

Diversity of Ethnomedicinally important aquatic macrophytes from Theroor Pond in Agastheeswaram Taluk, Kanyakumari District, Tamilnadu, South India

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ABSTRACT

The result of aquatic plant diversity of Theroor pond were 24 species of aquatic plants, 21 genera belonging to 16 families and 11 orders under 7 clades /groups were documented. Among the 24 species, 13 species belongs to dicotyledons, 9 species belongs to monocotyledons and 2 species belongs to Pteridophytes. The dominant clade is Monocots (9 species from 9 genera) followed by Asterids (6 species from 4 genera). The most dominant family in the present study is Hydrocharitaceae with 4 species, followed by Onagraceae, Lentibulariaceae and Menyanthaceae (2 species each). The most dominant habitat of the aquatic plant species are Free Floating Hydrophytes and Floating submerged anchored Hydrophytes (6 species each). Among these 24 species, 19 species were used as medicine and 6 species used as fodder. 17 species of aquatic hydrophytes used in Ethnomedicine and it's followed by Folk (13 species). Aquatic hydrophytes species are specific to the environment quality and therefore can be used as agent in biomediation.

Keywords: Hydrophytes, Theroor pond, Ethnomedicine and Agastheeswaram.

1. Introduction

Wetland ecosystems are beauty of nature and wealth for future ^[1]. Wetlands are not only important life support system for the flora and fauna alone but also act as sources of livelihood and bioresource to supplement their day to day life for human populations surrounding them ^[2]. Macrophytes are important component and play a major role in primary productivity of the aquatic ecosystem ^[3]. The aquatic macrophytes are the important source of food, fodder, herbal medicine and domestic household materials. Macrophytes as a component of fresh water ecosystems play an important role in the structure and functioning of the aquatic ecosystems ^[4]. There is very little literature is available about the aquatic macrophytes of our study area ^[5,6,7,8,9]. The present investigation was therefore to study the species diversity of ethnomedicinally important aquatic macrophytes in Theroor pond.

2. Materials and Methods

2.1 Study area

Kanyakumari is the southernmost district of Tamil Nadu. This district lies between 77°07' - 77°35' E, 08°05' - 08°35' N, and it occupies an area of about 1672 sq. km. The District is bound by Tirunelveli District on the north and the east. The South Eastern boundary is the Gulf of Mannar. On the South and the South West, the boundaries are the Indian Ocean and the

Arabian Sea. On the West and North West it is bound by Kerala. This district is comprised of four taluks namely, Agastheeswaram, Thovalai, Kalkulam and Vilavancode. In Agastheeswaram Taluk 183 ponds were located; Out of these, only Theroor pond of Agastheeswaram Taluk was selected for the study area is given (Fig.1).



Fig.1 Satellite Map of Kanyakumari District

2.2 Preservation and identification of plant materials

Frequent field trips were carried out from Oct 2014 to Oct 2016 to collect different aquatic and semi - aquatic plants found in Theroor pond of Agastheeswaram Taluk. Plants were collected carefully with hand or hook and identified with the help of various published monographs, taxonomic revisions and floras^[10,11,12,13,14, 15,16] and by using the field keys devised by^[17]. Species diversity of the wetland plants was adapted by^[18,19,20]. Interviews were conducted with local people, medicine men and elderly settlers near by the ponds for documenting indigenous knowledge of the local people and utilization value of the plant species. The medicinal use of species was cross checked through the literature available.

Authentication of the identity of plant species were confirmed by specimens deposited in Botanical Survey of India, Southern Circle, Coimbatore, Jawaharlal Nehru Tropical Botanical Garden and Research Institute (JNTBGRD) Palode, Trivandrum, Kerala and Botany Department

of Scott Christian College, Nagercoil. APG IV [21] was followed to clarify the species were verified with IPNI. The voucher specimens collected from the field were prepared the herbarium and were deposited in the P.G. & Research Department of Botany, S.T. Hindu College, Nagercoil.

3. Results and Discussion

A total of 24 species belonging to 21 genera distributed in 16 families from 11 orders and 7 Clades / groups according to Angiosperm Phylogeny Group IV Classification were recorded during the present study from Theroor ponds of Agastheeswaram Taluk. These taxa are represented in Table 1.

Table 1. List of Aquatic hydrophytes in Theroor ponds in Agastheeswaram Taluk, Kanyakumari District

Class/clade/Order	Family/Botanical name	Uses in medicinal systems	Life form	Fl.&Fr.	Parts Used	Uses	STICH No.
Peridophytes							
Salviniales	Salviniaceae						
	<i>Azolla caroliniana</i> Willd.		FFH		WP	M/O	4554
	<i>Salvinia natans</i> All.		FFH		WP	Fo	4561
ANA Grade							
Nymphaeales	Nymphaeaceae						
	<i>Nymphaea pubescens</i> Willd.	AY,SD,UN,FL,EM	FLAH	Throughout	Fr,L,P,S	M/F	4093
Monocots							
Alismatales	Araceae						
	<i>Lemna perpusilla</i> Willd.		FFH	Jul-Oct	WP	Fo	4135
	<i>Pistia stratiotes</i> L.	AY,SD,UN,FL,EM	FFH	Mar-Aug	WP	M	4089
	Hydrocharitaceae						
	<i>Hydrilla verticillata</i> (L.f.) Royle	FL,EM	SAH	Oct- Jan	WP	M/O	4502
	<i>Najas graminea</i> Delile		SAH	Aug- Oct	WP	M	4494
	<i>Ottelia alismoides</i> (L.) Pers.	SD,FL,EM	SAH	Aug-Dec	WP	Ma	4016
	<i>Vallisneria spiralis</i> L.	SD,FL	SAH	Oct- Feb	WP	M/Fo	4070
	Aponogetonaceae						
	<i>Aponogeton natans</i> (L.) Engl.&K.Krause	SD,FL,EM	FLAH	Throughout	L	M	4345
	Potamogetonaceae						
	<i>Potamogeton nodosus</i> Poir.		SAH	Oct- Dec	WP	Fo	4353
Commelinales	Pontederiaceae						
	<i>Eichhornia crassipes</i> (Mart.) Solms.	SD,EM	FFH	Throughout	L, R, F	M/Fo	4130

	Probable sister of Eudicots							
	Ceratophyllales	Ceratophyllaceae						
13		<i>Ceratophyllum demersum</i> L.	AY,EM	SSH	Oct- Nov	L	M	4
	Eudicots							
	Proteales	Nelumbonaceae						
14		<i>Nelumbo nucifera</i> Gaertn.	AY,SD,UN,FL,EM	FSAH	Jul- Oct	L, S	M	4
	Rosids							
	Fabales	Fabaceae						
15		<i>Neptunia oleracea</i> Lour.	AY,SD,EM	FFH	Aug- Jan	L, St	M	4
	Myrtales	Lythraceae						
16		<i>Trapa natans</i> L.	AY,SD,UN,FL,EM	FSAH	Jul- Nov	L	M	4
		Onagraceae						
17		<i>Ludwigia adscendens</i> (L.) H.Hara.	FL,EM	FSAH	Jun- Sep	Fr,L	M	4
18		<i>Ludwigia octovalis</i> (Jacq.) P.H.Raven	AY,FL,EM	FLAH	Jul-Mar	Rh,R	M	3
	Asterids							
	Solanales	Convolvulaceae						
19		<i>Ipomoea aquatica</i> Forssk.	AY,SD,FL,EM	FSAH	Jul- Apr	Rh,F,Fr,L	M/F	4
	Lamiales	Plantaginaceae						
20		<i>Limnophila heterophylla</i> (Roxb.) Benth.	EM	SSH	Aug- Feb	WP	M	43
		Lentibulariaceae						
21		<i>Utricularia aurea</i> Lour.	EM	SSH	Oct- Jan	WP	M	40
22		<i>Utricularia stellaris</i> L.f.	SD,FL	SSH	Oct-Jan	WP	M	43
	Asterales	Menyanthaceae						
23		<i>Nymphoides hydrophylla</i> (Lour.) Kuntze	AY,SD,EM	FSAH	Jul-Apr	WP	M/Fo	41
24		<i>Nymphoides indica</i> (L.) Kuntze	FL,EM	FSAH	Aug-Apr	L	M	45

Habitat: FLAH- Floating leaved anchored hydrophytes, FSAH- Floating submerged anchored hydrophytes, FFH- Free floating hydrophytes, SAH- Submerged anchored hydrophytes, SSH- Submerged suspended hydrophytes. **Parts Used:** F- Flower, Fr- Fruit, L- Leaves, P- Petiole, R- Root, Rh- Rhizome, S- Seed, St- Stem, WP- Whole plant. **Uses:** F- Food, Fo- Fodder, Ma- Manure, M- Medicine, O- Ornamental

Of the recorded species in the present study area, Dicotyledons (13 species) belonging from 9 genera and 9 families was the largest number of plant groups followed by Monocotyledons (9 species) belonging from 9 genera and 5 families (Fig.2). Likewise dicotyledons were dominant over monocotyledons and very few only Pteridophytes its already reported in the work of [22, 23& 24].

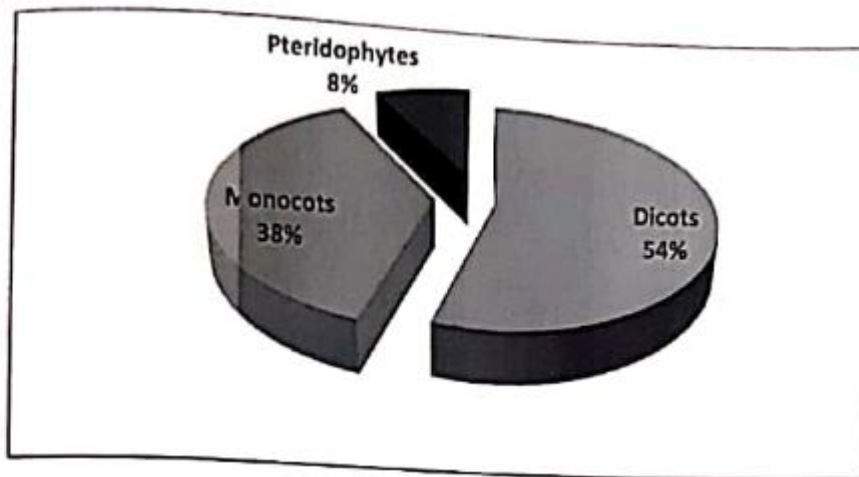


Fig. 2. Distribution of species

An analysis of the floristic diversity denotes that the family Hydrocharitaceae dominates the flora with 4 species followed by Lentibulariaceae, Araceae, Menyanthaceae, Onagraceae and Salviniaceae 2 species each (Fig. 3). The dominant family Hydrocharitaceae (4 species) was recorded in pond of Chiyada [25].

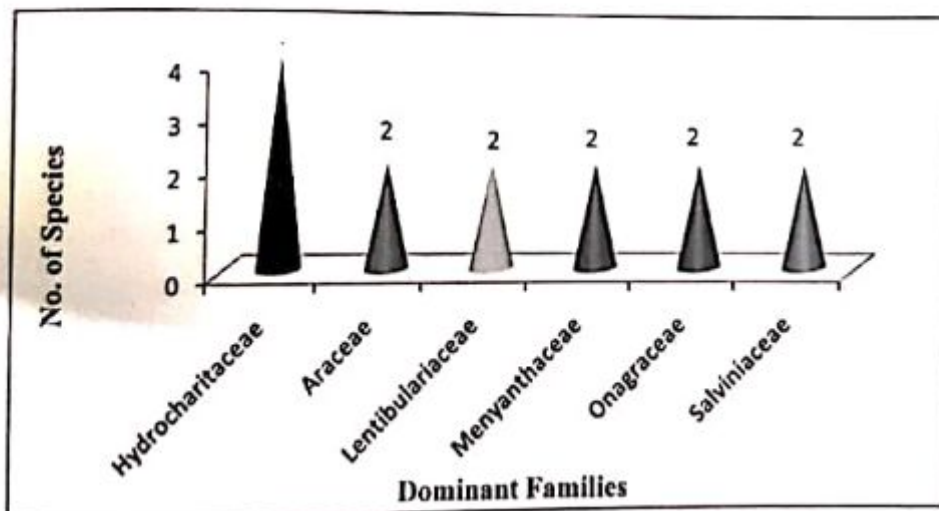


Fig.3 Dominant Aquatic plant families in Theroor pond

Further the aquatic macrophytes classified in morphological groups viz., free floating hydrophytes, and floating submerged anchored hydrophytes (6 species each) followed by submerged anchored hydrophytes (5 species), submerged suspended hydrophytes (4 species) and

floating leaved anchored hydrophytes (3 species) (Fig. 4). Presence of *Ipomoea* sps, *Pistia stratiotes*, *Eichornia crassipes* indicated a clear sign of invasion of alien species in this pond [26]. Submerged macrophytes dominant over other category was reported by [27]. *Nelumbo nucifera* and *Trapa natans* are also considered to be endemic [28].

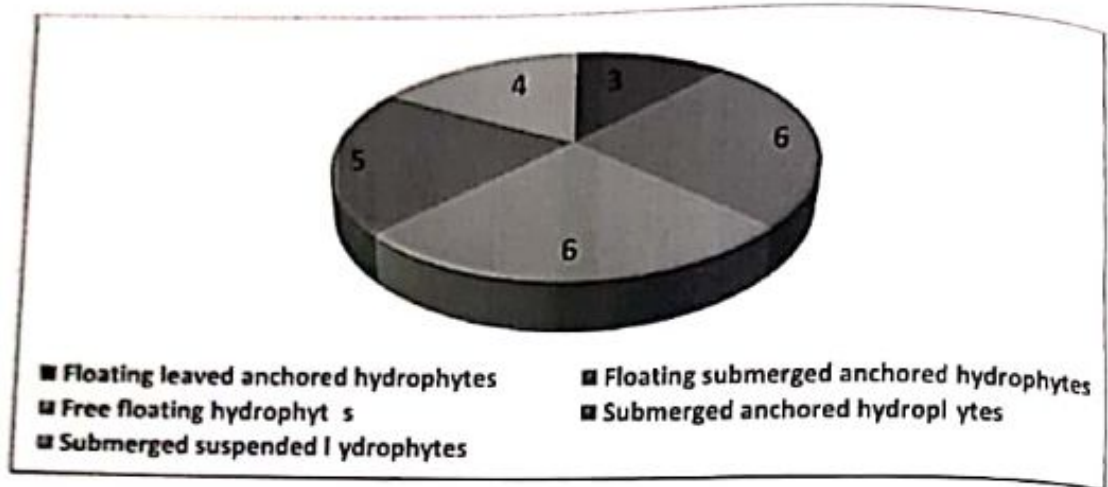


Fig. 4. Life form distribution of wetland Angiosperms in the study area

All the medicinal plants collected from the present study area are used in Ethnomedicinal preparations by local people. Out of 24 aquatic plants species, 17 aquatic species are used in ethnomedicine, 13 medicinal plant species are used in Folk medicines. 12 species are used in Siddha medicines, 9 species are used in Ayurveda medicines and 4 species are used in Unani medicines (Fig. 5).

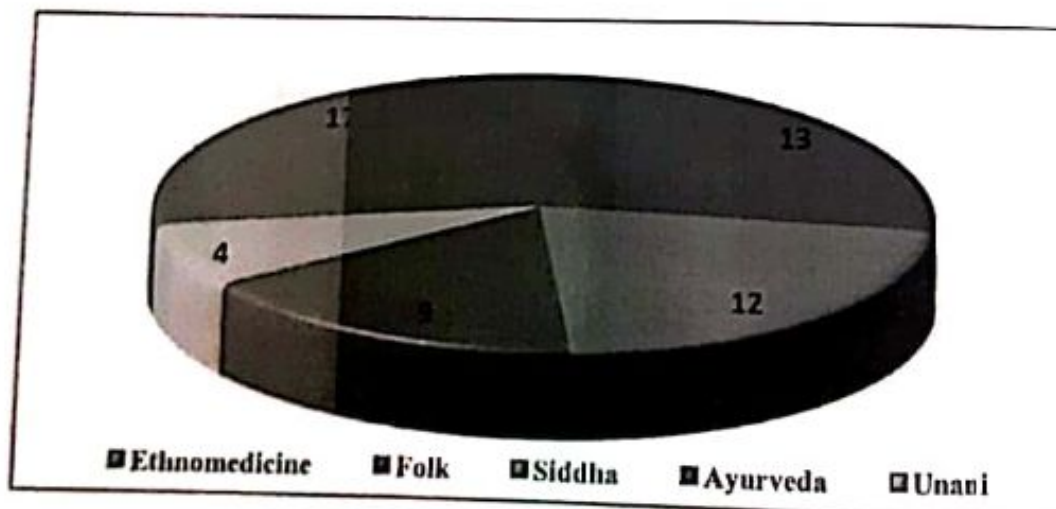


Fig. 5. Number of medicinal plants used in different traditional medicines.

In the study, ethno-botanically used plants were also identified and are grouped in to medicinal (19 species) followed by fodder (6 species), ornamental, manure and food (2 species each) (Fig. 6). [29] made a review on the utility of Indian wetland species as food and medicine by

Integrating the traditional knowledge of local communities. Medicinal plants provide easily available and relevant resources for primary health care with minimum side effects [30].

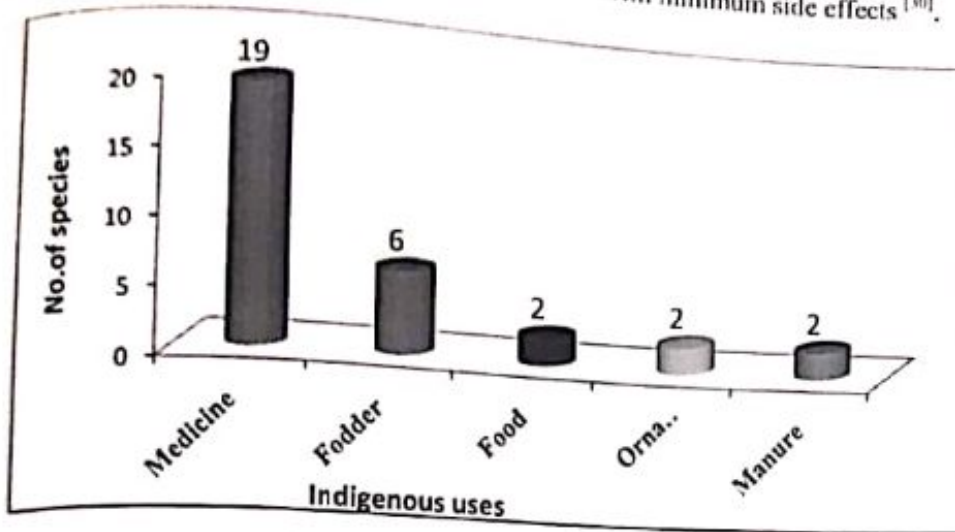


Fig. 6. Economically important plants collected from the present study area

Among these 24 aquatic species, different plant parts were used economically. Maximum plant parts are reported in whole plant (13 species), leaves (10 species), fruits (3 species), rhizome, roots, seeds (2 species each stem and petiole (1 species each) (Fig. 7). *Pistia stratiotes*, *Najas graminea*, *Nymphaea pubescens*, *Ludwigia octovalis* and *Trapa natans* are used to control may diseases. *Ipomoea aquatic* and *Nymphaea pubescens*, are reported for edible value in the Kanyakumari District and it's already mentioned by [31].

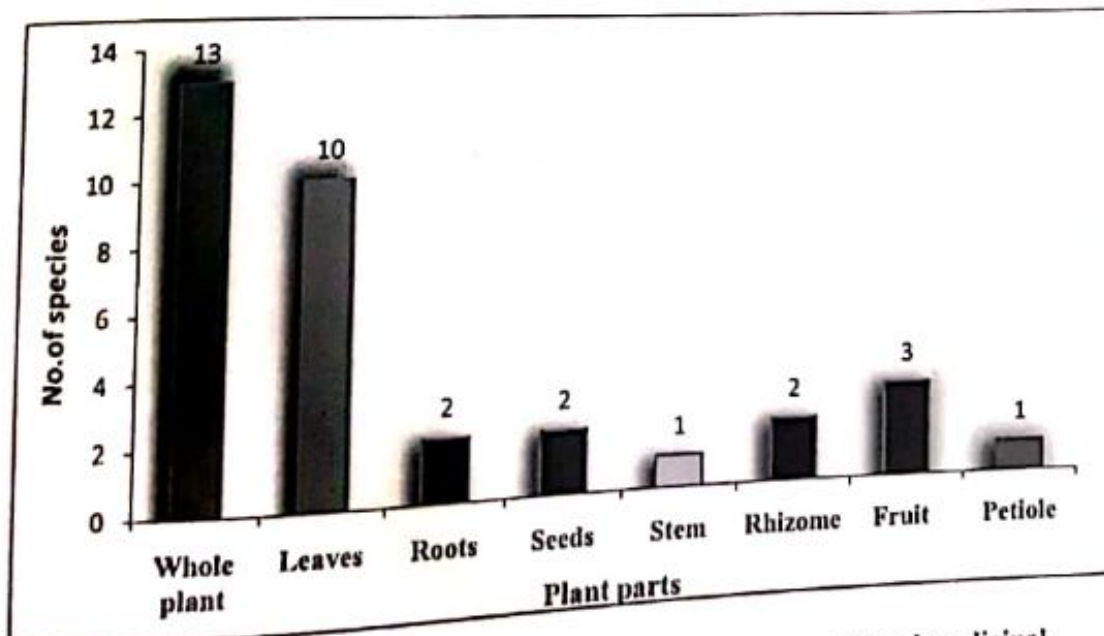


Fig. 7. Morphological useful parts of angiospermic plants used for traditional medicinal preparations

Information gathered through personal interview and authentication by referring literature revealed that 19 aquatic species of wetland plants are well known for their therapeutic efficacy. Many number of medicinal plants are commonly distributed in this Theroor pond are *Najas graminea*, *Neptunia oleracea*, *Nymphoides indica*, *Nymphoides hydrophylla*, *Pistia stratiotes* etc., Many plants are used to treat cold, cough, fever, stomachache, piles, diarrhoea, dysentery, headache, wounds and skin diseases etc. (Table.2).

Ethno medico botany plays a great role in exploiting the medicinal chemicals from the medicinal plants used by indigenous communities^[32]. Most of the aquatic plants are grown wild and hence people freely collect them. This is a means of livelihood and source of income for the poor and landless people^[32]. Out of the various parts used as native medicines, leaf and shoot or whole plants are commonly used^[34]. Sometimes, the same plant is suggested for more than one disease. In such cases it is very difficult to assess which plant is actually effective in curing a particular disease. Only clinical trials on these plants can give some indications^[35].

Table - 2 List of Ethnomedicinally used aquatic macrophytes with different ailments

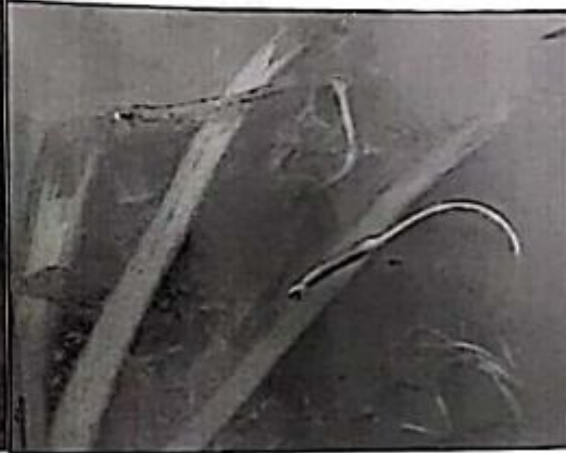
S.No	Botanical name	Ailments
1	<i>Aponogeton natans</i>	Cuts and wounds
2	<i>Ceratophyllum demersum</i>	Vomiting, cooling agent
3	<i>Eichhornia crassipes</i>	Skin diseases, toothache, goiter, hairloss
4	<i>Hydrilla verticillata</i>	Skin diseases, ulcers
5	<i>Ipomoea aquatica</i>	Diarrhea, blood dysentery, piles, scabies, headache, cardiac, headache, liver ailments, foot crack
6	<i>Limnophila heterophylla</i>	Hair nourishment
7	<i>Ludwigia adscendens</i>	Diuretic, rubefacient
8	<i>Ludwigia octovalis</i>	Blood dysentery, piles, dyspepsia, menorrhagia, abortion
9	<i>Najas graminea</i>	Skin rashes, headaches, jaundice, lacrimation, headache, scabies, swellings
10	<i>Nelumbo nucifera</i>	Eye diseases, scorpion and snake bite, anthelmintic
11	<i>Neptunia oleracea</i>	Intestinal infections, earache, astringent
12	<i>Nymphaea pubescens</i>	Bone fracture, constitution disorders, conjunctivitis, diarrhoea, blood circulation
13	<i>Nymphoides hydrophylla</i>	Inflammation, antidandruff, ulcer
14	<i>Nymphoides indica</i>	Expel worms, dysentery, fever
15	<i>Pistia stratiotes</i>	Piles, dysentery, coughing, fever, constipation, asthma, cough, skin diseases, swelling, leprosy, eczema, irregular urination

16	<i>Trapa natans</i>	Laxative, pile problems, jaundice, eye diseases, blood purifier, gonorrhoea, blood purifier
17	<i>Utricularia aurea</i>	Prevention the mosquito disease
18	<i>Utricularia stellaris</i>	Astringent, diuretic
19	<i>Vallisneria spiralis</i>	Refrigerent, stomachic problems

Some of the ethnomedicinally important aquatic macrophytes of Theroor pond of Aascheeswaram Taluk are given below



Utricularia aurea Lour.



Vallisneria spiralis L.



Pistia stratiotes L.



Nymphoides indica (L.) Kuntze



Limnophila heterophylla (Roxb.) Benth.

Hydrilla verticillata (L.f.) Royle

Conclusions

Since there are limited studies made on Theroor wetland, hence in the light of lack of literature, it is rather difficult to compare the results of present study with others. There is a need to make correlations between the availability of aquatic macrophytes with physico-chemical and biological variables. The present work exhibited the database of aquatic macrophytes in Theroor wetland and its adjoining area which will help in future work for its conservation, preservation and addition of the local biodiversity and only that the plant bioresources are depleting rapidly jeopardizing the livelihood of the poor wetland dependent people. Therefore, measures for conservation of wetlands and wetland resources should be taken up on priority by different government and non-government organizations involving these stakeholders for the benefit of humanity.

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