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Diversity of medicinal flora in and around Kolleru lake

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ABSTRACT

Kolleru Lake is the largest freshwater lake in India, located between West Godavari and Krishna districts of Andhra Pradesh. Being the largest freshwater body, Kolleru Lake supports rich aquatic medicinal flora and as an elevated land between Godavari and Krishna rivers, it provides good habitat for many terrestrial medicinal plants. At the time of the floristic survey, this study identified 11 aquatic and 24 terrestrial flora in Kolleru. In and around Kolleru area 35 medicinal plants were reported from 17 sites, out of 35 medicinal flora, 11 aquatic flora and 24 terrestrial plants were identified. Aquatic medicinal flora including Ipomea aquatica, Nymphaea nouchali, Nelumbium species, Salvinia cumulata Alternanthera sessilis, Typha angustata, Cypress rotundus, Ecilipta Alba, Scripus articilum, Cynodon dactylon, Utricularia species was identified in Kolletikota, Gudivakalanka, Atapaka, Pedayadlagadi bridge. Terrestrial plants like Aerva lanata, Andrographis paniculata, Asystica gangetica, Abrus precatorius, Achyranthes aspera, Cassia occidentalis, Euphorbia hirta, Gloriosa superba, Hemedesmis indica, Tridax procumbence, Oscimum sanctum, Ricinus communis, Vitex negundo, Rauwolfia serpentina, Bixa octandra, Sida acuta, Abutilon indium, Acalypha indica, Tephrosia purpurea, Centella asiatica, Coccinia indica, Boerhavia diffusa, Crotan banplandianum, Phyllanthus madraspatens were identified in belt villages of the lake. During the last two decades, water quality and other environmental changes in Kolleru Lake resulted in stress on the biodiversity of the ecosystem. If these medicinal plant species properly maintained, harvested and marketed then it can be another source of livelihood of Kolleru area.

Keywords— *Medicinal Flora, Aquatic flora, Terrestrial flora, Extracts, Decoctions, Leaf paste, Health care*

1. INTRODUCTION

Kolleru Lake is the largest fresh water lake in India and situated between West Godavari and Krishna districts of Andhra Pradesh, India. Kolleru area includes 7 mandals in West Godavari and 2 mandals in Krishna districts. Nearly more than three lakhs people are residing in bed and belt villages of the Kolleru sanctuary. Being the fresh water nature of the lake, it provides a good habitat for a variety of flora and fauna. Flora of Kolleru Lake, previously studied by Seshavataram, Dutt, and Venu.1982. [1] Floral diversity of common and aquatic flora, in and around Kolleru Lake was studied by Brahmaji Rao et al., (2015) and identified 17 aquatic flora and 15 common flora in 17 field stations of Kolleru Lake. [2] Sood studied about 360 Indian plants which were used for the treatment of Diabetes.[3] Uawonggu et al., (2006) work reported that Andrographis paniculata and *Ipomoea aquatica* had a tendency to be scorpion venom antidotes.[4]. Ethanobotanical plants of East Godavari and Krishna districts of Andhra Pradesh were reported by several taxonomists of various fields.[5,6]. In addition, several ethano-medicinal surveys and studies on plants have been reported by several researchers from various regions of India and many parts of the world. [7-21]. But there is no adequate data on medicinal diversity in Kolleru Lake. It is an attempt to gather the information on medicinal plants and their uses practiced by local people and reported a list of medicinal plants and their uses in and around Kolleru Lake. Observing the plant species and identified 11 as aquatic medicinal flora and 24 terristrial medicinal flora in Kolleru.

2. STUDY AREA

Kolleru Lake includes 50 bed and 98 belt villages in Kolleru Lake. Out of which 17 field stations were selected as sampling sites based on geographical and ecological significance. Field stations in bed villages are Mondukodu, Gudivaka lanka, Prathikolla lanka, Chettunnapadu, Pedayadlagadi, Kovvada lanka, Devichintapadu, Vegilamalli, Bhujabalapatnam, Chatakaya, Kolletikota, Uppeteru Bridge, Siddhapuram, Adavikolanu, Thokalapalli, Chinayadlagadi, and Aatapaka.

3. METHODOLOGY

A present investigation carried out in 17 bed and belt villages in Kolleu Lake. 35 medicinal plants were collected, identified and reported from 17 sites which are used by rural people. Information collected about medicinal plants and their mode of applications through interviews with the local elder people, rural people and herbal phsicians in and around Kolleru Lake. Out of 35 flora 11 aquatic plants and 24 terristrial plants were identified with the help of standard herbaria of the Botanical Survey of India and Gamble volumes of the Department of Botany, Acharya Nagarjuna University, Guntur, [22]and Flora of Krishna District, Venkanna et al.,(1990) [23]

All the identified 35 medicinal plants were reported as a list with their botanical name, vernacular name, family, partly used and location in the tabular form. (Table 1 & 2)

4. RESULTS AND DISCUSSION

Most of the plants were used to treat one or two or more than two diseases. Local people collected and prepared juices, pastes, decoctions, powders used fresh or dried leaves, stems, barks, root, fruits, and seeds based on the complaint. Doses were also prescibed to the suffering people.

Table 1: Aquatic medicinal plant species in and around Kolleru Lake

S. No	Botanical Name	Family	Vernacular Name	Part Used	Location
1	*Ipomea aquatic*	Convolvulaceae	Thutukada	Whole plant	Mondukodu, Gudivaka lanka, Prathikolla lanka. Kolletikota
2	*Nymphaea nouchali*	Nymphaeace	Kaluva	Whole plant	All sites
3	*Nelumbium species Nymphoides indicum*	Gentianaceae	Nymphoides/floating heart	Whole plant	All sites
4	*Salvinia aurticulata*	Salviniaceae	Pilli adugu	leaves	Pedayadlagadi, Kolletikota, Upputeru bridge
5	*Alternanthera sessilis*	Amaranthaceae	Ponnagantikoora	Whole plant	Siddhapuram, Adavikolanu, Thokalapalli, Chinayadlagadi
6	*Typha angustata*	Typhaceae	Jammu/Jammugaddi	Rhizome	All sites
7	*Cyperus rotundus*	Cyperaceae	Tunga gaddi	Roots	All sites
8	*Scirpus cernuus*	Cyperaceae	Fairy lights	Whole plant	Kolletikota,atapaka,pedayadlagadi,Chatakai , Gudivaka lanka,
9	*Eclitpa alba*	Asteraceae	Guntagalagara	Roots, seeds, seed oil and Whole plant	Kolletikota,Atapaka,pedayadlagadi,Chatakai , Gudivaka lanka,
10	*Cynodon dactylon*	Poaceae	Garika gaddi	Whole plant	Kolletikota,Atapaka,pedayadlagadi,Devichintapadu
11	*Utricularia species*	Lentibulariaceae	Keetaka mokka	Dried leaves	Kolletikota

Table 2: Terrestrial medicinal plant species in and around Kolleru lake

S. No	Botanical Name	Vernacular name	Family	Plant/part used	Location
1	*Aerva lanata*	Kondapindiaaku	Amaranthaceae	Whole plant	Chettunnapadu, Pedayadlagadi, Kovvada lanka, Devichintapadu, Vegilamalli, Bhujabalapatnam, Chatakaya Kolletikota,
2	*Andrographis paniculata*	Nela vemu	Acanthaceae	Entire plant (leaves and tender shoots)	Bujaalapatnam, Chettunnapadu
3	*Asystisia gangetica*	Poda beera	Acanthaceae	Whole plant	Chettunnapadu, Pedayadlagadi, Kovvada lanka, Devichintapadu, Vegilamalli, Bhujabalapatnam, Chatakaya, Kolletikota,
4	*Abrus precatorious*	Guruvinda	Fabaceae	Leaves, roots, seeds	Chettunnapadu, Kovvada lanka, Devichintapadu, Vegilamalli, Bhujabalapatnam
5	*Achyranthes aspera*	Uttareni	Amaranthaceae	Whole plant	Chettunnapadu, Pedayadlagadi, Kovvada lanka, Devichintapadu, Vegilamalli, Bhujabalapatnam, Chatakaya, Kolletikota,
6	*Cassia occidentalis*	Kasintha	Caesalpinaceae	Leaves	Chettunnapadu, Pedayadlagadi, Kovvada lanka, Devichintapadu, Vegilamalli, Bhujabalapatnam, Chatakaya, Kolletikota,
7	*Euphorbia hirta*	Asthma weed/ Nanbalu	Euphorbiaceae	Whole plant	Kovvada lanka, Devichintapadu, Vegilamalli, Bhujabalapatnam, Chatakaya, Kolletikota,

8	*Gloriosa superba*	Adavi nabhi/ Agnisikkha	Liliaceae	Tubers, leaves	Komatilanka,
9	*Hemedesmis indica*	Sugandhi paala	Asclepiadaceae	Roots	Devichintapadu, Vegilamalli, Bhujabalapatnam, Chatakaya
10	*Tridax procumbenes*	Gaddi chamanthi	Asteraceae	Leaves	Chettunnapadu, Pedayadlagadi, Kovvada lanka, Devichintapadu, Vegilamalli, Bhujabalapatnam, Chatakaya, Kolletikota,
11	*Oscimum sanctum*	Krishna Tulasi	Lamiaceae	Entire plant	All belt villages, Kolletikota,
12	*Ricinus communis*	Amudamu chettu	Euphorbiaceae	Leaves, Seeds	All belt villages,
13	*Vitex negundo*	Vaavili, Nalla Vaavili	Verbenaceae	Leaf, root, seeds	Vegilamalli, Bhujabalapatnam,
14	*Rauwolfia serpentine*	Surpaganda	Apocyanaceae	Roots	Kolleru
15	*Bixa octandra*	Bixa	Bixaceae	Leaves, seeds	Mondukodu, Gudivaka lanka
16	*Sida acuta*	Sida, Nela benda	Malvaceae	Leaves, roots	All belt villages
17	*Abutilon indicum*	Tutturu benda/ Duvvana Kaya	Malvaceae	Leaves, roots, seeds and bark	All belt villages
18	*Acalypha indica*	Muripundi Aku, Kuppichettu	Euphorbiaceae	Whole plant	All belt villages
19	*Tephrosia purpurea*	Vempali	Fabaceae	Whole plant	All belt villages
20	*Centella asiatica*	Saraswathi Aku	Apiaceae	Whole plant	Kolletikota
21	*Coccinia indica*	Dondakaya	Cucurbitaceae	Whole plant	All sites
22	*Boerhavia diffusa*	Atakamamidi, Punarnava	Nyctaginaceae	Root, leaf and flowers	Chettunnapadu, Pedayadlagadi, Kovvada lanka, Devichintapadu, Vegilamalli, Bhujabalapatnam, Chatakaya, Kolletikota,
23	*Croton bonplandianum*	Galivana	Euphorbiaceae	Whole plant	All sites
24	*Phyllanthus maderaspatensis*	Nela Usiri	Euphorbiaceae	Entire plant	All sites

4.1 Aquatic flora

1. ***Ipomea aquatica*:** Ipomea aquatica is an aquatic creeper on the water surface. It is commonly known as Thutukada, which belongs to the family Convolvulaceae. The whole plant is used to treat various diseases in local people of Kolleru area. Extraction of the plant is used as an antidote to scorpion bite and snake bite. The paste is used to cure itching.
2. ***Nympea nouchali:*** It is an aquatic plant which gives a beauty to the lake. It is commonly known as kaluva, which belongs to the family Nymophaeaceae. The whole plant is useful to treat the various diseases. Rhizomes are used to cure the urine infections. Juice of leaves applied to the body to reduce fever. Tubers are rich in starch and used as a tonic for improving digestion.
3. ***Nelumbium species or Nymphoides indicum*:** *Nelumbium* species is commonly called as Nymphoides or floating heart which belongs to family Gentianaceae. This plant gives majestic beauty to the lake. The whole plant is used for various purposes by local people. The starch of Root is used for the treatment of skin infections. Rhizome and leaves are used for the treatment of sunstroke, fever. The leaf juice is used for the treatment of diarrhea.
4. ***Salivania auriculata:*** The common name of Salvinia is Pilliadugu. Plant extract is used as Herbal soap to prevent antibacterial infections.
5. ***Alternanthera sessilis:***It is an aquatic plant, which is mainly used by local people as leafy vegetables. Local physicians have suggested it is the best and natural remedy for the eye infected people or those who are suffering from vision problems. Intake of the plant is used for the treatment of burning sensation and fever.
   It is used for improving lactation in lacting mothers. Leaves are used for the treatment of hypertension, high B.P, especially in eyes, cataract, burning eyes and watery eyes. Roots are used in stomach problems.
6. ***Typha angustata:*** It is the common aquatic herb belongs to the family. Typhaceae. Creeping rhizome contains more medicinal uses which are used by local people for various diseases. Root stock is used as anti-inflamation, diuretic and prevents bleeding from the nose. Rhizome and leaves are used as a diuretic.
7. ***Cyperus rotundus:*** It is commonly known as Tunga, which belongs to family Cyperaceae. Powdered rhizome is mixed with honey and ginger and used for the treatment of gas problems, fever and pain relief.
8. ***Scripus articulare*:** It is a densely tufted aquatic plant belongs to the family Cyperaceae. The whole plant was used by local people to treat diarrhea. Root juice is used as juice for babies. Entire plant extract is used as purgative.
9. ***Eclipta alba**:* It is a small herb which belongs to family Asteraceae. Juice of leaves is used to cure skin diseases, dizziness, and vertigo. A paste of the entire plant is applied to the forehead to relief from a headache and toothache. Tailum prepared from the leaves and flowers are used for the treatment of jaundice. Commonly *Eclipta alba* is used as a hair tonic since the ages. Plant paste prepared and applied on the scalp for one hour in 100 days, it promotes the hair growth, prevents grey hair and dandruff. Juice of leaves also used for a toothache when it applied on the gums. By applying the paste of the leaves with oil, and massage on the scalp to prevent a headache.

10. ***Cynodon dactylon*:** It is commonly known as Bermuda grass/Garika gaddi and belongs to family Poaceae. *Cynodon* is rich in proteins, calcium, enzyme (25) and juice is prepared from plant and drink the juice in the morning empty stomach it controls sugar level. Mainly it is used by local people. Juice along with ginger powder to relieve stomach pain.
    This juice takes along with neem juice to control sugar level. A paste of grass leaves are mixed with turmeric powder is used in the treatment of skin infections and rashes. A decoction of Cynodon juice mixed with coconut water or butter milk taken regularly to reduce weight. They also used as the protective agent.
11. ***Utricularia:*** It is a submerged insectivorous plant belongs to family Lentibulariaceae. Dried leaves are applied on the skin burns and swelling by local people.
12. ***Scripus cernuus*:** It is commonly known as Fairy lights, which belongs to the family Cyperaceae. Leaf paste is mixed with garlic paste and used as a bandage on the wounds to cure infections

4.2 Terrestrial Flora

1. ***Aervalanata:*** It is an annual herb belongs to the family Amaranthaceae, it is common on lake banks of bed and belt villages of Kolleru. Leaves decoction or cooked leaves or flowers are used to dissolve kidney stones. So, it is popularly known as Kondapindiaaku. A decoction of flowers and roots is used as a tonic for the treatment of a headache. A paste of leaves applied to wounds, it gives relief and reduces swelling. Dried leaf powder used to control diabetes.
2. ***Andrographis paniculata:*** The whole plant is used as an antidote for insect and snake bite. Leaf extract is used to cure stomach pain. People of Kolleru area use this plant for various diseases like jaundice, malaria and skin diseases. Leaves cut into small pieces and placed in water 10 to 12 hours, filtered and used as a drink to cure malaria. Leaf paste or mixed with turmeric powder is applied to the skin infected areas and wounds to cure Abscess and infected wounds.
3. ***Asystisia gangetica:*** It is a common plant in belt villages of Kolleru area and common along with other bushes, belongs to the family Acanthaceae. It is used to improve appetite. Collected fresh leaves and cooked with onion and cumin seeds to improve appetite.
4. ***Abrus precatorius:*** Common along hedges of belt villages of Kolleru. The leaves of the plant are used to cure a cough and cold. A paste of leaves and seeds in applied to the scalp to prevent graying hair and promote hair growth. Seeds are all uniform and beautiful, so used as weighing units. Leaf paste mixed with honey and applied to swellings.
5. ***Achyranthes aspera:*** It belongs to family Amaranthaceae. The entire plant is used against snake bite. Root powder is applied externally on skin wounds. The entire plant is used in the treatment of jaundice and indigestion.
6. ***Cassia occidentalis:*** Leaves are used as leafy vegetables. A paste of leaves applied to wounds of the skin for quick healing. Root orally applied to scorpion bite. Rasam is prepared from cassia leaves and uses to cure mouth ulcers and or digestion.
7. ***Euphorbia hirta:*** It belongs to the family Amaranthaceae common in plain areas of the Kolleru. It is used to respiratory problems like a cough and asthma. Gargiling of the decoction prepared with fresh plant used to cure thrush. A decoction of root improves lactation
8. ***Gloriosa superba:*** Beautiful herb found in belt villages of Kolleru. Seeds and tubers are used against snake bite. Tuber extraction is applied on the abdomen, gives relief from labour pain during pregnancy. Tuber extract is applied on the scalp to promote haor growth. Extract of the tuber is applied on the sprain, it gives relief.
9. ***Hemidesmis indicus:*** It is a prostrate shrub belongs to the family Asclepiadaceae. Aromatic root is mixed with rice, as it gives strength to the body. The leaves are used to prepare beverages. Drink decoction of the herb gives glory to the lake. Leaf paste applied to the snake bite region/ scorpion bite. Root paste is applied on the forehead or decoction taken internally it gives relief from fever. Decoction as a health tonic and control diabetes. Hemidesmus paste is applied on the joints it gives relief from pain.
10. ***Tridax procumbence:*** Local people of Kolleru used Tridax leaves to cure conjuctivities. Leaf paste is used as a hair tonic. Leaf juice is applied on the wounds part directly for relief and also used in skin inections.
11. ***Oscimum sanctum:*** People frequently used Oscimum as holy basil for various purposes. Chewing raw tulasi leaves gives relief from cold and cough. Extract from the herb used as an antidote for insect bites. The plant used as a mosquito repellent. Leaves chewed for mouth ulcers and used as mouth freshner stops the bad smell from mouth. Also, it is used in the cure of dental problem and headache.
12. ***Ricinus communis:*** Castor seeds are used in the villages as a milk laxative for children. The seeds are made into paste or poultice is reported to be applied to ores, boils, and gouty or rheumatic swellings. Leaves are said to be used in the form of poultice or fomentation on sores, boils, and swellins. Leaves coated with oil and warmed are commonly applied over the abdomen to give relief flatulence in children. An infusioa n of leaves is used for stomach-ache and as a lotion for the eye. Fresh juice of leaves is used as an emetic and also useful in jaundice. Roots administered in the form of a paste for a toothache.
13. ***Vitex negundo:*** Leaf paste is used for rheumatic pains. Leaf juice is used to cure fever and give relief from body pain. Ripen fruits are used to treat indigestion. A decoction of the leaves and the vapours are used for the treatment of rhematic and joint pains. The flowers are astringent and are used in fever. The fruits are prescribed in a headache and watery eyes,
14. ***Rauwolfia serpentina:*** It is rarely found in Kolletikota. The bitter root is used to treat snake, scorpion bite as a sedative, menstrual disorders, rheumatism. The root has febrifuge and as an antidote to the bites of poisonous reptiles. The root is supposed to cause uterine contraction and promote the expulsion of the foetus.
15. ***Bixa octandra:*** Seeds powder act as a dye and it is used in the preparation of food items. It is used as a laxative, expectorant. It is also advised by local physicians as anti-inflamatory agent for wounds. Infusion of leaves is used against a sore throat and eye inflammation. Pulp and seeds are mixed with water and used as a drink.
16. ***Sida accuta:*** Roots juice and bark is used to cure wounds. Leaves juice use4d for the treatment of asthma. Leaf juice is given for relief in chest pain and as an anthelmintic. Fresh juice of the roots is applied to wounds and ulcers.
17. ***Abutilon indicum:*** The leaves are rich in mucilage and are used as a demulcent tonic. A lotion of leaves is used in warm for rheumatism. The seeds are rich in mucilage, are laxative and demulcent. The bark is astringent and diuretic.

18. ***Acalypha indica:*** A decoction of the entire plant is used as a safe and speedy laxative. The leaf of the plant ground with common salt and lime juice is reported to be a parasiticide and is applied externally. The root is rubbed with hot water as a cathartic.
19. ***Tephrosia purpurea:*** The dried herb is a tonic, laxative, diuretic and also for the treatment of boils, pimples, and bleeding piles. It is reported to be useful in a cough and in kidney disorders. Leaves are useful in jaundice. A decoction of the roots is given in dyspepsia, diarrhea, rheumatism, asthma and urinary disorders. The root juice is used for skin eruptions. The roots are powdered and smoked for relief from asthma and cough. An extract of the pod is given as a cure for pains and inflammations. The decoction from the pod is used to stop vomiting. The root is chewed in case of stomach pain and in any poisonous bites.
20. ***Centella asiatica:*** Leaves took as a tonic for improving memory, useful in syphilic skin diseases both internally and externally.
21. ***Coccinia indica:*** The whole plant extract is used in the treatment of skin diseases, bronchitis, and diabetes. The juice of leaves mixed with salt and breast milk is given in the case of eye diseases.
22. ***Boerhavia diffusa:*** The root of the plant is considered laxative and diuretic. The root has also expectorant properties and is used in asthma. In large doses, it acts as an emetic, found to be a fairy good diuretic.
23. ***Croton bonplandiam:*** Leaf paste is applied for the skin diseases. The plant is used to treat skin diseases including ring worm infections, to cure the swellings of the body, bronchitis, and asthma. The seeds are used for the treatment of jaundice, acute constipation.
24. ***Phyllanthus maderaspatensis:*** An infusion of the leaves is used in a headache. The seeds possess laxative, carminative and diuretic properties.

5. CONCLUSION

Local people believe that locally available plants are the resources to treat various diseases.

All the above plants were used externally or internally to treat various diseases like antidote to scorpion bite and snake bite, relief from itching, urine infections, fever, indigestion, skin infections, sunstroke, herbal soap to prevent infections, eyes cataract, burning eyes and watery eyes, improve lactation in lacting mothers, as anti-inflamation, diuretic and prevents bleeding from nose, gas problems, vertigo, jaundice, hair tonic. diarrhea, control sugar level, reduce weight, skin burns, kidney stones, malaria, abscess and infected wounds, appetite, swellings, mouth ulcers, cough, and asthma, gives relief from labour pain, joint pain, dental problem, headache. Rheumatic pains, expectorant.

The present study reported valuable information regarding medicinal plants used by Kolleru people to cure a no of diseases in an effective way through their own traditional knowledge and inheritance practices acquired from their ancestors. Even now the people inhabited in Kolleu area are practicing these methods. 60% of the local people used herbal medicines in Kolleru area for their basic health problems and cure efficiently by using available herbs for treating complications of their daily life. However, this review uses the detailed medical utilization was reported by Rudrapal, studied in East Godavari district of Andhra Pradesh,[5] India and Padal in Visakhapatnam district, [6] AP, India. During the last two decades, water quality and other environmental changes in Kolleru Lake resulted in stress on the biodiversity of the ecosystem. If these medicinal plant species properly maintained, harvested, marketed or establishment of herbal medicinal industries then it can be a better source of livelihood of Kolleru area. Experimental evidence and clinical testing are not done in this area for available medicinal plants. In present research scientific fields, collaboration of scientists from pharmaceutical Industries and academicians from universities is the need of the hour in order to promote, develop and innovate Scientific knowledge based on experimental training to the upcoming research scholars in this field, Which will help in their research studies by identifying to discover new medicinal drugs by using the locally available natural plant resources in Kolleru Lake.

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