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IMPACT OF HUMAN INTERFERENCE ON ETHNOMEDICINAL PLANT WEALTH AND DIVERSITY: A COMPARATIVE STUDY OF SANKULANGARA SACRED GROVE AND A DISTURBED NON-SACRED GROVE LAND LOCATED AT S.N.PURAM, THRISSUR DISTRICT, KERALA

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ABSTRACT

Since ancient times, a wide variety of plants have been used to treat various kinds of diseases based on the traditional knowledge. But now-a-days the major threat to this kind of treatment is the disappearance or scarcity of many valuable medicinal plants due to large scale destruction of vegetation for various reasons. Whatever be the reason, the fact that is often neglected is the pharmacological importance of this safer, cheaper and reliable source of drugs and its preservation for the future.

Objectives: *Comparative analysis on the ethnomedicinal plant wealth and diversity between the Sankulangara sacred grove and the near by disturbed non-sacred grove land*

Methodology: *Study includes identification and distribution of ethnomedicinal plants and their uses (through survey & interviews), analysis on the phytosociological aspects such as relative density and relative frequency of plant species, dominance of ethnomedicinal family and species, Species Richness Index (Menhinick 1964) and Diversity Index (Shannon, 1963).*

Results: *The ethnomedicinal plant wealth and diversity is significantly higher in the grove area compared to disturbed non-sacred grove area.It is very necessary to protect and maintain these reminants of natural forest for the future.*

KEYWORDS : *traditional knowledge , pharmacological , ethnomedicinal plant.*

INTRODUCTION

The survey conducted by the All India Coordinated Research Project on Ethnobiology (AICRPE) during the last decade recorded over 8000 species of wild plants used by the tribals and other traditional communities in India for treating various health problems (Laloo et al., 2006). The phytomedicines usually exert their medicinal effects through the additive or synergistic action of several bioactive compounds acting at single or multiple target sites associated with a physiological process. This kind of action not only eliminate the problematic side effects associated with the predominance of a single xenobiotic compound in the body but also ensure effectiveness against a wide range of pathogens and decrease the chances of these organisms developing resistance or adaptive responses (Kaufman et al., 1999). However, now a day the most serious problem we face in the rural as well as urban area is the large scale destruction of vegetation particularly forest vegetation and the disappearance or scarcity of many valuable medicinal plants of traditional use. Today most of the areas have only certain patches or reminants of forest the so called sacred

groves, which are protected under the ground of religious faith. These sacred groves are considered as treasure house of rare and endangered plant species and abode of many medicinal plants. But now they are also facing threats due to various man made activities. Therefore it is very important to protect these surviving examples of climax vegetation by any means. Here comes the importance of ethnobotanical study and documentation of data on medicinal plants and dissemination of this information to the public to make them aware of the relevance of maintaining and preserving these natural resources for future. The present study was carried out to collect information on the ethnomedicinal wealth of the selected Sankulangara sacred grove and to compare this information with present status of nearby disturbed non-sacred grove land to reveal the difference in ethnomedicinal plant diversity, wealth, pharmacological importance and to create awareness among the people about the relevance of preserving these treasure houses for future.

OBJECTIVES

Comparative analysis on the ethnomedicinal plant wealth and diversity between the Sankulangara sacred grove and the near by disturbed non-sacred grove land.

MATERIALS AND METHODS

Study area

The study area is Sankulangara sacred grove of about 0.635 hectare size and a nearby disturbed non-sacred grove land of the same extend located at Sree Narayana Puram which belongs to the Coastal Belt of Thrissur District, Kerala. The study was conducted during the period January 2016 - March 2017.

Ethnobotanical studies

The study includes comparative evaluation of information on the ethnomedicinal plants of selected sacred grove and disturbed non-sacred grove land. The details of ethnomedicinal plants and related informations were collected through survey, discussions and interviews with local people and traditional healers in the area. The identification and other required informations on ethnomedicinal plants were done with the help of referred books and reports (Krishnan et al., 1985; Akhtar, 1992; The Ayurvedic Pharmacopoeia of India, 2004; Khare, 2007). Ethnomedicinal plants belonging to different group such as trees, shrubs, herbs, lianas and climbers were selected and analysed for the following parameters.

1. Identification and distribution of ethnomedicinal plants

2. Relative Density of species (RD) = $\frac{\text{Number of individuals of the species} \times 100}{\text{Number of individuals of all species}}$

3. Relative frequency of species (RF) = $\frac{\text{Number of quadrats of occurrence of the species} \times 100}{\text{Number of quadrats of occurrence of all species}}$

4. Dominance of ethnomedicinal family and species- based on the total population count and diversity of ethnomedicinal plant species
5. Species richness index (Menhinick 1964)
   Species richness index = S/√N Where S - total number of the species and N - Total number of individuals in a sample
6. Diversity Index of ethnomedicinal plants- based on Shannon Wienor Index (H')
   Shannon Wienor Index (H') = -∑ {(n/N) ln (n/N)}

RESULTS AND DISCUSSION

The ethnobotanical study conducted in Sankulangara sacred grove identified 28 plant species as commonly used ethnomedicinal plants by the local people and traditional healers in the area for the treatment of various ailments. These plants are distributed in 26 genera belonging to 22 families. This constituted 27.72% of the total plant species representation and constituted around 29.92% of the entire plant population in the grove. In the disturbed non-sacred grove land, 14 plant species were identified as ethnomedicinal which comprised of 12 genera belonging to 10 families and this constituted around 23.33% of the total plant species represented and around 28.66% of the entire plant population. The highest percentage of ethnomedicinal plant species distributed in the sacred grove is represented by the plant group trees (28.57%) which are followed by climbers (21.43%), shrubs (21.43%), herbs (17.86%) and lianas (10.71%). Whereas in the disturbed land, the highest percentage of ethnomedicinal plant species belongs to herbaceous group (57.14%) and is followed by shrubs (21.43%), trees (14.29%) and the lowest representation of 7.14% of climbers **(Table-1)**. The ethnomedicinal plants identified in the Sankulangara sacred grove and in the nearby disturbed land along with details such as scientific name, local name, family, habit, parts used and traditional use in treating ailments are depicted in T**able-2** and **Table-3**.

The present study analysed the density, relative density and relative frequency of each ethnomedicinal plant species as well as the sum total of ethnomedicinal plants in both the selected study area. The results obtained are shown in the **Table-4 and Table-5.** The data revealed the tree member Hopea ponga belonging to the family Dipterocarpaceae recorded the highest density (101 nos.) and relative density (15.9) in the Sankulangara sacred grove. Hopea ponga is immediately followed by climber Tiliacora racemosa of Menispermaceae and then the member of lianas Gnetum ula of Gnetaceae. The highest relative frequency of 5.56 in the grove was shared by 3 tree members Hopea ponga, Hydnocarpus pentandra and Quassia indica and also a liana member Gnetum ula. Whereas in the disturbed non-sacred grove land, the highest density (30181 nos.) and relative density (47.5) was recorded by the herbaceous member Cynodon dactylon which belong to the family Poaceae. Cynodon dactylon was immediately followed by the herbaceous members Aerva lanata of Amaranthaceae and Phyllanthus amarus of Euphorbiaceae. The higest relative frequency of 10.26 in the disturbed land was shared by these herbaceous members. The density, relative density and relative frequency of sum total of ethnomedicinal population in the grove were 635, 29.9 and 28.8 respectively while in the disturbed land; it was 63593, 28.7 and 26.26 respectively for density, relative density and relative frequency.

The analysis on the richness of species and diversity index of ethnomedicinal plant species in the Sankulangara sacred grove showed the highest individual values of 4.01 and 0.29 respectively by the tree member Hopea ponga of Dipterocarpaceae. Hopea ponga is immediately followed by Tiliacora racemosa of Menispermaceae and then by Gnetum ula and Strychnos minor of Gnetaceae and Menispermaceae respectively **(Table-6).** In the disturbed land, the herbaceous member Cynodon dactylon of Poaceae recorded highest individual values for richness of species and diversity index which was 119.68 and 0.35 respectively.This was immediately followed by the herbaceous members Aerva lanata (36.22 and 0.28) of Amaranthaceae and then Phyllanthus amarus (29.92 and 0.25) of Euphorbiaceae. Richness of species index and diversity index of sum total of the ethnomedicinal population in the grove was 1.11 and 2.89 respectively while in the disturbed land, it was 0.06 and 1.66.

The dominance of ethnomedicinal families in the sacred grove and disturbed land in the present study was analyzed in two ways. In the analysis based on the total plant population count of ethnomedicinal plants under each family, Dipterocarpaceae was identified as the most dominant family in the grove with a total plant population of 101 trees and this constituted 15.91% of the total number ethnomedicinal plants and 4.76% of the entire population in the study area. Dipterocarpaceae was immediately followed by Menispermaceae which have a total population of 78 climbers. Menispermaceae is followed by Apocynaceae with a total population of 72, consisting of trees and climbers. This constituted 12.28% of the total number of ethnomedicinal plants and 3.68% of the entire population with respect to Menispermaceae

while 11.34% of the total number ethnomedicinal plants and 3.39% of the entire population with respect to Apocynaceae **(Table-4)**. Whereas in the disturbed land, the family Poaceae was identified as the most dominant with a total plant population of 30180 herbs and this constituted 47.46% of the total number ethnomedicinal plants and 13.60% of the entire population in the study area. Poaceae was immediately followed by Amaranthaceae and then Euphorbiaceae with total plant population of 12707 and 7545 herbs respectively and these constitute 19.98% and 11.86% of the total number ethnomedicinal plants and 5.73% and 3.40% of the entire population respectively in the area **(Table-5)**. However, when the dominance of family was analyzed based on the diversity of ethnomedicinal plant genus and species under the families, Apocynaceae is identified as the most dominant families in the grove, which consists of three genus and three species namely Ichnocarpus frutescens, Kamettia caryophyllata & Tabernaemontana alternifolia. Apocynaceae is immediately followed by Annonaceae and Fabaceae, both consisting of two genus and two species each namely Uvaria narum & Polyalthia korinti and Abrus precatorius & Desmodium gangeticum respectively. Whereas in the disturbed land, Amaranthaceae and Apocynaceae are identified as the most dominant families. Amaranthaceae consists of two genus and two species namely Aerva lanata and Cyathula prostrata with comparatively higher number of representations while Apocynaceae consists of two genus and two species namely Ichnocarpus frutescens & Tabernaemontana alternifolia with lesser number of representations compared to Amaranthaceae immediately followed by Amaranthaceae and Apocynaceae is Malvaceae which consists of one genus and three species namely Sida acuta, Sida cordifolia & Sida rhombifolia **(Table 4 & 5)**.

Comparative evaluation of ethnomedicinal plants in the study sites reveal that only 12 genus of ethnomedicinal plants were recorded in the disturbed land in comparison to 26 plant genus in the sacred grove and this constitute about 63.64% reduction over grove region while the total number of plant species was restricted to 14 in the disturbed land compared to 28 species in the grove and this is about 50.0% reduction over the grove region. With respect to the distribution of ethnomedicinal plant species, 22 families are distributed in the sacred grove while in the disturbed land it was restricted to 10 families and this account for a reduction of 54.55% in the diversity of families over grove region. The study found the ethnomedicinal plant species of all the plant groups in disturbed land, with the exception of herbs and recorded lower representations compared to sacred grove and the decrease was 75%, 50% and 83.33% respectively for trees, shrubs and climbers while an increase of 37.5% in the species diversity was recorded for herbs. No lianas were recorded as ethnomedicinal plant species in the disturbed land.

In Sankulangara sacred grove, the highest individual values recorded for relative density, relative frequency and richness of species index is by the tree member Hopea ponga, which is immediately followed by the climber Tiliacora racemosa, then the liana Gnetum ula, whereas in the disturbed land, the highest individual values was recorded by the herbaceous member Cynodon dactylon, immediately followed by the herbaceous members Aerva lanata and then Phyllanthus amarus **(Table 4 & 5)**. This clearly revealed that, Hopea ponga is the most dominant plant species in the grove which is immediately followed by Tiliacora racemosa and then Gnetum ula while in the disturbed land Cynodon dactylon is the most dominant plant species which is immediately followed by Aerva lanata and then the Phyllanthus amarus. Therefore the study further revealed that majority of the dominant ethnomedicinal plant species in the sacred grove are represented from diverse groups of plants such as trees, climbers, lianas etc. a typical charecteristics of undisturbed natural forest vegetation. However, all the dominant ethnomedicinal plant species in the disturbed land are belonging to the plant group herbs- typical characteristics of degraded forest vegetation. Further the overall diversity index value recorded for ethnomedicinal plant species in the sacred grove is found 42.56% higher than the diversity index value recorded for the disturbed land. The study found the tree member Hopea ponga which is identified as most dominant plant species in the Sankulangara sacred grove is a listed plant in the IUCN Red list as threatened and endangered species and similarly the shrub species Memecylon grande is listed as vulnerable species.

However the present study noted that, the overall population count of ethnomedicinal plants in the disturbed lands recorded significantly higher value compared to sacred groves. This is due to the fact that most of the ethnomedicinal plant species in the disturbed land are belonging to the plant group herbs and due to their remarkably higher individual representation compared to herbaceous plant species of sacred groves. At the same time present investigation also revealed that the total population count as well as the diversity in the representation of ethnomedicinal plants from other diverse groups of plants such as trees and climbers are very scarce and even total absence was recorded with respect to lianas in the disturbed land. Considerable reduction in the herbaceous ethnomedicinal plant species and their population count in the Sankulangara sacred grove may be attributed to the accumulation of litter particularly by trees which usually form a thick layer over the floor area and may cause an unfavorable environment for the seeds of herbaceous plants to get germinate, emerge and establish. This interpretation is with the observations recorded by Alejandro et al (2014) who found that tree litter act as a mechanical barrier to the establishment of herbaceous seedlings, in their study conducted in the forest–grassland ecotones at Lahn-Dill highlands, Germany. Similar observation was also reported by Xiong and Nilsson (1999) who found the tree litter has strong negative effect on grassland vegetation. Further the reduction of herbs may also be due to the lack of availability of sunlight to the herbaceous plants, as the sunlight fails to peneterate and reach ground area of the grove due to thick canopy layer formed particularly by trees and lianas. Remarkably higher population of herbaceous plants and their increased diversity in the disturbed land may be due to the absence of above said barriers together with comparatively less competition from other groups of plants. However, more or less uniform distribution and better diversity of ethnomedicinal plants from diverse groups of plants in the studied sacred grove may be attributed to comparative low human interference and better environmental conditions such as the physical and chemical properties of soil, microclimate etc in the grove area.

CONCLUSION

Present investigation clearly revealed that the ethnomedicinal plant wealth in the Sankulangara sacred grove is significantly higher when compared to the nearby disturbed land. With the exception of herbs, most of the plant group such as trees, climbers, lianas and shrubs in the grove recorded higher population, species diversity and better ethnomedicinal properties. The informations on plant parts used and ethnomedicinal uses of identified plants in both sacred grove and disturbed land collected from the local people and traditional healers in the area may be useful for making certain herbal or modern medicine in the future. This type of comparative evaluation and passing of such information to the present generation is of almost importance in understanding what the past ethnomedicinal plant wealth was and how it is today. This in turn helps people to be aware of the past and the present interrelationship between human culture and plants. The present study further expects that this sort of documentation about the indigenous and scientific knowledge on ethnomedicinal plants and practices of traditional medicine are very essential in understanding the utilization of natural biological resources and is valuable for the conservation of at least these patches of original forest vegetation for the future.

Table 1: Brief Summery on Distribution of Ethnomedicinal Plants in the Study Area

Details of Study area		Study area	
		Sankulangara Sacred Grove	Disturbed Non-sacred Land
Number of Genera		26	12
Number of Species		28	14
Number of Family		22	10
Trees	Species	8	2
	Population	187	8

Shrubs	Species	6	3
	Population	77	39
Herbs	Species	5	8
	Population	53	63537
Climbers	Species	6	1
	Population	226	9
Lianas	Species	3	0
	Population	92	0
Total ethnomedicinal plant population		635	63593
Entire plant species		101	60
Entire plant population		2122	221848

Table 2: Details of Ethnobotanical Plants in the Sankulangara Sacred Grove

S.No.	Name of the Plant	Local Name	Family	Habit	Parts used	Medicinal Uses
1	Abrus precatorius L.	Kunni	Fabaceae	Climber	Whole plant	Leaf juice is a blood purifier.Root paste is applied on swellings and skin diseases.Plant extract is boiled with coconut oil is used as hair tonic.
2	Asparagus racemosus Willd.	Sathavari	Liliaceae	Climber	Tubers	Root is used in the treatment of throat problems, tuberculosis, leprosy, epilepsy, diseases of blood, kidney and liver and gonorrhoea. A decoction of tubers in milk is very effective in bladder problems.The root extract with a honey is given against colic.
3	Connarus monocarpus L	Kurilathali	Connaraceae	Liana	Leaves	Pounded leaves are applied to painful swellings,seeds are used to treat nervous disorders,contraceptive also.Root extract is used against sore throat, asthma,fever and skin diseases.

4	Desmodium gangeticum (L.) DC.	Orila	Fabaceae	Herb	Roots	Root paste is applied for chronic fever, cough, vomiting, asthma and rheumatism.
5	Elephantopus scaber L.	Anachuvadi	Asteraceae	Herb	Whole plant	A decoction of leaves and roots is used to treat diarrhoea, dysentery and swelling or pain in the stomach. Bruised leaves are applied to ulcers and eczema.
6	Gnetum ula Brongn.	Odavalli	Gnetaceae	Liana	Seeds	Decoction of seeds used for rhematism.
7	Hibiscus rosa-sinensis L.	Chembarathi	Malvaceae	Shrub	Root, leaves, flower	Crushed leaves with water are used as hair tonic.Decotion of boiled flowers used for menstrual problems.
8	Holigarna arnottiana Hook.f.	Cheru	Anacardiaceae	Tree	Bark	Highly diluted bark decoction mixed with milk and turmeric used in mild skin problems.
9	Hopea ponga (Dennst.) Mabb.	Thambakam	Dipterocarpaceae	Tree	Root,Bark	Root decoction taken orally for piles. Bark paste mixed with milk taken to minimize spreading of poison during snake bite.
10	Hydnocarpus pentandrus (Buch.-Ham.) Oken	Marotti	Flacourtiaceae	Tree	Seeds	Seed oil applied to area affected by rheumatism.
11	Ichnocarpus frutescens (L.) W.T.Aiton	Parvalli	Apocynaceae	Climber	Root, leaves	Root and leaf extract is applied to backpain, skin diseases.
12	Kamettia caryophyllata (Roxb.) Nicolson & Suresh	Narumarathivu	Apocynaceae	Climber	Leaves, roots	Decoction of the whole plant is used for leprosy and arthritis.Leaf paste is applied on affected area for itches and scabies.
13	Laportea	Choriyanam	Urticaceae	Herb	Leaves,	Root is crushed and

	interrupta (L.) Chew				root, fruits.	juice taken for fever and leaves crushed and made paste is directly applied to headache.
14	Memecylon grande Retz.	Palluvirisa	Melastomataceae	Shrub	Bark, fruits	Leaf paste used in snake bite. Root decoction is used for abnormal menstrual periods.
15	Mussaenda frondosa L.	Vellilam	Rubiaceae	Shrub	Leaves	Decoction of stem is used as a remedy for cough and decoction of root is given against white leprosy, Aqueous extract of leaves using hot water is used as shampoo.
16	Ocimum basilicum L.	Ramathulasi	Lamiaceae	Herb	Leaves	Decoction made from boiled leaves is used for headaches, coughs, diarrhea, Leaf crushed and made paste with turmeric is orally administrated for worms.
17	Ocimum tenuiflorum L.	Krishna thulasi	Lamiaceae	Shrub	Leaves	Decoction made from leaves boiled with water is used for cough,fever and leaves crushed and made paste is directly applied as antidote for insect bites.
18	Polyalthia korinti (Dunal) Thwaites	Karuvalli, Korandippanal	Annonaceae	Shrub	Leaves, bark	Decoction of bark is used for cold and cough, Leaf paste is applied as antidote for snake bite.
19	Quassia indica (Gaertn.) Noot.	Karingotta	Simaroubaceae	Tree	Bark, seeds	An infusion of leaves is used to kill lice. fleas, and white ants. Seeds are used against bilious fever and are used as a purgative and emetic. Oil from seeds is used

						as an external application in rheumatism.
20	Sterculia guttata Roxb. ex G.Don	Peenaari/ Kavalam	Sterculiaceae	Tree	Bark, seeds	Leaves and bark grinded using water and this paste are applied for swellings.
21	Strychnos minor Dennst.	Cherukanjiravalli	Loganiaceae	Climber	Bark	Leaves and roots are boiled in oil and applied to rheumatic swellings. Bark is used as antipyretic
22	Syzygium lanceolatum (Lam.) Wight & Arn.	Karinjaval	Myrtaceae	Tree	Fruits	Oral administration of decotion of fruits is used for piles.
23	Syzygium zeylanicum (L.) DC.	Poochapazham	Myrtaceae	Shrub.	Leaves, fruits	Decoction of fruits is orally taken for diarrhea and leaf paste is applied on anti-rheumatic.
24	Tabernaemontana alternifolia L.	Kuruttupala	Apocynaceae	Tree	Leaves	Latex from leaves directly applying on warts, wounds and other skin diseases.
25	Terminalia bellirica (Gaertn.) Roxb.	Thanikka	Combretaceae	Tree	Fruits, seeds	Powdered seeds and friuts with honey are used for cough and fever.
26	Tiliacora racemosa Colebr.	Vallikanjiram	Menispermaceae	Climber	Bark, root, leaves	Paste of bark, root and leaves used as antidote for snake bite.
27	Torenia bicolor Dalzell	Malatilata, Malatipuspam	Scrophulariaceae	Herb	Whole plant	Juice taken from the crushed whole plant is applied for eye infections.
28	Uvaria narum A.DC.	Paanal	Annonaceae	Liana	Roots	A decoction of roots is used to stomachache after childbirth.External application of root extract is used for skin problems.

Table 3: Details of Ethnobotanical Plants in the Disturbed Non-Sacred Grove Land

S.No.	Name of the Species	Local Name	Family	Habit	Parts used	Medicinal Uses

1	Aerva lanata (L.) Juss.	Cherula	Amaranthaceae	Herb	Whole plant	Whole plant is boiled with water and this decotion is used for the treatment of cough and urinary problems.
2	Biophytum reinwardtii (Zucc.) Klotzsch	Mukkutti	Oxalidaceae	Herb	Whole plant	Whole plant is crushed and juice is used for cough, asthma and oral administration of cooked whole plant with duck egg is used for piles.
3	Cyathula prostrata (L.) Blume	Cherukadaladi	Amaranthaceae	Herb	Whole plant	Whole plant is grinded and made paste is applied for skin diseases. Decoction of roots is given for dysentery.
4	Cynodon dactylon (L.) Pers.	Karuka, Karukapullu	Poaceae	Herb	Whole plant	Plant juice is applied to fresh cuts and wounds; A decoction of the root is given in cases of dropsy and secondary syphilis.
5	Cyperus rotundus L.	Muthanga	Cyperaceae	Herb	Rhizome	Peeled rhizome is crushed and boiled in milk is used as anti venom, liver problems and fever.
6	Hydnocarpus pentandrus (Buch.-Ham.) Oken	Marotti	Flacourtiaceae	Tree	Seeds	Oil from the seed is directly applied for rheumatism
7	Ichnocarpus frutescens (L.) W.T.Aiton	Parvalli	Apocynaceae	Climber	Root, leaves	Root and leaf extract are used to backpain,skin diseases
8	Laportea interrupta (L.) Chew	Choriyanam	Urticaceae	Herb	Leaves root and fruits.	Root is crushed and juice taken for fever, leaf paste is applied for headache.
9	Leucas aspera (Willd.) Link	Thumpa	Lamiaceae	Herb	Leaves and Flowers	The plant juice is directly applied for skin diseases and headache.
10	Phyllanthus	Keezharnelli,	Euphorbiaceae	Herb	Whole	Whole plant is

	amarus Schumach. & Thonn.	Kiruthaanelli			plant	grinded with milk and consumed on empty stomach for liver problems.
11	Sida acuta Burm.f.	Anakurunthotti, Cheruparava	Malvaceae	Shrub	Roots	A decoction of leaves and roots is given in haemorrhoids and impotence, decoction of root is used for nervous and urinary diseases.
12	Sida cordifolia L.	Kurunthotti	Malvaceae	Shrub	Roots	Decoction of whole plant is used for rheumatism, Root juice is used for healing wounds and fever.
13	Sida rhombifolia L.	Kurunthotti, Vankurunthotti	Malvaceae	Shrub	Roots	A decoction of the roots mixed with milk is used in rheumatism, arthritis and allied complaints and decoction of roots facilitate child birth.
14	Tabernaemontana alternifolia L.	Kuruttupala	Apocynaceae	Tree	Leaves	Latex from leaves directly applying on warts, wounds and other skin diseases

Table 4: Phytosociological Aspects of Ethnomedicinal Plant Species in the Sankulangara Sacred Grove

S.No.	Botanical Name	Habit	Density	Relative density	Relative frequency	Diversity Index (H')
1	Abrus precatorius L.	Tree	101	15.9	5.56	0.29
2	Asparagus racemosus Willd.	Climber	78	12.3	4.86	0.26
3	Connarus monocarpus L	Liana	55	8.66	5.56	0.21
4	Desmodium gangeticum (L.) DC.	Climber	53	8.35	4.86	0.21
5	Elephantopus scaber L.	Climber	48	7.56	4.17	0.2
6	Gnetum ula Brongn.	Liana	35	5.51	3.47	0.16
7	Hibiscus rosa-sinensis L.	Tree	27	4.25	5.56	0.13
8	Holigarna arnottiana Hook.f.	Shrub	25	3.94	4.86	0.13
9	Hopea ponga (Dennst.) Mabb.	Tree	24	3.78	5.56	0.12
10	Hydnocarpus pentandrus (Buch.-	climber	19	2.99	4.17	0.1

	Ham.) Oken					
11	Ichnocarpus frutescens (L.) W.T.Aiton	Herb	18	2.83	2.78	0.1
12	Kamettia caryophyllata (Roxb.) Nicolson & Suresh	Shrub	17	2.68	4.17	0.1
13	Laportea interrupta (L.) Chew	climber	16	2.52	4.17	0.09
14	Memecylon grande Retz.	Tree	14	2.2	4.86	0.08
15	Mussaenda frondosa L.	Shrub	13	2.05	4.17	0.08
16	Ocimum basilicum L.	Herb	12	1.89	4.17	0.07
17	Ocimum tenuiflorum L.	Climber	12	1.89	2.08	0.07
18	Polyalthia korinti (Dunal) Thwaites	Tree	12	1.89	4.17	0.07
19	Quassia indica (Gaertn.) Noot.	Herb	11	1.73	4.17	0.07
20	Sterculia guttata Roxb. ex G.Don	Shrub	11	1.73	2.78	0.07
21	Strychnos minor Dennst.	Herb	10	1.57	2.08	0.07
22	Syzygium lanceolatum (Lam.) Wight & Arn.	Herb	6	0.94	2.08	0.04
23	Syzygium zeylanicum (L.) DC.	Shrub	5	0.79	2.08	0.04
24	Tabernaemontana alternifolia L.	Tree	4	0.63	2.08	0.03
25	Terminalia bellirica (Gaertn.) Roxb.	Tree	4	0.63	2.08	0.03
26	Tiliacora racemosa Colebr.	Liana	2	0.31	1.39	0.02
27	Torenia bicolor Dalzell	Herb	2	0.31	1.39	0.02
28	Uvaria narum A.DC.	Tree	1	0.16	0.69	0.01
TOTAL			**635**	**29.9**	**28.8**	**2.89**

Table 5: Phytosociological Aspects of Ethnomedicinal Plant Species in the Disturbed Non-Sacred Grove Land

S.No.	Botanical name	Family	Density of plants	Relative density	Relative frequency	Diversity Index (H')
1	Aerva lanata (L.) Juss.	Herb	30180	47.5	10.26	0.354
2	Biophytum reinwardtii (Zucc.) Klotzsch	Herb	9133	14.4	10.26	0.279
3	Cyathula prostrata (L.) Blume	Herb	7545	11.9	10.26	0.253
4	Cynodon dactylon (L.) Pers.	Herb	4765	7.49	8.974	0.194

5	Cyperus rotundus L.	Herb	3574	5.62	7.692	0.162
6	Hydnocarpus pentandrus (Buch.-Ham.) Oken	Herb	3177	5	6.41	0.15
7	Ichnocarpus frutescens (L.) W.T.Aiton	Herb	2780	4.37	7.692	0.137
8	Laportea interrupta (L.) Chew	Herb	2383	3.75	6.41	0.123
9	Leucas aspera (Willd.) Link	Shrub	14	0.02	7.692	0.002
10	Phyllanthus amarus Schumach. & Thonn.	Shrub	13	0.02	7.692	0.002
11	Sida acuta Burm.f.	Shrub	12	0.02	6.41	0.002
12	Sida cordifolia L.	Climber	9	0.01	3.846	0.001
13	Sida rhombifolia L.	Tree	5	0.01	3.846	0.0007
14	Tabernaemontana alternifolia L.	Tree	3	0.005	2.564	0.0005
TOTAL			**63593**	**28.7**	**26.26**	**1.66**

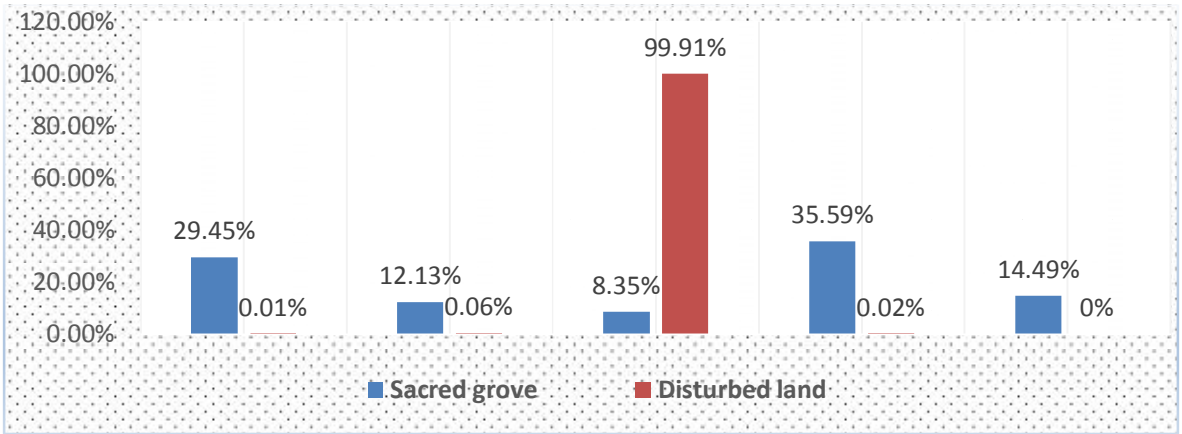

Figure 1: Population Wise Distribution of Ethnomedicinal Plants of Different Groups in Sankulangara Sacred Grove and in the Disturbed Non-Sacred Grove Land

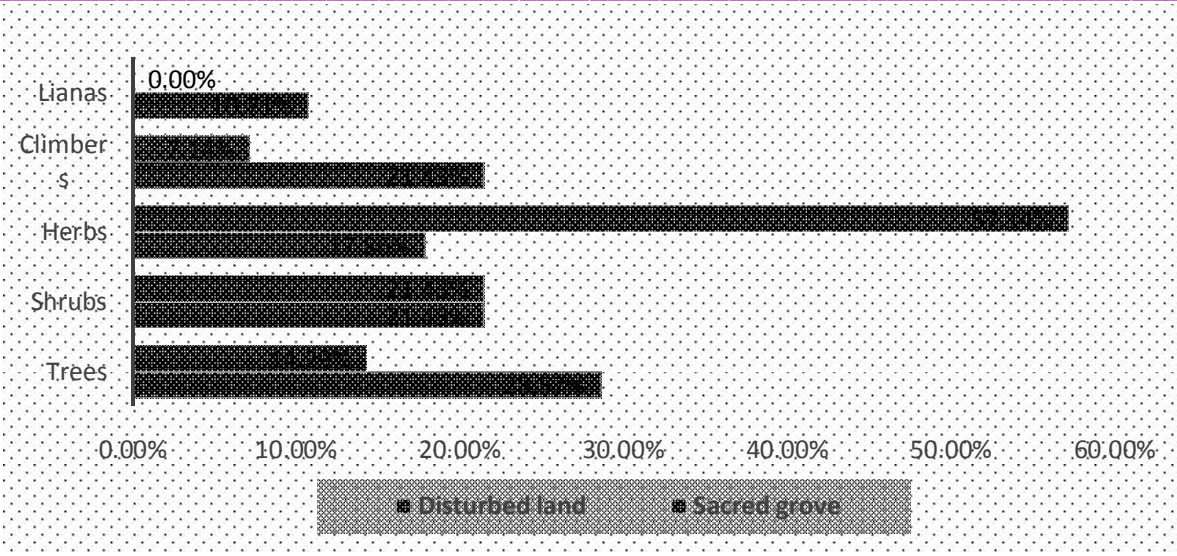

Figure 2: Diversity in the Species Distribution of Ethnomedicinal Plants of Different Plant Groups in Sankulangara Sacred Grove and Disturbed Non-Sacred Grove Land

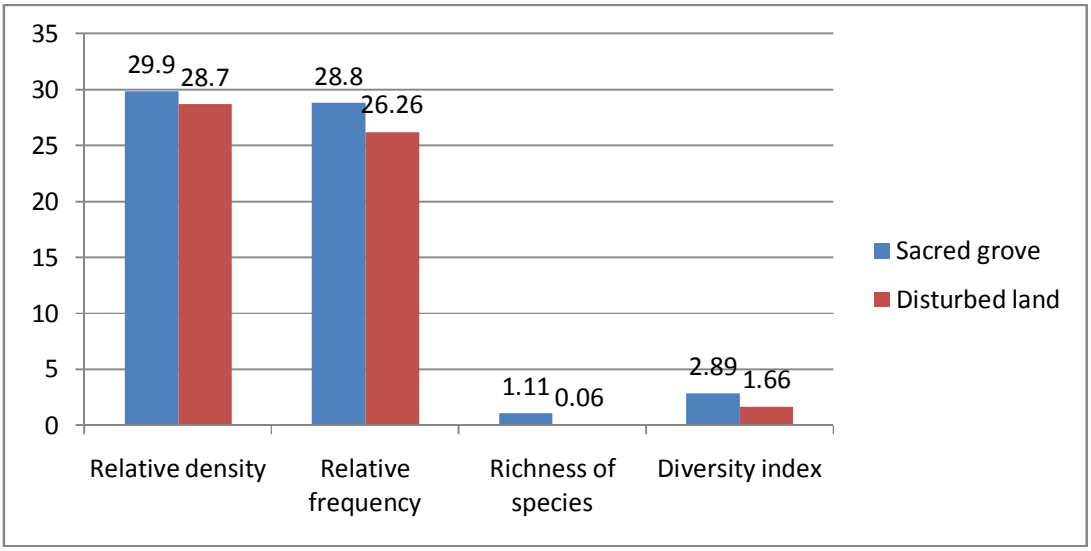

Figure 3: Comparative Evaluation on Relative Density, Relative Frequency, Richness of Species and Diversity Index of Ethnomedicinal Plants in Sankulangara Sacred Grove and Disturbed Non-Sacred Grove Land

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