae*, *Caesalpiniaceae*, *Cactaceae*, *Oleaceae*, *Apocynaceae*, *Boraginaceae*, *Convolvulaceae*, *Solanaceae*, *Verbenaceae*, *Lamiaceae*, *Nyctaginaceae*, *Aristolochiaceae* and *Cyperaceae*. At genus level, *Justicia*, *Tragia*, *Ficus* and *Phonix* showed the maximum diversity with two species (Table-1).

The present study revealed that the local people living nearby the sacred grove were using 41 species of medicinal plants belonging to 20 families to cure various diseases (Table 2). Medicine preparations made from different parts of medicinal plants included whole fresh plant, leaf paste, leaf decoction, boiled leaf, leaf powder, leaf juice, leaf extract, stem paste, latex, bark powder, bark decoction, fruit powder, root decoction and tuber paste were used for treatment of various diseases by the village people. However, fresh plant parts were preferred over dried ones for the preparation of most of the drugs.

Gastro intestinal problems like digestive problems, diarrhoea, dysentery, stomach ache and constipation were treated using specific herbal prescriptions by the rural peoples. Antidotes for insect and animal bites like wasp sting, dog bite, scorpion-sting and snake bite were prepared using herbal formulations developed by the rural people from the sacred grove. Respiratory tract diseases like cold and cough, sinus infection, whooping cough, bronchitis and asthma also treated using common plants. Swellings, Leucorrhoea, skin diseases, joint and muscular pains, urinary diseases and colic pain, diuretic, bleeding piles, intermittent fever, diabetes, biliousness, rheumatism, treatment of boils, paralysis, nervous diseases, pains caused by haemorrhoids, gynaecological disorders, toothache, sore throat, parasitic worms, gout and painful urination and ear maladies also treated by herbal medicines by the rural peoples in the district. Effectiveness of the herbal drug was connected to nature of the disease and dose response. Doses are differing from patient to patient and same patient from time to time based on the cause and effectiveness of the drug.

Table.1 List of Angiospermic plant diversity of a Sacred Grove in the Karaikal District

S. No	Plant Name	Family	Habit
1	<i>Cissampelos pareira</i> L. var. <i>hirsuta</i> (Buch.-Ham. ex DC.) Forman	Menispermaceae	Twiner
2	<i>Crateva magna</i> (Lour.) DC.	Cappariaceae	Tree
3	<i>Sida cordifolia</i> L.	Malvaceae	Herb
4	<i>Biophytum sensitivum</i> (L.) DC.	Oxalidaceae	Herb
5	<i>Azadirachta indica</i> A. Juss.	Meliaceae	Tree
6	<i>Ziziphus oenoplia</i> (L.) Mill.	Rhamnaceae	Straggling shrub
7	<i>Cayratia trifolia</i> (L.) Domin.	Vitaceae	Climber
8	<i>Cissus quadrangularis</i> L.	Vitaceae	Climber
9	<i>Desmodium triflorum</i> (L.) DC.	Fabaceae	Herb
10	<i>Pseudarthria viscida</i> (L.) Wight & Am.	Fabaceae	Herb
11	<i>Rhynchosia minima</i> (L.) DC.	Fabaceae	Climbenig herb
12	<i>Teramnus labialis</i> (L.F.) Spreng.	Fabaceae	Twining herb
13	<i>Cassia fistula</i> L.	Caesalpiniaceae	Tree
14	<i>Acacia nilotica</i> (L.) Willd. ex Del. subsp. <i>indica</i> (Benth) Brenan	Mimosaceae	Tree

15	<i>Albizia lebbek</i> (L.) Willd.	Mimosaceae	Tree
16	<i>Prosopis juliflora</i> (Sw.) Dc.	Mimosaceae	Tree
17	<i>Opuntia dillenii</i> (Ker Gawl.) Haw.	Cactaceae	Shrub
18	<i>Canthium coromandelicum</i> (Burm. F.) Alston	Rubiaceae	Shrub
19	<i>Hedyotis puberula</i> (G.Don) Arn.	Rubiaceae	Herb
20	<i>Morinda pubescens</i> J.E. Smith	Rubiaceae	Tree
21	<i>Spermacoce articularis</i> L.f.	Rubiaceae	Herb
22	<i>Pavetta indica</i> L.	Rubiaceae	Shrub
23	<i>Vernonia cinerea</i> (L.) Less.	Asteraceae	Herb
24	<i>Vicoa indica</i> (L.) DC.	Asteraceae	Herb
25	<i>Jasminum angustifolium</i> (L.) Willd. var. <i>sessiliflorum</i> (Vahl) P.S. Green	Oleaceae	Twiner
26	<i>Cascabela thevetia</i> (L.) Lippold	Apocynaceae	Shrub
27	<i>Calotropis gigantea</i> (L.) R.Br.	Asclepiadaceae	Undershrub
28	<i>Pentatropis capensis</i> (L.f.) Bullock	Asclepiadaceae	Twiner
29	<i>Carmona retusa</i> (Vahl) Masamune	Boraginaceae	Shrub
30	<i>Ipomoea sepiaria</i> Koen.	Convolvulaceae	Climber
31	<i>Solanum insanum</i> J.B.Fisch.	Solanaceae	Undershrub
32	<i>Andrographis echinoides</i> Nees	Acanthaceae	Herb
33	<i>Ecobolium viride</i> (Forssk.) Alston	Acanthaceae	Undershrub
34	<i>Dipteracanthus prostratus</i> (Poir.) Nees	Acanthaceae	Prostrate herb
35	<i>Justicia adhatoda</i> L.	Acanthaceae	Shrub
36	<i>Justicia prostrata</i> (Roxb. ex Clarke) Gamble	Acanthaceae	Prostrate herb
37	<i>Tectona grandis</i> L.f.	Verbenaceae	Tree
38	<i>Ocimum tenuiflorum</i> L.	Lamiaceae	Undershrub
39	<i>Boerhavia diffusa</i> L.	Nyctaginaceae	Prostrate herb
40	<i>Achyranthes aspera</i> L.	Amaranthaceae	Herb
41	<i>Aerva lanata</i> (L.) Juss. ex Schultes	Amaranthaceae	Spreading herb
42	<i>Psilotrichum nudum</i> (Heyne ex Wall.) Moq.	Amaranthaceae	prostrate herb
43	<i>Pupalia lappacea</i> (L.) Juss.	Amaranthaceae	Scrambling herb
44	<i>Aristolochia indica</i> L.	Aristolochiaceae	Climber
45	<i>Croton bonplandianum</i> Baill.	Euphorbiaceae	Herb
46	<i>Euphorbia hirta</i> L.	Euphorbiaceae	Herb
47	<i>Phyllanthus reticulatus</i> Poir.	Euphorbiaceae	Shrub
48	<i>Securinega leucopyrus</i> Willd.	Euphorbiaceae	Shrub
49	<i>Tragia involucrata</i> L.	Euphorbiaceae	Herb
50	<i>Tragia plukenetii</i> R. Smith	Euphorbiaceae	Climbing herb
51	<i>Ficus hispida</i> L.f.	Moraceae	Tree
52	<i>Ficus religiosa</i> L.	Moraceae	Tree
53	<i>Streblus asper</i> Lour.	Moraceae	Shrub or tree
54	<i>Borassus flabellifer</i> L.	Arecaceae	Tree
55	<i>Phoenix pusilla</i> Gaertn	Arecaceae	Shrub
56	<i>Phoenix sylvestris</i> (L.) Roxb.	Arecaceae	Tree
57	<i>Fimbristylis ovata</i> (Burm. F.) Kern	Cyperaceae	Annual herb
58	<i>Chloris barbata</i> Sw.	Poaceae	Perennial herb
59	<i>Eragrostis viscosa</i> (Retz.) Trin.	Poaceae	Annual herb

Table 2. Diversity and indigenous medicinal uses of angiosperms in a Sacred Grove used by the rural peoples of Karaikal District, U.T of Puducherry, India

S. No	Name	Indigenous Name	part used	Medicinal uses
1	<i>Streblus asper</i> Lour. (Moraceae)	Piraya maram	Leaf	Leaf paste is applied topically to treat measles like swellings on the skin.
2	<i>Cissus quadrangularis</i> L. (Vitaceae)	Pirandai	Stem and Leaf	Paste of stem and leaf is taken orally with food for easy digestion and to increase appetite.
3	<i>Boerhavia diffusa</i> L. (Nyctaginaceae)	Mookarattai	Whole plant	The plant is pasted with cumin and taken internally to cure digestive problems.
4	<i>Jasminum angustifolium</i> (L.) Willd. var. <i>sessiliflorum</i> (Vahl) P.S. Green (Oleaceae)	Kuruvilaangkodi	Leaf	The leaf is boiled in water and taken with food to cure diarrhoea.
5	<i>Justicia adhatoda</i> L. (Acanthaceae)	Adathodai	Leaf	The leaf decoction is taken internally to cure cold and cough.
6	<i>Croton bonplandianum</i> Baill. (Euphorbiaceae)	Rail poondu	Leaf	Plant latex is applied externally on the site of wasp sting.
7	<i>Euphorbia hirta</i> L. (Euphorbiaceae)	Ammanpacharisi	Whole plant	Leaf and fruit powder is mixed with cow's milk and taken orally to treat Leucorrhoea and cool the body.
8	<i>Achyranthes aspera</i> L. (Amaranthaceae)	Nayurivi	Leaf	Paste of leaves with onion is applied externally on the bitten site of dog and to cure skin diseases.
9	<i>Ficus religiosa</i> L. (Moraceae)	Arasu	Latex	Latex applied on the surface to relief joint and muscular pains.
10	<i>Securinega leucopyrus</i> Willd. (Euphorbiaceae)	Pulanji	Leaf	Leaf paste mix with tobacco used to destroy worms and sores.
11	<i>Cissampelos pareira</i> L. var. <i>hirsuta</i> (Buch.-Ham. ex DC.) Forman (Menispermaceae)	Appatta	Leaf and Stem	Leaf paste used to cure various skin diseases and stem powder used for cough, urinary diseases and colic pain.
12	<i>Vernonia cinerea</i> (L.) Less. (Asteraceae)	Mookutthipoondu	Leaf and Root	Leaf and root decoction is used to cure asthma
13	<i>Ocimum tenuiflorum</i> L. (Lamiaceae)	Thulasi	Whole plant	leaves are effective against cold, cough and sinus infection.
14	<i>Sida cordifolia</i> L. (Malvaceae)	Nilatutti	Leaf and Root	Leaves used as an infusion in treating fevers and delirium. The roots used for diuretic, bleeding piles and dysentery.
15	<i>Biophytum sensitivum</i> (L.) DC. (Oxalidaceae)	Nilaccurunki	Leaf and Root	Root decoction used for fever and leaf paste used to heal wounds and cuts to stop bleeding.
16	<i>Calotropis gigantea</i> (L.) R.Br. (Asclepiadaceae)	Erukku	Whole plant	Plant used to cure of leprosy and also used for the treatment of dysentery
17	<i>Cascabela thevetia</i> (L.) Lippold (Apocynaceae)	Pacha arali	Leaf and Seed	Leaf and bark decoction is used to cure for intermittent fever.
18	<i>Cassia fistula</i> L. (Caesalpinaceae)	Sarakkondrai	Leaf and Seed	Leaves are used for rheumatism and to reduce irritation and bark used to treat dysentery
19	<i>Ficus hispida</i> L.f. (Moraceae)	Peyatthi	Leaf and Bark	Leaf and bark powder used as a found very well in rheumatic headache.
20	<i>Crateva magna</i> (Lour.) DC. (Cappariaceae)	Mavalingam		Leaf and bark powder used for asthma and bronchitis.
21	<i>Azadirachta indica</i> A. Juss. (Meliaceae)	Vaepam	Leaf and Seed	Leaves as poultice applied to boils. Neem seed oil used for the birth control and bark for diabetes treatment.
22	<i>Cayratia trifolia</i> (L.) Domin. (Vitaceae)	Kattuppirantai	Tuber	Paste of tuber applied on the affected part of snake bite.
23	<i>Desmodium triflorum</i> (L.) DC. (Fabaceae)	Sirupulladi	Leaf and Root	Leaf applied to wounds, dysentery, and abscesses. Root tonic used as an diuretic, cough and asthma.
24	<i>Pseudarthria viscida</i> (L.) Wight & Am. (Fabaceae)	Moovilai	Whole plant	Plant used for biliousness, rheumatism, and asthma.
25	<i>Rhynchosia minima</i> (L.) DC. (Fabaceae)	Kaliyan tuvarai	Leaf	Leaf paste used for treatment of boils.
26	<i>Teramnus labialis</i> (L.F.) Spreng. (Fabaceae)	Mashaparuni	Whole plant	plant used for rheumatism, paralysis, and nervous diseases
27	<i>Prosopis chilensis</i> (Molina) stuntz (Mimosaceae)	Vaelikaruvai	Bark	Bark used as an remedy in rheumatism and scorpion-sting.
28	<i>Opuntia dillenii</i> (Ker Gawl.) Haw. (Cactaceae)	Chappathikkalli	Leaf	Leaf juice applied to cure of asthma, burning, whooping cough and fever.
29	<i>Hedyotis puberula</i> (G.Don) Am. (Rubiaceae)	Saya vaer	Leaf and Root	Leaf and root used as an expectorant and bronchitis.
30	<i>Morinda pubescens</i> J.E. Smith (Rubiaceae)	Nuna	Leaf	Leaf extract is used to cure dysentery.
31	<i>Pavetta indica</i> L. (Rubiaceae)	Pavattai	Leaf	Leaf paste used for external cream to alleviate the pains caused by hemorrhoids.
32	<i>Vicoa indica</i> (L.) DC. (Asteraceae)	Jimikkipoo	Leaf	Leaf decoction used for stomach ache and dysentery
33	<i>Ipomoea sepiaria</i> Koen. (Convolvulaceae)	Thalikkerai	Leaf	Leaf powder used for urinary retention, sterility in women, constipation and gynecological disorders
34	<i>Solanum insanum</i> J.B.Fisch.	Mullu Kathiri	Whole plant	Plant used as an remedy for toothache and sore

	(Solanaceae)			throat.
35	<i>Andrographis echinoides</i> Nees (Acanthaceae)	Gopuram thaangi	Leaf	Leaf Juice of taken orally for stomach ache and parasitic worms.
36	<i>Ecobolium viride</i> (Forssk.) Alston (Acanthaceae)	Neelambaram	Whole plant	Used for gout and painful urination.
37	<i>Dipteracanthus prostratus</i> (Poir.) Nees (Acanthaceae)	Pottakanchi	Leaf	Plant decoction used as ear maladies
38	<i>Pupalia lappacea</i> (L.) Juss. (Amaranthaceae)	Adai-otti	Stem	Used as a tooth brush and wound healing
39	<i>Aristolochia indica</i> L. (Aristolochiaceae)	Eshwara mooli	Leaf	Used for Snake bite
40	<i>Tragia involucrata</i> L. (Euphorbiaceae)	Kaanjori	Root	Root paste used to evict guinea worms and it also used for itchy boil of skin
41	<i>Tragia plukenetii</i> R. Smith (Euphorbiaceae)	Karunchenthatti	Root	Root decoction used for diaphoretic and bronchial troubles

Table 3. List of fruits used by the rural people in a Sacred Grove of Karaikal District

S. No.	Name	Indigenous Name	Uses
1	<i>Borassus flabellifer</i> L.	Panai	Fruits used for flatulence, colic and skin diseases.
2	<i>Phoenix pusilla</i> Gaertn	Eechai	Fruits used as an respiratory disorders
3	<i>Phoenix sylvestris</i> (L.) Roxb.	Periya eecham	Fruit juice used as an cooling, gastric stimulant.
4	<i>Azadirachta indica</i> A. Juss.	Vaeppam	Used as laxative and parasitic worms.
5	<i>Ziziphus oenoplia</i> (L.) Mill.	Soorai mullu	Ripened fruits used as an purify blood and aid for digestion
6	<i>Carmona retusa</i> (Vahl) Masamu ne	Kuruvichippazham	Seeds promote the strength and sexual vigour
7	<i>Securinega leucopyrus</i> Willd.	Pulanji	Fruit and seeds are diuretic.
8	<i>Canthium coromandelicum</i> (Burm. F.) Alston	Kaaraichedi	Leaf and fruit used for intestinal worms in children given at regular intervals.

Some plants were even used in more than one form of preparations like leaf paste of *Cissampelos pareira*, used to cure various skin diseases and stem powder used for cough, urinary diseases and colic pain. The majority of the remedies were prepared from freshly collected plant material from the wild conditions and mostly from a single species or sometimes they mixed with other plant materials. When fresh plant parts are not available, dried parts are also used. The survey indicated that, the study area has plenty of medicinal plants to treat a wide spectrum of human ailments. Many fruits used by the rural people to treat the common diseases like respiratory disorders, digestion problems, parasitic intestinal worms, colic and skin problems (Table -3). Wild edible fruits are used by rural people to treat various diseases indicates that the rich ethnobotanical knowledge of plants prevailing in this region.

DISCUSSION

Sacred groves are scattered in the all coastal districts of Tamil Nadu and Puducherry that considered being residence of local deities. Various cultural and religious rituals and celebrations are performed in the groves and except for the medicinal purpose none of the plant species is harmed by human beings. Undoubtedly, the sacred groves are a refuge for rarity and endemism of several plant species and can be termed as treasure house of threatened species, dispensary of medicinal plants and gene bank for economically important species [30, 31]. In the present study, majority of species in the sacred grove were used medicinally towards the health care of indigenous rural people settled in the vicinity. The observations of present study showed that traditional medicine plays a significant role among the village people in the district. It is evident from the interviews conducted from the village people in the study site, knowledge of medicinal plants is limited to traditional healers and elderly persons who are living in rural areas. However, it is important to note that the wealth of valuable medicinal plants are depleting very fast in the recent years due to over exploitation, shifting cultivation and other socio-economic activities.

Therefore, there is urgent need for conservation and protection of sacred groves before it becomes completely disappear from this region. There is a delicate relationship between the biodiversity, tradition and culture of the rural communities. Disruption of biodiversity by any means results in the degeneration of sacred groves and also traditional rural people and their culture.

CONCLUSION

The present work elucidates the species composition of 59 plants species of flowering plants which spreads in 55 genera and 30 families. Indigenous knowledge documented through questionnaire and personal interviews, indicated that rural traditional healers used the plants to cure many diseases and various animal and insect bites. The modes of drug administration are simple and convenient. The study paves the way for further confirmation of doses, pharmacological and phytochemical screenings of these medicinal plants need to be taken up to find out the exact phytochemicals that help in curing the diseases. Conservation of such sacred groves is crucial not only for their sources of medicinal plants but also for meeting the basic herbal needs for the local people. The degraded sacred groves should be immediately restored or regenerated using appropriate biotechnological tools and by raising awareness among the rural people regarding the importance and conservation of such sacred groves.

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