



Research Paper

FLORISTIC DIVERSITY OF CHIRAKKAL CHIRA AND RAJARAJESHWARA CHIRA IN KANNUR DISTRICT, KERALA (INDIA)

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Abstract

Temple ponds are the water reservoir structures which are associated with temples and are common in Kerala. These traditional ponds are the blessing of nature that ensures the biodiversity and water conservation in that particular area. Studies were carried out to analyze the distribution of flora present in the two main sacred ponds namely Chirakkal chira and Rajarajeshwara chira of Kannur District, Kerala. A total of twenty seven genera of algae, ten genera of fungi, four pteridophytes and twenty angiosperms were recorded. Bryophyte was not encountered during the study period. Chlorophyceae members were dominating in study area. Fungal members belong to Ascomycetes and Deuteromycetes. Angiosperm flora was well established in Chirakkal chira than Rajarajeshwara chira.

Key words: *Ecosystems, Temple ponds, Biodiversity, Algae, Angiosperms, Fungi, Pteridophytes.*

INTRODUCTION

In India, temples are developed as the centers of civilization which are invariably associated with temple ponds. They are traditional rainwater storage structures built very near to the temples for use by the community. They are protected on behalf of their historical and cultural beliefs. Apart from religious aspects they are effective in recharging the ground water and serve as pockets of biodiversity, as swimming pools, protection and conservation of medicinal plants, as source of drinking water, for washing and agricultural purposes [1].

The pond ecosystem is a complex independent system which consisting of plants, animals and microorganisms along with suitable physical environment. Every element of a pond ecosystem works in conjunction with others to maintain balance [2]. They are

typically higher in biodiversity than terrestrial ecosystems due to the availability of a constant water source.

Literature collection reveals that Sankaran and Thiruneelagandan [3], Paul and Anu [4], Krishna *et al.*, [5], Umarani *et al* [1], Amish and Mathiarasi [6], Harsha *et al.*, [7], Sreeja and Pooja [8], Vincy *et al.*, [9], Reju *et al.*, [10], Nidhi and Kousalya [11] etc., have published reports on temple ponds ecosystem analysis in India.

The pond ecosystem has its own abiotic and biotic components. The phytoplanktons form the major part of the biotic flora. Instead of this, there are fungi, bryophytes, pteridophytes and angiosperms. The physico-chemical and biological characteristics of all aquatic ecosystems are dynamic, because of factors like temperature, organic matter deposition, rainfall, location of water body, etc. Hence, a floristic exploration of temple ponds from Kerala was undertaken. The paper deals with floristic diversity of Chirakkal chira and Rajarajeshwara chira, the largest temple ponds in Kannur district of Kerala which act as an important religious and cultural site. They are historically dominating temple ponds in Kannur district.

MATERIALS AND METHODS

Collection Sites

There are many famous temples in the region. Chirakkal chira is the forty acre gigantic water body at Chirakkal, it belongs to Chirakkal family, which is a major water resources. Rajarajeshwara chira is associated with the Rajarajeshwara temple in Taliparamba, Kannur. The temple is regarded as one of the existing 108 ancient Shiva temples of ancient Kerala.

Collection techniques

The samples were collected in a polythene bag from the Chirakkal chira during the month of November 2018. The collected samples include decaying leaves, seed, wood, water samples, etc. They were screened for algae and fungi under compound research microscope. Important features of angiosperms and pteridophyte flora were noted from the site and herbarium of the same was prepared for future reference. Identification of samples was carried out using standard literature like Madhusoodhanan [12], John and Francis [13], Bhat [14] and Gamble [14].

RESULTS

The study supports rich floral diversity in the two temple ponds, namely

Chirakkal chira and Rajarajeshwara chira of Kannur district of Kerala (Fig.1 and 2). A total number of twenty seven algae were identified, in which sixteen belongs to Chlorophyceae, three to Cyanophyceae, seven to Bacillariophyceae and one to Eugleninae. The genera included *Cosmarium*, *Closterium*, *Chlorella*, *Hormidium*, *Spirogyra*, *Euastrum*, *Staurastrum*, *Oedogonium*, *Anabaena*, *Pediastrum*, *Navicula*, *Oscillatoria*, *Tetraedron*, *Scenedesmus*, *Scytonema*, *Volvox*, *Characium*, *Pinnularia*, *Gomphonema*, *Nitzschia*, *Stauroneis*, *Phacus*, *Coleastrum*, *Ulothrix*, *Amphora*, *Cymbella* and *Nitella* (Table 1). The algae were distributed in specific substrata, like wood, seed and some of them were free-floating. Ten different genera of fungi were identified belonging to Ascomycetes and Deuteromycetes (Table 2). Both of the study sites lack the presence of bryophytes at the current period of study. Four pteridophytes were reported from the study sites and majority of them belongs to Pteridaceae, Marsileaceae and Salviniaceae (Table 3). Angiosperm flora was well established in Chirakkal chira than Rajarajeshwara chira and it included twenty different plants (Table 4).

Twenty five genera of algae, ten genera of fungi, three genera of pteridophytes and nineteen genera of angiosperms were reported from Chirakkal chira. Eleven algal genera, two fungi, two pteridophyte and eleven angiosperms were encountered from Rajarajeshwara chira. Submerged aquatic vegetation in Chirakkal chira mainly comprised of *Hydrilla verticillata*.

Spirogyra, *Anabaena*, *Pediastrum*, *Navicula*, *Oscillatoria*, *Scenedesmus* and *Pinnularia* were found common in both temple ponds. Apart from this *Cosmarium auriculatum*, *Staurastrum anatinoides*, *Amphora* and *Cymbella* were confined to Rajarajeshwara chira only. About twenty five algal members were present in Chirakkal chira which confirms its rich flora density. Chlorophycean members were much dominating than other classes. *Cosmarium*, *Closterium*, *Spirogyra*, *Oscillatoria*, *Scenedesmus* were present in more number.

The fungal diversity was more in Chirakkal chira. Eight genera of fungi were seen in Chirakkal chira. Deuteromycetes was more in number than Ascomycetes. *Bactrodesmium* and *Curvularia* were found common from both sites.

Pteridophytes were less in number from both site. and *Adiantum philippense* was common to both sites. *Ceropteris thalictroides* and *Salvinia molesta* were

encountered from Chirakkal chira and *Marselia minuta* was confined only to Rajarajeshwara chira.

Angiosperm flora was much flourished in Chirakkal chira (18) than Rajarajeshwara chira (10) . *Alternanthera tenella*, *Calotropis gigantean*, *Desmodium scropiurus*, *Eclipta alba*, *Euphorbia hirta*, *Eupatorium odoratum*, *Hedyotis corymbosa*, *Mikania micrantha*, *Pennisetum polystachyon* and *Tridax procumbens* were found common in both ponds. Asteraceace was found to be the dominating famiy.

Table 1: List of algae isolated from selected temple ponds of Kannur district

Sl.No.	Name of Algae	Class	Chirakka I chira	Rajarajeshwara chira
1. 33	<i>Amphora ovalis</i> Kuetz	Bacillariophyceae	-	+
2. 17	<i>Anabaena</i> sp	Cyanophyceae	+	+
3. 25	<i>Characium</i> sp	Chlorophyceae	+	-
4. 9	<i>Chorella</i> sp	Chlorophyceae	+	-
5. 8	<i>Closterium moniliferum</i> (Bory) Ehrenberg	Chlorophyceae	+	-
6. 7	<i>Closterium recurvum</i> Prescott	Chlorophyceae	+	-
7. 31	<i>Coelastrum</i> sp	Chlorophyceae	+	-
8. 6	<i>Cosmarium auriculatum</i> Reinsch	Chlorophyceae	-	+
9. 1	<i>Cosmarium blytii</i> Wille	Chlorophyceae	+	-
10. 4	<i>Cosmarium lundelii</i> Deloponte	Chlorophyceae	+	-
11. 5	<i>Cosmarium margaritifera</i> Meneghini	Chlorophyceae	+	-
12. 3	<i>Cosmarium medioscrobiculatum</i> West et West	Chlorophyceae	+	-
13. 2	<i>Cosmarium quadrum</i> Lund	Chlorophyceae	+	-
14. 34	<i>Cymbella</i> sp	Bacillariophyceae	-	+
15. 13	<i>Euastrum ansatum</i> Ehrbg	Chlorophyceae	+	-
16. 12	<i>Euastrum sinosum</i>	Chlorophyceae	+	-

	Lenorm			
17.27	<i>Gomphonema</i> sp	Bacillariophyceae	+	-
18.10	<i>Hormidium flaccidum</i> (Kutzing) A.Braun	Chlorophyceae	+	-
19.19	<i>Navicula viridula</i> Kuetz	Bacillariophyceae	+	+
20.35	<i>Nitella</i> sp	Chlorophyceae	+	-
21.28	<i>Nitzschia</i> sp	Bacillariophyceae	+	-
22.14	<i>Oedogonium</i> sp	Chlorophyceae	+	-
23.20	<i>Oscillatoria formosa</i> Bory ex Gomont	Cyanophyceae	+	+
24.18	<i>Pediastrum</i> sp	Chlorophyceae	+	+
25.30	<i>Phacus</i> sp	Euglenineae	+	-
26.26	<i>Pinnularia</i> sp	Bacillariophyceae	+	+
27.22	<i>Scenedesmus</i> sp	Chlorophyceae	+	+
28.23	<i>Scytonema</i> sp	Cyanophyceae	+	-
29.11	<i>Spirogyra</i> sp	Chlorophyceae	+	+
30.16	<i>Staurastrum anatinoides</i> Scott	Chlorophyceae	-	+
31.15	<i>Staurastrum crenulatum</i> (Nag) Delp	Chlorophyceae	+	-
32.29	<i>Stauroneis</i> sp	Bacillariophyceae	+	-
33.21	<i>Tetraedron</i> sp	Chlorophyceae	+	-
34.32	<i>Ulothrix</i> sp	Chlorophyceae	+	-
35.24	<i>Volvox</i> sp	Chlorophyceae	+	-

Table 2: List of aquatic fungi isolated from selected temple ponds of Kannur district

Sl. No.	Name	Chirakkal chira	Rajarajeshwara chira
1	<i>Alternaria alternata</i> (Fr.) Keissler	+	-
2	<i>Campylospora chaetoclada</i> Ranzoni	+	-
3	<i>Bactrodesmium linderi</i> (Crane et Shearer) Palm et Stewart	+	+
4	<i>Clavariopsis bulbosa</i> Anastasiou	+	-
5	<i>Curvularia lunata</i> (Wakker) Boedijin	+	+
6	<i>Helminthosporium velutinum</i> Link	+	-

	<i>ex Ficus et Schubert</i>		
7	<i>Periconia</i> sp	+	-
8	<i>Savoryella</i> sp	+	-
9	<i>Sporidesmium vagum</i> Nees et Nees	+	-
10	<i>Tetraploa aristata</i> Berk et Br.	+	-

Table 3: List of Pteridophytes isolated from selected temple ponds of Kannur district

Sl. No.	Name	Family	Chirakkal chira	Rajarajeshwara chira
1	<i>Ceropteris thalictroides</i> (L.) Brong	Pteridaceae	+	-
2	<i>Salvinia molesta</i> Mitch.	Salviniaceae	+	-
3	<i>Marselia minuta</i> L.	Marsileaceae	-	+
4	<i>Adiantum philippense</i> L.	Pteridaceae	+	+

Table 4: List of Angiosperms isolated from selected temple ponds of Kannur district

Sl. No.	Name	Family	Chirakkal chira	Rajarajewara chira
1	<i>Alternanthera tenella</i> Colla	Amaranthaceae	+	+
2	<i>Astercantha longifolia</i> (L.) Nees	Acanthaceae	+	-
3	<i>Calotropis gigantea</i> R.Br.	Asclepiadaceae	+	+
4	<i>Commelina diffusa</i> Burm.f.	Commelinaceae	+	-
5	<i>Cyanotis axillaris</i> Roem.et Sch.	Commelinaceae	+	-
6	<i>Desmodium scopiurus</i> (Sw.) Desv	Leguminosae	+	+
7	<i>Eclipta alba</i> Hassk.	Asteraceae	+	+
8	<i>Euphorbia hirta</i> L.	Euphorbiaceae	+	+
9	<i>Eupatorium odoratum</i> L.	Asteraceae	+	+
10	<i>Ficus heterophylla</i> Linn.	Moraceae	+	-
11	<i>Hedyotis corymbosa</i> L.	Rubiaceae	+	+

12	<i>Ipomoea triloba</i> L.	Convolvulaceae	+	-
13	<i>Ludwigia perennis</i> L.	Onagraceae	-	+
14	<i>Mikania micrantha</i> Kunth.	Asteraceae	+	+
15	<i>Mimosa diplotricha</i> L.	Mimosaceae	+	-
16	<i>Morinda citrifolia</i> Bedd.	Rubiaceae	+	-
17	<i>Nymphaea rubra</i> Roxb.	Nymphaeaceae	+	-
18	<i>Pennisetum polystachyon</i> Sch.	Poaceae	+	-
19	<i>Phyllanthus amarus</i> L.	Euphorbiaceae	+	-
20	<i>Tridax procumbens</i> L.	Asteraceae	+	+

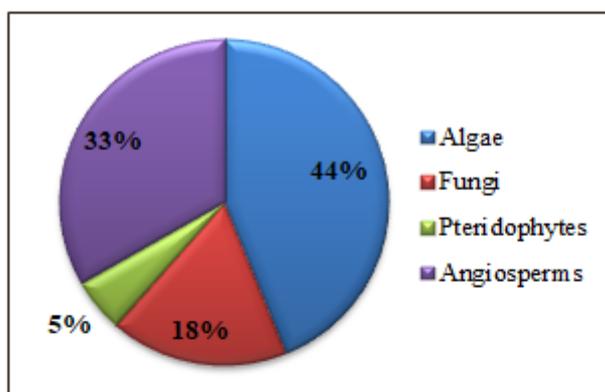


Fig. 1: Floristic diversity of Chirakkal Chira

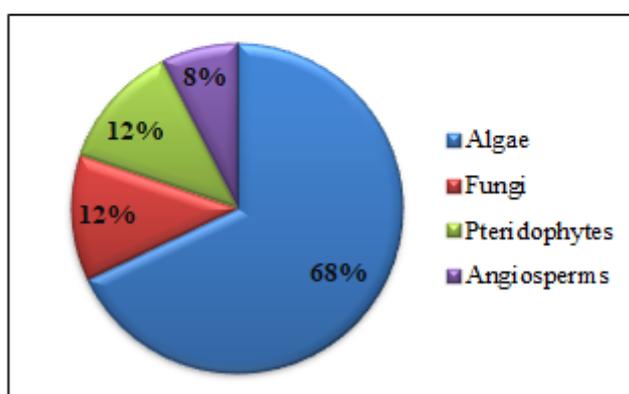


Fig. 2: Floristic diversity of Rajarajeshwara Chira

DISCUSSION

The study gives a broad outlook about the two major temple ponds in Kannur

district, namely Chirakkal chira and Rajarajeshwara chira which are rich in biodiversity and having cultural and historic significance. Chirakkal chira supported vast diversity of flora including algae, fungi, pteridophytes and angiosperms than Rajarajeshwara chira.

Algae being a vital group of plants in aquatic ecosystem are important component of biological monitoring programs for evaluating water quality. Sankaran and Thiruneelagandan [3] identified 63 species under 37 genera of algae from Parthasarathy temple tank, Chennai, India. The number of species of *Scenedesmus* was high. Algae have been associated with regulating environmental pollution. These can help in removing pollutants from the surroundings, restoring contaminated sites and preventing further pollution (*Chroococcus turgidus*– by phytoremediation). Thus there is a chance of regulating the pollution in these culturally important ponds of present investigation by using algal species as phytoremediation agent.

Study on the distribution of the hydrophytes and marshy plants of four ponds located in Venganoor Grama Panchayat, Thiruvananthapuram district, Kerala was carried out by Reju *et al.*, [16]. Considerable macro vegetation was found from the selected ponds. The increased number of macro vegetation indicates that the water quality of these reservoirs is going towards eutrophied condition. Among the two study sites the amount of macro vegetation was more in Chirakkal chira hence; it seems more close to eutrophication. The study also supports the view of Paul and Anu [4] that Chlorophycean members were more diverse followed by Euglenophycean members. Also, the presence of *Scenedesmus*, *Navicula*, *Scenedesmus*, *Navicula* and *Nitzschia* indicate the presence of pollution. Harsha *et al* [7] also reported Chlorophyceans as dominating group in a study on the diversity of planktonic algae of selected freshwater ponds of Mahe, U T of Puducherry,

Survey and studies in floristic diversity and phytosociology in Maniyoor Subramanya Swamy temple, Maniyoor, Kannur by Nidhi and Kousalya [11], revealed the presence of 111 vascular plants falling under 106 genera and 46 families among which angiosperms dominated with 105 members, five of them were pteridophytes and also include a single gymnosperm. Current study support greater number of angiosperms in Chirakkal chira than Rajarajeshwara chira. The invasive *Salvinia molesta* were seen fully spread in Chirakkal chira along with *Nymphaeae*, which leads

to organic pollution. The invasive plants like *Eupatorium* and *Mikania* were seen surrounding the ponds. The whole water body of Chirakkal chira is rich in flora ie. algae, angiosperm, fungi and pteridophyte. Floras obtained from Rajarajeshwara chira include algae followed by fungi and pteridophyte and least number by angiosperm (Fig. 1 and 2).

Frequent cleaning procedures were undertaken by the authority of Rajarajeshwara chira which minimizes the contamination and helps in maintenance of physical, chemical and biological balance. Hence, the maintenance of these scared temple ponds reduces the water scarcity and increases the ground water level and conserves the biodiversity.

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