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Journal of Development Economics and Management Research Studies (JDMS)
A Peer Reviewed Open Access International Journal

ISSN: 2582 5119 (Online)



Crossref Prefix No: 10.53422

09(13), 16-29, July-September, 2022

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Medicinal Plant Resource Diversity of Agroecosystem in Thiruvannamalai District, Tamil Nadu, South India

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Abstract

The Agroecosystems provide food, fuel, fodder, medicines, etc. These are all natural resources and livelihood for rural people in India. The aim of the present study was to document the diverse medicinal plant resources available in the agroecosystem of Valayampattu village in Thiruvannamalai District, Tamil Nadu, India. The field study was carried out during October 2018 to march 2019. The diverse of medicinal plant resources include a total of 32 plant families comprising 52 medicinal plant species (36 Trees, 3 Shrubs and 13 Herbs). Of them, the share of dicotyledons was 86.54% and monocotyledon was 13.46%. Among the dicotyledons, the families of polypetalae contributed 48.08 %, gamopetalae 17.31%, and monochlamydeae 21.15% to the Siddha medicinal plants. A total of 27 plant

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families comprising 43 plant species are used in Ayurveda medicines. Of these plant families the contribution of dicotyledons was 88.37 % and monocotyledons was 11.63 %. Among the dicotyledons, the families of polypetalae contributed 48.84 %, gamopetalae 20.93 %, and monochlamydeae 18.60 % to the Ayurveda medicinal plants used in the cure of human diseases. Leafs were found to be the predominant plant part (16.79 %) used in Siddha. This was followed by barks (15.33 %), fruits (15.33 %), and roots (13.14 %). Whereas, the fruits (17.98 %) of medicinal plants were preferred, followed by barks (include root and stem) (16.85 %), leaf/ash (15.73 %) and seed (11.24 %) in Ayurveda. Polypetalae plant with 42%, gamopetalae plant with 26%, dominated among the Siddha medicinal plants followed by monocotyledons. While in the case of Ayurveda medicinal plant groups, polypetalae 41% and gamopetalae plant 26 % were predominantly used. Medicinal plants resources in agroecosystem are significant to the local people as they rescue them from their primary health diseases. Increasing awareness on the medicinal plant resources in agricultural landscape can contribute to the conservation and management of medicinal plant diversity and the agroecosystem.

Keywords: Agroecosystem, Ayurveda, Fabaceae, Medicinal plant diversity, Siddha

Introduction

India, with its rich plant biodiversity, is recognized as one of the 12 mega biodiversity centres in the world. It houses an estimated 45,000 plant species in 16 agro climatic zones, 10 vegetation zones and 10 biotic provinces (Samy and Gopalakrishnakone, 2007). According to World Health Organization (WHO), all types of plants which are used as medicine in the treatment and cure of diseases are called as **medicinal plants** and the same can also be referred to as **medicinal plant resources**. In India, a large number of medicinal plants are collected as raw drugs for human ailments since ancient times. Although 2,000 species are documented in Indian Systems of Medicine like Ayurveda and Siddha, around 960 medicinal plants are currently used commercially all over India. Medicinal plants have been in use for combating human diseases since thousands of years ago. The different plant parts of medicinal plant resources consist of leaves, flower, fruits, seeds, bark, stem, latex, resin/gum, etc. The rural people in India thrive mainly on agriculture and they mostly use medicinal plant resources for their primary health care. As the medicinal plant resources are easily available besides being cheap if at all they are to be obtained from raw drug stores, they are used predominantly in managing human diseases by the rural people. The medicinal plant resources in villages occur in agricultural landscape and are found familiar in curing diseases like fever, cough, diarrhoea, etc. Further, many medicinal plants are used in animal husbandry too as they are in practice over many generations similar to the tradition followed in human health care. The field margins of agroecosystem have prime agricultural roles, such as stock fencing and delimiting field areas. They provide home for a range of medicinal plants resources in agroecosystems as the latter encompass a host of microclimates. Hence, the present study is necessitated with the main focus on generating baseline data on documenting medicinal plant resources (Ayurveda and Siddha) abetting agroecosystem of a village in Thiruvannamalai District, Tamil Nadu, south India. The prime objectives of the present investigation on the medicinal plant resources of agroecosystem are the following:

- Documentation of the diverse medicinal plant resources available in the agroecosystem of a village in Thiruvannamalai District, Tamil Nadu, India.
- Classification of Ayurveda and Siddha medicinal plants predominantly used in combating human diseases of the study area.

- Analysis of dominant plant families, useful plant parts and action types of medicinal plants used in human disease management of the study area.
- Finding out the Bench Categories of Siddha and Ayurveda medicinal plants used in various human diseases of the study area.

MATERIALS AND METHODS

The study area

The study area was a village called Valayambattu (12°19' N Latitude, 78°45' E Longitude) in Chengam Taluk of Thiruvannamalai District, Tamil Nadu (Fig 1). The village is spread over an area of 477.82 hectares consisting of red loam and black soils, its population of 4,040 (Males: 2,094; Females: 1,946) consisted of 841 households (Census of India, 2011). Agriculture is the major livelihood and primary source of income with paddy cultivation in the maximum area than other crops like ground nut, sugarcane, millet, cotton, etc. Never the less, majority of the land area is utilized for grazing. The climate details of the region show that it receives an average annual rainfall of 1031 mm, while maximum rain has been received during June to September from southwest monsoon (438.8 mm) and the rest from October to December from the north east monsoon (439.8 mm) during winter and summer. The maximum temperature experienced in the district is 36.3°C during the month of April and minimum temperature of 21.2°C during January (Census of India, 2011).

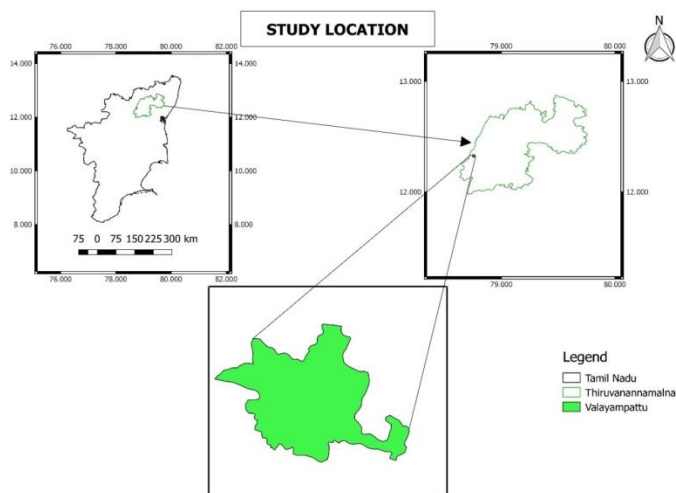


Fig 1. Map showing the location of study area Valayambattu Village, Chengam Taluk, Thiruvannamalai District, Tamil Nadu

Data Collection

The field study was carried out during October 2018 to march 2019. To record qualitatively the medicinal plant resources of Valayambattu Village in Chengam Taluk, Thiruvannamalai District, Tamil Nadu and India (Fig 1). The study site was selected based on easy accessibility and comfort. The plants were identified using Gamble & Fischer (1915-1935) and Matthew (1991). The applications of medicinal plants have been compiled through the literature such as Murugesu Mudaliar (2006) for Siddha uses and Yoganarasimhan (2000) for Ayurveda uses besides for Siddha. Medicinal plants used in Siddha and Ayurveda preparations are tabulated using the texts. The list is prepared alphabetically

with the binomial name, vernacular name, family and part used. The dominant plant families which contribute to the human health care are arrived at from the categories of plant families encountered in the field study. The families are arranged using Bentham and Hooker's Natural System of Classification which is in practice. The plants of Polypetalae, Gamopetalae and Monochlamydeae of Dicotyledons and Monocotyledons used in Siddha and Ayurveda medicinal plants are tabulated with the number of species which belonged to them and percentage of their contribution are analysed.

Bench categories of medicinal plants used in combating human disease

A comparison of families, plant parts and action types of medicinal plants is done by analysing the data from the table for the Siddha and Ayurveda medicinal plants. Their relative percentage has been worked out for the number of species belonging to their respective plant group. The same also has been followed in the case of medicinal plant parts and action types of the medicinal plants used in human disease cure (Saranraj, 2016).

Results And Discussion

The study records a total 52 medicinal plants belonging to 32 families (Table 1).

Table 1 The comprehensive list of medicinal plant resources found in the agroecosystem of Tamil Nadu, south India *(T = Tree, S = Shrub and H = Herb)

S.No	Binomial	Vernacular Name	Family	Habit (T/S/H) *
1	<i>Acacia nilotica</i> (L.) Delile	Karuvela maram	Fabaceae	T
2	<i>Acalypha indica</i> L.	Kupaimani	Euphorbiaceae	H
3	<i>Achyranthes aspera</i> L.	Nayuruvi	Amaranthaceae	H
4	<i>Aerva lanata</i> (L.) Juss. Ex Schult	Pula poo	Amaranthaceae	H
5	<i>Alangium salvifolium</i> (L.F.) Wang.	Alingi maram	Alangiaceae	T
6	<i>Albizzia amara</i>	Thuringi maram	Fabaceae	T
7	<i>Albizzia lebeck</i> (L.) Willd.	Kaatu vagai	Fabaceae	T
8	<i>Annona squamosa</i> L.	Seetha maram	Annonaceae	T
9	<i>Arthocarpus hyterophyllus</i> Lam.	Pala maram	Moraceae	T
10	<i>Azadirachta indica</i> A. Juss.	Veppa maram	Meliaceae	T
11	<i>Barleria crisлата</i> L.	December poo	Acanthaceae	H
12	<i>Bauhinia racemosa</i> Lam.	Athi maram	Fabaceae	T
13	<i>Borassus flabellifer</i> L.	Pannai maram	Arecaceae	T
14	<i>Carica papaya</i> L.	Papali	Caricaceae	T
15	<i>Citrus limon</i> L.	Elumichai	Rutaceae	T
16	<i>Citrus medica</i> L.	Narthakkai	Rutaceae	T
17	<i>Cocos nucifera</i> L.	Thennai	Arecaceae	T
18	<i>Commelina benghalensis</i> L.	Kalan chedi	Commelinaceae	H
19	<i>Cynodon dactylon</i> (L.) Pers.	Arugampul	Poaceae	H
20	<i>Cyperus rotundus</i> L.	Kambampul	Cyperaceae	H

21	<i>Eucalyptus grandis</i> W. Hill ex Maiden	Thyala maram	Myrtaceae	T
22	<i>Euphorbia hirta</i> L.	Ammanpatchaiarisi	Euphorbiaceae	H
23	<i>Ficus benghalensis</i> L.	Ala maram	Moraceae	T
24	<i>Ficus religiosa</i> L.	Arasa maram	Moraceae	T
25	<i>Justicia tranquebariensis</i> L.f.	Thavasi murungai	Acanthaceae	T
26	<i>Lannea coromandelica</i> (Houtt.) Merr.	Udhya maram	Anacardiaceae	T
27	<i>Lantana camara</i> L.	Unni mul	Verbenaceae	S
28	<i>Limonia acidissima</i> L.	Villa maram	Rutaceae	T
29	<i>Lueucas aspera</i>	Thumbai	Lamiaceae	H
30	<i>Mangifera indica</i> L.	Maa maram	Anacardiaceae	T
31	<i>Melia azedarach</i> L.	Malai vembu	Meliaceae	T
32	<i>Mimosa pudica</i> L.	Thotta siningi	Mimosaceae	H
33	<i>Morinda coreia</i> Buch. Ham.	Nunna maram	Rubiaceae	T
34	<i>Moringa olifera</i> Lam.	Murungai	Moringaceae	T
35	<i>Murraya koenigii</i> (L.) Spreng.	Karuveppillai	Rutaceae	T
36	<i>Musa paradisiaca</i> L.	Vallai maram	Musaceae	T
37	<i>Ocimum sanctum</i> L.	Thulasi	Lamiaceae	H
38	<i>Phoenix dactylifera</i> L.	Echa maram	Arecaceae	T
39	<i>Phyllanthus acidus</i> (L.) Skeels	Nelli maram	Phyllanthaceae	T
40	<i>Phyllanthus niruri</i> L.	Keela neli	Phyllanthaceae	H
41	<i>Psidium guajava</i> L.	Koia	Myrtaceae	T
42	<i>Pungamia pinnata</i> (L.) Pierre	Pungai	Fabaceae	T
43	<i>Punica granatum</i> L.	Mathulai	Punicaceae	S/T
44	<i>Rosa gallica</i> L.	Rosa poo	Rosaceae	S
45	<i>Santalum album</i> L.	Santhana maram	Santhalaceae	T
46	<i>Strychnos nux-vomica</i> L.	Yetti	Fabaceae	T
47	<i>Tamarindus indica</i> L.	Puliya maram	Leguminosae	T
48	<i>Tectona grandis</i> L. f.	Thekku	Verbenaceae	T
49	<i>Terminalia catappa</i> L.	Batham	Combretaceae	T
50	<i>Thespesia populnea</i> (L.) Sol. Ex Cor-rea	Poovarasu	Malvaceae	T
51	<i>Tridax procumbens</i> L.	Vetumarunthu thalai	Asteraceae	H
52	<i>Ziziphus mauritiana</i> Lam.	Eillanthai	Rhamnaceae	T

Medicinal Plant Resources of Ayurveda

The angiosperm plants families of medicinal plants belonging to Ayurveda studies are presented in (Table 2). A total of 27 plant families comprising 43 plant species are used in Ayurveda medicine of these plant families the contribution of Dicotyledons was 88.37 % and Monocotyledons was 11.63 %. Among the dicotyledons, the families of polypetalae contributed 48.84 %, Gamopetalae 20.93 %, Monochlamydeae 18.60 % to the Ayurveda medicinal plants used in combating human diseases. Fabaceae 7 species, Rutaceae 4 species, Mimosaceae, and Moraceae with 3 species each, Anacardiaceae, Euphorbiaceae, Meliaceae, Verbenaceae, Rubiaceae, Santhalaceae, Lamiaceae, Amaranthaceae and with 2 species each, Annonaceae, Rhamnaceae, Alangiaceae, Moringaceae, Acanthaceae, Caricaceae, Phyllanthaceae, Loganiaceae, Asteraceae, Punicaceae, Cyperaceae, Commelinaceae, Arecaceae, Musaceae and Poaceae with 1 species each used in Ayurveda medicines (Table 2 and Fig 2)

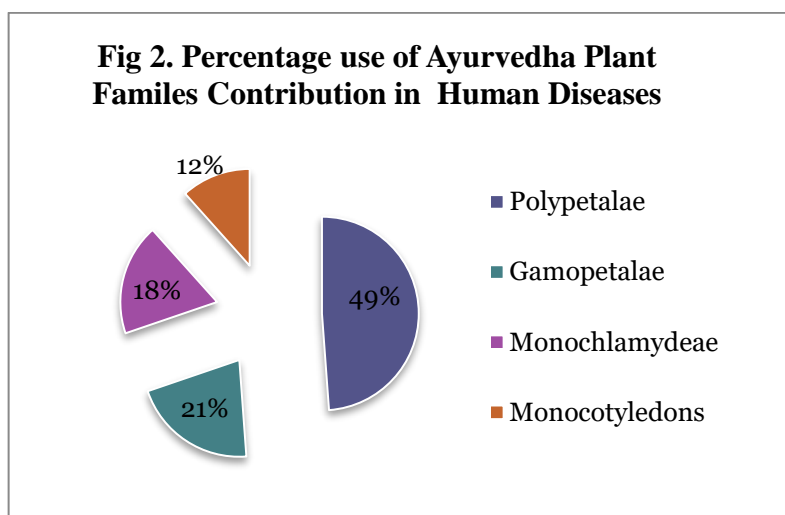


Table 2 Total plant families of the study area used in Ayurveda

S. No	Family	Number of species	Percentage (%)	Part used
Dicotyledon			88.37	
Polypetalae			48.84	
1	Anacardiaceae	2	4.65	Bark, Leaf, Flower, Fruit, Gum and Seed
2	Fabaceae	2	4.65	Bark, Fruit and Flower
3	Meliaceae	2	4.65	Bark, Leaf, Flower, Root and Seed
4	Mimosaceae	3	6.98	Whole plant
5	Annonaceae	1	2.33	Fruit
6	Rutaceae	4	9.30	Bark, Leaf and Fruit
7	Leguminosae	2	4.65	Bark, Leaf, Flower and Seed
8	Myrtaceae	2	4.65	Leaves, Fruit and Gum
9	Rhamnaceae	1	2.33	Root, Bark and Fruit
10	Alangiaceae	1	2.33	Root bark
11	Moringaceae	1	2.33	Root bark and Seed

		Gamopetalae	20.93	
12	Acanthaceae	1	2.33	Root
13	Lamiaceae	2	4.65	Whole plant
14	Verbenaceae	2	4.65	Heart Wood and Bark
15	Loganiaceae	1	2.33	Seed
16	Asteraceae	1	2.33	Whole plant and Seed
17	Caricaceae	1	2.33	Leaf, Fruit, Seed and Latex
18	Punicaceae	1	2.33	Root bark, Fruit and Flower
		Monochlamydeae	18.60	
19	Euphorbiaceae	2	4.65	Whole plant
20	Amaranthaceae	2	4.65	Whole plant
21	Moraceae	3	6.98	Bark, Leaf, Fig and latex
22	Phyllanthaceae	1	2.33	Fruit
		Monocotyledons	11.63	
23	Cyperaceae	1	2.33	Tuber
24	Commelinaceae	1	2.33	Whole plant
25	Arecaceae	1	2.33	Root, Ash, Oil, Flower and Fruit
26	Musaceae	1	2.33	Rhizome, Flower, Stem and Fruit
27	Poaceae	1	2.33	Whole plant
		Total	43	100

Whereas, the fruits (17.98 %) of Ayurveda medicinal plants were preferred, followed by barks (root and stem) (16.85 %), leaf/ash (15.73 %) and seed (11.24 %). (Table 6 and Fig. 8).

Table 3. Medicinal plant parts used in human diseases by Ayurveda and Siddha

S.No	Part used	Ayurveda plants		Part used	Siddha plants	
		No of species	Percentage (%)		No of species	Percentage (%)
1	Fruit	16	17.98	Leaf	23	16.79
2	Bark(Root/Stem)	15	16.85	Bark	21	15.33
3	Leaf/Ash	14	15.73	Fruit	21	15.33
4	Seed	10	11.24	Root	18	13.14
5	Flower	8	8.99	Seed	15	10.95
6	Root	7	7.87	Flower	11	8.03
7	Whole plant	7	7.87	Whole plant	11	8.03
8	Stem	3	3.37	Gum	5	3.65

9	Latex	2	2.25	Wood	5	3.65
10	Gum/Resin	2	2.25	Latex	4	2.92
11	Oil	2	2.25	Rhizome	1	0.73
12	Rhizome	2	2.25	Tuber	1	0.73
13	Tuber	1	1.12	Oil	1	0.73

Medicinal Plant Resources of Siddha

The angiosperm plant families of medicinal plants belonging to Siddha studies are presented in (Table 3). A total of 33 plant families comprising 52 plant species are reported in these studies (Table 3 and Fig 3). Of them, the share of Dicotyledons was 86.54% and Monocotyledons was 13.46%. Among the dicotyledons, the families of polypetalae contributed 48.08 %, Gamopetalae 17.31%, Monochlamydeae 21.15% to the Siddha medicinal plants used in combating human diseases. Leguminosaea 5 species, Rutaceae 4 species, Arecaceae, Mimosaceae, Euphorbiaceae and Moraceae with 3 species each, Anacardiaceae, Fabaceae, Meliaceae, Lamiaceae, Amaranthaceae and Phyllanthaceae with 2 species each, Annonaceae, Malvaceae, Rosaceae, Combretaceae, Rhamnaceae, Alangiaceae, Moringaceae, Acanthaceae, Verbenaceae, Rubiaceae, Caricaceae, Loganiaceae, Asteraceae, Punicaceae, Santhalaceae, Cyperaceae, Commelinaceae, Musaceae and Poaceae with 1 species each used in Siddha medicines.

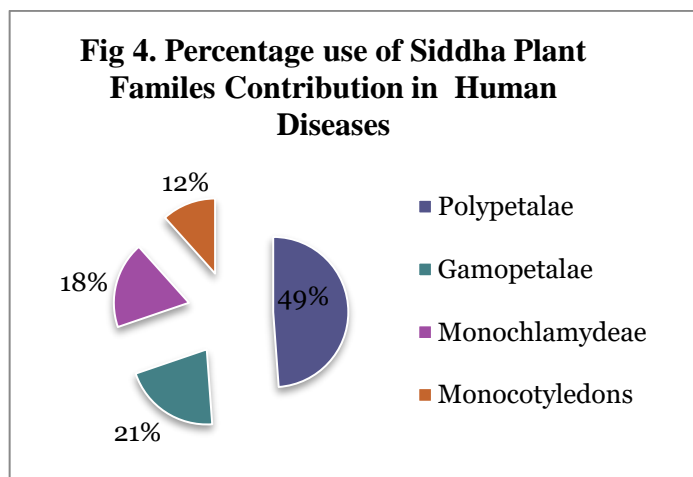


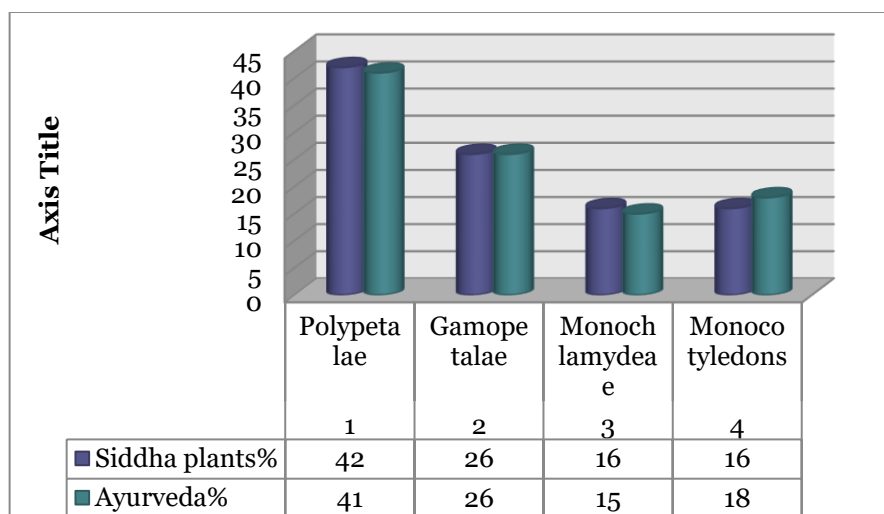
Table 4 Total plant families of the study area used in Siddha

S. No	Family	Number of species	Percentage (%)	Part used
Dicotyledon			86.54	

Polypetalae			48.08	
1	Anacardiaceae	2	3.85	Root and Stem bark, Leaf Flower, Fruit and Gum
2	Fabaceae	2	3.85	Root, Leaf, Bark and Seed
3	Meliaceae	2	3.85	Root, Bark, Leaf and Gum
4	Mimosaceae	3	5.77	Root and Leaf
5	Annonaceae	1	1.92	Root, Bark, Fruit and Seed
6	Malvaceae	1	1.92	Root, Bark, Leaf, Seed, Flower and Fruit
7	Rutaceae	4	7.69	Root, Leaf and Fruit
8	Rosaceae	1	1.92	Flower
9	Leguminosae	5	9.62	Bark, Leaf, Flower, Fruit and Seed
10	Combretaceae	1	1.92	Fruit and Gum
11	Rhamnaceae	1	1.92	Root bark and Stem bark
12	Alangiaceae	1	1.92	Bark, Root and Seed
13	Moringaceae	1	1.92	Whole plant
Gamopetalae			17.31	
14	Acanthaceae	1	1.92	Leaf and Root
15	Lamiaceae	2	3.85	Leaf and Flower
16	Verbenaceae	1	1.92	Wood, Bark, Flower, Fruit and Seed
17	Rubiaceae	1	1.92	Root, Leaf and Bark
20	Loganiaceae	1	1.92	Root bark, Bark, Leaf, Fruit and Seed
21	Asteraceae	1	1.92	Whole plant
22	Caricaceae	1	1.92	Fruit, Seed and Latex
23	Punicaceae	1	1.92	Root, Bark, Fruit and Seed
Monochlamydeae			21.15	
24	Euphorbiaceae	3	5.77	Whole plant
25	Amaranthaceae	2	3.85	Whole plant
26	Santhalaceae	1	1.92	Wood and Oil
27	Moraceae	3	5.77	Root, Bark, Leaf and Seed
28	Phyllanthaceae	2	3.85	Fruit
Monocotyledons			13.46	
29	Cyperaceae	1	1.92	Tuber
30	Commelinaceae	1	1.92	Whole plant
31	Arecaceae	3	5.77	Root, Leaf, Flower and Fruit
32	Musaceae	1	1.92	Rhizome, Root, Stem, Leaf and Flower
33	Poaceae	1	1.92	Whole plant
Total		52	100	

The medicinally useful plant parts are of 13 types. When they are compared with reference to their contribution in combating human diseases management, leaves were found to be the predominant plant part (16.79 %) used in Siddha. This was followed by barks (15.33 %), fruits (15.33 %), and root (13.14 %) (Table 5, Fig 7).

Fig 9. Medicinal Plant groups used in Combating Human Diseases of Ayurveda and Siddha



Whereas, in the case of Ayurveda medicinal plant groups, Polypetalae 41% and Gamopetalae plant 26% followed by were used predominantly in combating human diseases (Table 5; Fig9).

Bench Categories of Ayurveda and Siddha medicinal plant

When the dominant plant family categories of Siddha and Ayurveda medicinal plants used in combating human diseases were compared, the percentage contribution varied. Polypetalae plant with 42%, Gamopetalae plant with 26%, share dominated among the Siddha medicinal plants followed by Monocotyledons share used in human diseases (Table 7; Fig 9).

Table 5. A comparative contribution of medicinal plants groups used in human diseases.

S.No	Plant groups	No of Plant Species
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		Siddha plants	%	Ayurveda plants	%
1	Polypetalae	13	42	11	41
2	Gamopetalae	8	26	7	26
3	Monochlamydeae	5	16	4	15
4	Monocotyledons	5	16	5	18
Total		31	100.00	27	100.00

Whereas, in the case of Ayurveda medicinal plant groups, Polypetalae 41% and Gamopetalae plant 26% followed by were used predominantly in combating human diseases (Table 5; Fig 10).

Conclusion

Medicinal plants resources in agroecosystem are significant to the local people as they rescue them from their primary health diseases. Increasing awareness on the medicinal plant resources in agricultural landscape can contribute to the conservation and management of medicinal plant diversity and the agroecosystem.

Agroecosystems provide food, fuel, fodder, medicines, etc. These are all natural resources and livelihood for rural people in India. So, sensitizing people through government programmes about conservation will help improve the medicinal plant resources of agroecosystems in India.

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