

FLORA OF MEDICINAL SIGNIFICANCE IN KOLE WETLANDS OF PONNANI, KERALA



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Abstract: The paper presents an overview of the floristic survey of aquatic medicinal plants carried out during 2011- 2012 in Ponnani kole wetland ecosystem. The study aimed at exploring the medicinal plant wealth of this important site, a part of Vembanad kole Ramsar site, which still remains unknown. The key objective was to assess and document the potential of floral resources in healthcare that are thrown away as weeds. During the present investigation 12 stations were selected and surveyed in different zones of Ponnani kolelands. From each station four 10m transects were observed for the floristic structure and samples were collected for identification. The investigation on the community conformation of medicinal herbs in the Ponnani kole revealed the occurrence of 26 species under 23 genera and 18 families with strictly aquatic habitat. Taxonomic identification of medicinal plants collected from study area was done using existing keys, taxonomic revisions and monographs. The data on the medicinally significant plants indicate that the observed species were utilized to treat gastrointestinal disorders, respiratory illnesses, dermatological problems, urinogenital complaints, cardiovascular hitches and neurodisorders in various systems of medicine. Among the listed plant species *Bacopa monnieri*, *Centella asiatica*, *Evolvulus alsinoides*, *Cynodon dactylon* and *Hygrophila schulli* are very important in medical usage against different ailments. Therefore population of these plant species need to be maintained *in situ* by adopting organized cultivation techniques and proper conservation methods. Kole wetlands are not only important in terms of ecology and maintaining the microclimate of the region but also provide useful resources for livelihood and healthcare.

Key words: Herbal Medicine, Ramsar site, Aquatic macrophytes.

INTRODUCTION

Kole wetlands are vital ecosystems which provide response for the livelihood concerns of thousands of inhabitants in and around this area and also support a varied spectrum of biodiversity. Kole wetland ecosystem is an outstanding habitat for several species of aquatic and semi aquatic medicinal flora and is characterized by rich biodiversity. In spite of the commercial value, local community utilizes good amount of these vegetation for various healing purposes. Majority of aquatic macrophytes are very subtle to fluctuations in the normal physio-chemical parameters of the wetland, hence any attempt for the modification of this delicate wetland ecosystem may results in the extirpation of these plants. This will ultimately end in large scale economic loss in terms of the medicinal products. Concerted attempts have neither been made to record the availability of medicinal plants nor to highlight the known therapeutic

properties of the wetland plants of this important zone, used by different systems of medicine like ayurveda, siddha, folk, homeopathy and unani. The knowledge on the medicinal property of plants has been accrued in the course of many centuries (Kirtikar and Babu, 1980). The local populations have inherited rich traditional information on the use of these plants against recurrent diseases (Vedavathy, 2003). Cook (1996), in his book on aquatic and wetland plants of India, provided some short records on the utility of aquatic plants.

Koleland ecosystems are usually designated as wastelands and are being reclaimed for various developmental requirements bringing several taxa, which would be of great potential in medicine, to the verge of extirpation. At the same time, medicinal plants in this wetland area can provide employment and income generating

chances to local communities. To achieve said goal, recurrent gathering, often resulted in overexploitation, may be controlled or supported by modern approaches for propagation of these plants. Moreover due to the reduction of the kolelands, the plant resources has been recording a falling trend during recent years. Community oriented tactic needs to be organized for propagation and sustainable harvest procedures for the conservation and better exploitation of the medicinal plants of this region. Conservation plan should be developed assuring the complete participation of the local stakeholders for the effective implementation. Traditionally the local inhabitants have been using wetland plants against many diseases. The importance of traditional medicine that provides health service to about 80% of world population has not been realized to an extent that deserves (Marini, 1980). India, with its excellent traditional knowledge in the herbal medicine, has greater potentials to increase its share in the world market. Plants of kole wetland ecosystem played fascinating role in the life of humankind in earlier days as food, fodder and medicine. But with the changes in the life style, the worth of these wetland plants is overlooked and now, they are treated as weeds. Though the kole wetlands are rich repositories of various plant species, attempts has not been undertaken to enumerate the food values and medicinal uses of them. Therefore, there is an urgent need to document the present status of medicinal plants in this unique ecosystem for their conservation and utilization for sustainable development. In this context a preliminary study has been carried out for the documentation of availability and medicinal potential of plants that grow as weeds in Ponnani kolelands, a unique wetland ecosystem which is a part of Vembanad-Kole Ramsar (Ramsar Convention Secretariat, 2006) spread over Thrissur and Malappuram districts.

MATERIALS AND METHODS

Ponnani Kole, situated in south western region of Malappuram district, is the northern most extension of the Vembanad Kole Ramsar site. The study area is extending from southern bank of Bharathapuzha in the north to Naranipuzha in the south in a stretch of about twenty kilometers.

Floristic survey was carried out during January 2011 to December 2011 to assess the occurrence and abundance of plants with medicinal properties in the study area. During the present study, 12 stations were selected and surveyed in different zones of Ponnani kole lands (Table 1).

Table 1. Geographic positions of the stations, in the Ponnani Kole wetland, selected for the study

No. Stations	Latitude and Longitude
1 Porangue	N 10° 45.672, E 75° 56.958
2 Cheerppu	N 10° 45.069, E 75° 56.684
3 Mukolamthazhath	N 10° 47.060, E 75° 58.009
4 Aynichira	N 10° 45.654, E 75° 58.552
5 Kottamukku	N 10° 46.461, E 75° 56.067
6 Kalachal	N 10° 45.666, E 76° 00.564
7 Naranipuzha	N 10° 43.109, E 75° 59.380
8 Uppungalkadavu	N 10° 41.098, E 75° 59.831
9 Vadakkekottol	N 10° 42.329, E 76° 03.688
10 Muchikadavu	N 10° 44.090, E 75° 59.825
11 Kummipalam	N 10° 43.595, E 75° 58.530
12 Thuyyam	N 10° 47.156, E 75° 58.151

From each station four 10m transects were observed for the floristic composition and samples were collected for identification. Taxonomic identification of plants collected from study area were done using available keys, taxonomic revisions, monographs and texts like Flora of British India (Hooker, 1875-97), Flora of the Presidency of Madras (Gamble, 1915-36), Flora of Calicut (Manilal and Sivarajan, 1982) and Flora of Alappuzha District (Sunil and Sivadasan, 2009). Author citation and binomial of collected species were verified with International Plant Names Index (IPNI). Plants so identified were further categorized as medicinal plants (Udayan and Balachandran, 2009) centered on their usage in diverse systems of medicine (Table 3). Plants represented only in 1 to 4 transects in a season are considered as rare, 5-10 as common and those found in more than 10 transects are designated as abundant (Table 2). The pharmacological terms used in this study were taken from pharmacological resources which deal mainly with the terms in the field of pharmacognosy (Udayan and Balachandran, 2009). Plants collected during the present study were deposited in MES Ponnani College Herbarium with taxonomical and ecological data (Daubenmire, 1947).

RESULTS AND DISCUSSION

Kole lands in Ponnani serve as an excellent habitat for numerous medicinal herbs which can be harvested for economic benefits. This investigation on the availability and abundance of medicinal herbs in the Ponnani kole revealed the presence of 26 species under 23 genera and 18 families (Table 2). In the present analysis of kole land flora, members of the family Convolvulaceae were predominant followed by Poaceae and Acanthaceae. *Nymphaea nouchali*, *Ludwigia parviflora*, *Ludwigia adscendens*, *Hygrophila schulli*, *Ipomoea carnea*, *Ipomoea pes-caprae*, *Bacopa monnieri*, *Acanthus ilicifolius*, *Clerodendrum inerme*, *Hydrilla verticillata*, *Monochoria vaginalis*, *Schoenoplectus articulatus* and *Hygroryza aristata* are frequent in all seasons in the study area. The study area has stations with saline intrusion, therefore saline tolerant species like *Ipomoea pes-caprae*, *Clerodendrum inerme* and *Acanthus ilicifolius* with different medicinal values were also come across. The observed species were used to treat gastrointestinal disorders, respiratory ailments, dermatological snags, urinogenital illnesses, cardiovascular problems and neurodisorders (Table 3). The plant parts used by people for different applications include decoction, extraction, infusion and paste preparation. Several methods of application of medicine are observed like oral administration, local application, inhalation or smoking and massaging. The data compiled in this study highlights the diversity and abundance of plants with medicinal properties in this wetland system. This necessarily leads to create a better understanding of medicinal plants of kolelands to the present community. Currently, aquatic macrophytes in this ecosystem are considered as weeds, because of the paddy cultivation and open fishing in this region. Providing basic information on the medicinal attributes of these plants can change the status of the plants from worst weed to important medicines which are useful for mankind.

According to Panda and Misra (2010) about three-fourth of the biologically active plant derived compounds presently in use globally have been discovered through research on folk and ethno-medicinal uses. Maya *et al.* (2003) analyzed the economic importance of river

vegetation of Kerala including both wetland species and bank species. Swapna *et al.* (2011) made a review on the utility of Indian wetland plant species as food and medicine by incorporating the traditional knowledge of local communities. The interest of public in plant based medicine together with the rapid expansion of pharmaceutical industries has necessitated an increased demand for medicinal herbs leading to the over exploitation of many species (Pushpangathan and Nair, 1997). As we know that globally wetlands are dwindling rapidly hence their resources, both plants and animals, are also reducing in the same pace. The agricultural interests of koleland, one of the important rice granaries of Kerala, is facing serious difficulties due to the diminishing price of rice, growing expenditure for farming and unavailability of the agricultural workhands. This leads small scale farmers to leave their fields without farming or change the land use pattern which ultimately alter the vital function of this ecosystem. In the context of unexplored potential and shrinking resources, kolelands should be properly managed giving high priority for the conservation and propagation of medicinally important herbal resources. Most of the aquatic medicinal plants in kolelands are grown in wild and people have open access to collect and utilize them. The kolelands of the region can provide high income generating opportunities to local communities. Over exploitation of indigenous medicinal plants should be avoided partly through the use of local indigenous knowledge and health care systems (Amusan, 2006).

Medicinal plants provide easily accessible and relevant resources for primary health care with minimum side effects (Shahzadi and Bhat, 2012). All the medicinal plants found in Ponnani kolelands are commonly seen in rivers, ponds and paddy fields all over Kerala, however, kolelands offer plenty of space for its feasible agriculture and sustainable exploitation. Some of the therapeutic usages of such species are very unique to the traditional medicinal knowledge system of the locality. Among the listed plant species (Table 2), *Evolvulus alsinoides*, *Centella asiatica*, *Hygrophila schulli*, *Bacopa monnieri* and *Cynodon dactylon* are having greater importance in the therapeutic field and used

Table 2. Seasonal variation in the abundance of aquatic medicinal plants in the Ponnani Kole wetlands during 2011-2012

No	Species	Family	POM	PRM	MON
1	<i>Nymphaea nouchali</i> Burm. f.	Nymphaeace	*	*	**
2	<i>Nelumbo nucifera</i> Gaertn.	Nelumbonaceae		*	
3	<i>Ludwigia perennis</i> L.	Onagraceae	**	*	**
4	<i>Ludwigia adscendens</i> (L.) H.Hara	Onagraceae	***	***	***
5	<i>Centella asiatica</i> (L.)Urban	Apiaceae	*		*
6	<i>Mollugo pentaphylla</i> L.	Aizoaceae		*	
7	<i>Sphaernanthus africanus</i> L.	Asteraceae		*	
8	<i>Hedyotis corymbosa</i> (L.) Lam.	Rubiaceae			**
9	<i>Aniseia martinicensis</i> (Jacq.) Choisy	Convolvulaceae	*		*
10	<i>Evolvulus alsinoides</i> (L.) L	Convolvulaceae			**
11	<i>Ipomoea carnea</i> Jacq.	Convolvulaceae	*	*	**
12	<i>Ipomoea pes-caprae</i> (L.) R.Br.	Convolvulaceae	*	*	*
13	<i>Bacopa monnieri</i> (L.) Pennell	Scrophulariaceae	**	**	*
14	<i>Acanthus ilicifolius</i> L.	Acanthaceae	**	*	**
15	<i>Hygrophila schulli</i> (Harm.)	Acanthaceae	*	*	**
16	<i>Hygrophila ringens</i> R.Br.ex Steud	Acanthaceae	*		**
17	<i>Clerodendrum inerme</i> (L.) Gaertn.	Verbenaceae	*	*	*
18	<i>Alternanthera sessilis</i> (L.) R.Br.exDC.	Amaranthaceae	***	**	
19	<i>Polygonum barbatum</i> L.	Polygonaceae	*	*	
20	<i>Hydrilla verticillata</i> (L.f.)Royle	Hydrocharitaceae	***	**	**
21	<i>Monochoria vaginalis</i> (Burm.f.) Presl	Pontederiaceae	**	*	*
22	<i>Pistia stratiotes</i> L.	Araceae			**
23	<i>Schoenoplectus articulatus</i> (L.) Palla	Cyperaceae	*	**	**
24	<i>Hygroryza aristata</i> Nees	Poaceae	**	***	**
25	<i>Cynodon dactylon</i> (L.) Pers.	Poaceae	*	*	
26	<i>Oryza sativa</i> L.	Poaceae	*		*

POM Post monsoon; PRM Premonsoon; MON Monsoon

for different ailments and as diet supplement. The nutritive values of some of the plants have been deliberated by various authors and the present enumeration emphasize the usefulness of the koleland plant wealth which in turn may form another criteria to conserve the delicate ecosystem considering the provisions they offer to mankind. Therefore, population of this set of plants should be improved by following organized cultivation techniques to ensure their availability in this ecosystem. The harvesting of the medicinally important aquatic macrophytes should be improved and managed for appropriate utilization of these indigenous information and fitness care systems. A strong participatory approach linking local people and other stakeholders is mandatory for sustainable management of this wetland expanse. To achieve the said goal, the community needs to be organized for adopting sustainable harvest

protocols for all these wetland species and required training should be given to them.

The existence of aquatic species of kolelands is threatened owing to the dwindling of the extent of wetland and alterations in land use pattern. Hence the aquatic resources, particularly those having economic worth and direct significance to the local public are required to be prioritized for protection. The aquatic macrophytes, with enormous potential in ethno-medicinal and fitness of the local public, demands special attention for their maintainable harvest, appropriate management and augmentation through suitable cultivation technique. Most of the wetland medicinalflora have low shelf life therefore improving quality and creating by-products can assist in increasing income from them. Also the most preferred wetland medicinal plants can be domesticated in farmers'

Table 3. Common names, vernacular names and the usages in different systems of medicine of aquatic medicinal plants from Ponnani Kole wetlands collected during the present study

No	Name	English Name	Vernacular	Systems of medicine	Usage
1	<i>Nymphaea nouchali</i> Burm.f.	Indian water lily	Neerambel, Vellambel, Poothali (M) Kanaval, Kokka (H)	Ayurveda Folk	Diarrhoea, Dysentery, Dyspepsia Cardio tonic, Cutaneous disease, Disease of urinary track, Dermato-pathy, enorrhagia, Erysipelas
2	<i>Nelumbo nucifera</i> Gaertn.	Sacred lotus, Indian lotus	Thamara, Chenthamara (M) Kamal, Kanval (H)	Ayurveda Siddha Unani, Folk	Hyperdipsia, Cholera, Diarrhoea, Helminthiasis, Haemorrhage, Menorrhagia, Bronchitis
3	<i>Ludwigia perennis</i> L.		Neerkarayambu (M)	Folk	Dysentery, Headache, Gastric problems, Curing lumbago
4	<i>Ludwigia adscendens</i> (L.) H.Hara			Folk	Ulcers, Burns, Skin disease
5	<i>Centella asiatica</i> (L.)Urban	Indian penny wort	Kudangal, Muthil (M) Brahmanduki (H)	Ayurveda Folk, Siddha, Unani	Epilepsy, Leprosy, Polyuria, Distaste, Psychosis, Fever, Bronchial asthma, Stammer, Rejuvenator, Brain tonic, Nervine and cardiac tonic.
6	<i>Mollugo pentaphylla</i> L.		Parpadakam (M)	Folk, Siddha	Aperient, Antiseptic, Poultices for Sore leg, Ear ache
7	<i>Sphaeranthus africanus</i> L.		Veluthaadakkamani an (M)	Ayurveda	Abdominal tumour, Colic, Indigestion, Piles, Hydrocele, Diarrhoea, Leucorrhoea, Blood purifier
8	<i>Hedyotis corymbosa</i> (L.) Lam.		Parpadakam (M)	Ayurveda Folk	Blood purifier, Stimulate action of liver, Improve digestion, Diarrhoea, Menorrhagia, Distaste, Giddiness, Intoxication, Skin disease
9	<i>Aniseia martinicensis</i> (Jacq.) Choisy		Venthiruthali, Kulayadambu (M)	Folk	Bilious dyspepsia, Purgative
10	<i>Evolvulus alsinoides</i> (L.) L		Vishnukranti, Krishnakranthi (M) Syamakrantha (H)	Folk, Siddha, Unani, Ayurveda	Carminative, Rejuvenator, Used in Bronchitis, Asthma, Epilepsy, Anorexia, Piles, Abdominal disorder, Haematemesis, Insomnia,, Psychosis, Amentia, Internal haemorrhage, Dysentery, Diarrhoea, Helminthiasis, All kinds of fever, As brain stimulant
11	<i>Ipomoea carnea</i> Jacq.			Folk	Purgative
12	<i>Ipomoea pes-caprae</i> (L.) R.Br.	God's foot creeper	Kuthirakulamban (M) Dopatilata (H)	Folk, Siddha	Skin diseases, Swellings, Wounds, Ulcers, Dropsy, Menorrhagia, Haemorrhoids, Dyspepsia, Vomiting, Burning sensation

13	<i>Bacopa monnieri</i> (L.) Pennell	Bacopa	Neerbrami (M) Jalnim, Barami (H)	Ayurveda Folk, Homeopathy Siddha	Brain tonic, Improve memory power, Intelligence and Mental health, Cure indigestion, Constipation, Insanity, Anaemia, Leprosy, Polyuria, Psychosis, Emaciation, Epilepsy
14	<i>Acanthus ilicifolius</i> L.		Chakaramulli, Chulli (M)	Folk, Siddha	Asthma, Paralysis, Leucorrhoea, Debility, Neuralgia, Rheumatism, Expectorant
15	<i>Hygrophila schulli</i> (Harm.) M.R.&S.M.Almeida	Long leaved barleria	Vayalchuli (M) Kamtakaliya, Talmakhana (H)	Ayurveda, Folk	Appetite, Aphrodisiac, Rejuvenator, Oedema, Eye disease, Urinary calculi, Dysuria, Gout, Arthritis, Amavatha, Bladder stone, Arrest abortion .
16	<i>Hygrophila ringens</i> R.Br.ex Steud			Folk	Appetite, Arthritis, Amavatha, Eye disease, Bladder stone, Arrest abortion, Toothache
17	<i>Clerodendrum inerme</i> (L.) Gaertn.	Wild jasmine Gardenquine	Puzhamulla Chinnayila (M)	Folk, Siddha	Fever, To resolve Buboos, Rheumatism
18	<i>Alternanthera sessilis</i> (L.) R.Br.exDC.	Sessile joy weed	Ponnammannikkeera (M) Gudrisag (H)	Folk, Ayurveda Siddha, Unani	Rejuvenator, Night blindness, Diarrhoea, Leprosy, Dyspepsia, Splenomegaly, Snakebite, Fever, Skin disease
19	<i>Polygonum barbatum</i> L.		Veluthamuthalamo oku (M)	Folk, Siddha, Unani	Ulcers, Stomach ache, Diarrhoea, Carminative, Purgative, Emetic
20	<i>Hydrilla verticillata</i> (L.f.)Royle	Hydrilla		Folk, Siddha	Abscess to maturity
21	<i>Monochoria vaginalis</i> (Burm.f.) Presl		Karimkoovalam, Kolachembu	Ayurveda, Folk, Siddha, Unani	Strangury, Gastropathy, Hepatopathy, Asthma, Scurvy, Haemorrhage
22	<i>Pistia stratiotes</i> L.	Nile cabbage, Water bonnet, Water lettuce	Akasathamara, Kudappayal, Muttappayal (M) Chelli (M)	Folk, Siddha, Unani	Goiter, Blood disorder, Emaciation, Skin diseases
23	<i>Schoenoplectus articulatus</i> (L.) Palla			Folk	Purgative
24	<i>Hygroryza aristata</i> Nees	Bengal wild rice	Neervallipullu, Vari nellu (M) Jungali-dal (H)	Ayurveda Folk	Diuretic, Emollient, Galactagogue, Strangury, Diarrhoea, Otopathy, Fatigue, General debility
25	<i>Cynodon dactylon</i> (L.)Pers.	Bermuda grass, Hariali grass, Dogs tooth grass	Karuka, Balikaruka (M)	Ayurveda, Folk, Homeopathy, Unani	Fever, Chronic diarrhoea, Dysentery, Dropsy, Wounds, Catarrhal ophthalmia, Haemorrhage, Erysipelas, Scabies, Menorrhagia, Piles, Epilepsy, Insanity
26	<i>Oryza sativa</i> L.	Paddy	Nellu (M)	Ayurveda Folk, Siddha, Unani	Disease of pitta, Aphrodisiac, Diuretic, Galactagogue, Vomiting, Debility, Piles

arena after evolving proper agro-techniques for them, which will positively help to diminish the pressure on these plants in koleland and other related delicate ecosystems. Kole wetlands not only provide useful resources but are also important in terms of ecology, renewal of ground water and maintaining the microclimate of the region. Resource management and conservation are immediate necessities for maintaining the balance of this special ecosystem. Lack of

community participations in management efforts, source of revenue, and dearth of awareness amongst decision makers on the exact values of wetland were major impediments in the protection of wetland resources (Kairo *et al.*, 2000). Eco-restoration of marshland zones, conservation instruction to communities and income generating avenues along with additional promotional activities, such as ecotourism would support the conservation of

these valuable resources in long-run. Therefore a complete and comprehensive management strategy, based on ethnic, ecological and financial principles, need to be planned for this kole wetland region for sustainable management by the whole participation of local stakeholders.

Glossary of medical terms

Anorexia : No appetite
 Aphrodisiac : Drug that arouse sexual desire
 Arthritis : Inflammation for joints
 Aperient : Mild purgative
 Bubo : Abscess of lymph gland
 Carminative : Relieving flatulence
 Catarrhal : Inflammation of mucous membrane
 Dermatopathy : Skin disease
 Dropsy : Accumulation of serous fluid in cellular tissues or serous cavities
 Dyspepsia : Reduced water in take
 Dysuria : Painful urination or absence of urine
 Emaciation : A state of extreme leanness
 Emetic : Drug inducing vomiting
 Emollient : Substance that softens the skin
 Epilepsy : An affection of the nervous system resulting from excessive or disordered discharge of cerebral neurons.
 Erysipelas : Inflammatory disease affecting the face marked by redness of the skin
 Expectorant : Aiding the secretion of mucous membrane
 Galactagogue : Producing milk
 Gastropathy : Stomach disease
 Goiter : Enlargement of thyroid gland
 Haemorrhage : Bleeding
 Haemorrhoid : Piles
 Helminthiasis : Presence of parasite worms in the body
 Hepatopathy : Liver disease
 Hydrocele : A circumscribed collection of fluid in the tunica vaginalis testis
 Hyperdipsia : Intense thirst
 Insanity : Mental disease
 Leucorrhoea : A white discharge from vagina and uterine cavity
 Lumbago : Pain in the lower back
 Menorrhagia : Profuse discharge of menses
 Neuralgia : A painful affection of nerves due to functional disturbances

Octopathy : Morbid condition of ear
 Ophthalmia : Inflammation of whole eye
 Polyuria : Increase in the amount of urine due to diabetes
 Poultice : Thick pasty preparation intended for local application
 Psychosis : Mental disorder
 Purgative : Promoting evacuation from bowel
 Scurvy : Disease due to deficiency of vitamin C
 Splenomegaly : Spleen enlargement
 Stammer : Speech disorder
 Strangury : Slow and painful discharge of urine

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