JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

A Study on the Influences of Physico - Chemical Characteristics of Faecal Coliform Bacteria on Aquatic Macrophytes Diversity in Kadamba Pond at Keelakalamparai

DR. ESTHER ISABELLA EUCHARISTA,

ASSISTANT PROFESSOR,

DEPARTMENT OF ZOOLOGY,

NAZARETH MARGOSCHIS COLLEGE AT PILLAIYANMANAI, NAZARETH – 628617

TAMILNADU

Abstract : Fresh water is essential for agriculture, industry and human existence. The present study was undertaken during month of Feb 2022 - April 2022 to determine the physiochemical and faecal coliform properties of pond water. Different species of macrophytes were collected on monthly basis throughout the year walking along the margin of pond. The collected water samples were transported to laboratory was used for analysis of physiochemical and faecal coliform parameters by APHA (2017) method. Aquatic macropytes were subjected to diversity analysis using different indices like Shannon - Weiner index (H) (1963), Simpson Dominance index (D) and Simpson index of diversity (I-D) (1949). The present investigation represented *Nymphoides peltata* species was dominant. This dense growth is a sign of pollution. All the values of the physico – chemical parameters were within the permissible limits except the faecal coliform parameter. Hence it is reported the water is bacteriologically not safe for drinking purposes.

Keywords **:** Physico – chemical parameters, Keelakalamparai.

INTRODUCTION:

Fresh water is essential for agriculture, industry and human existence. It is a finite resource of earth. Rapid growth of urban areas directly or indirectly affected existence of the pond (*Thilaga et al., 2005*). A change in water quality affects the biotic community of an aquatic ecosystem ultimately reducing the primary productivity *(Iwama et al., 2000).*

Therefore, there is a regular and uninterrupted interaction between biotic and abiotic components in fresh water habitat. There are many types of macrophytes and phytoplanktons grow in water bodies such as Hydrilla, Ceretophylum, Eichhornia, Trapa bispinossa, potamogitones etc., have ability to maintain water quality. The climatic characteristic influences the water quality and quantity affects the biodiversity (*Boyd and Tucker, 1998*). The aim of present study is the investigation of physico - chemical faecal coliform parameters, and aquatic macrophytes diversity of kadamba pond at keelakalamparai.

NEED FOR THE STUDY:

- To arrest decline in ground water levels.
- To improve ground water quality by dilution.
- To increase agriculture production.
- To improve ecology of the area by increase in vegetation cover etc.

OBJECTIVES OF STUDY:

1. To analyse the physico – chemical faecal parameters of Kadamba pond at Keelakalamparai.
2. To calculate the standard deviation.

3. To classify the aquatic macrophytes of kadamba pond at keelakalamparai
4. To estimate the species diversity of aquatic macrophytes of Kadamba pond at Keelakalamparai.

STUDY AREA:

The kadamba pond is located between latitude 8.764166 N and longitude 78.134834 E.

Figure:1 Map of Kadamba Pond at Keelakalamparai, Thoothukudi, TamilNadu.

The present study involves analysis of pond water quality in terms of physico - chemical and faecal coliform parameters along with aquatic Macrophytes. It is located in Thoothukudi District, TamilNadu (Fig.1). Water samples of these sites are basically used for domestic purposes, fisheries and agriculture purpose. The bank of the pond is surrounded by human wastes. The pond is originated from Thamirabarani river, Tirunelveli District, TamilNadu. Further the water flows to the agriculture field at keelakalamparai.

Water flows out through the ten out lets of the pond. The pond water is utilizing for agriculture purposes.

METHODOLOGY:

COLLECTION OF WATER SAMPLE:

The present study was undertaken during month of Feb 2022 - April 2022 to determine the physiochemical and faecal coliform properties of pond water. Samples were collected during the third week of each month. Water samples were collected in 5 litres plastic bottle from surface water between 6 am to 8 am. The actual samplings were done midstream by dipping each sample bottle at approximately 30 - 45 cm below the water surface, projecting the flow direction. The collected water samples were transported to laboratory was used for analysis of physiochemical and faecal coliform parameters by APHA (2017) method.

COLLECTION OF MACROPHYTES:

Different species of macrophytes were collected on monthly basis throughout the year walking along the margin of pond. All collected plants were kept in plastic bags and transported to laboratory where they were washed thoroughly to remove silt, snails, epiphytes and other unwanted materials. Identification was followed according to Sculthore (1971); (*Holm et al., 1997*) and Fassett (2006). Percentage Frequency of macrophytes species was calculated by quadrat method. The size of quadrat was 1 x 1 m^2. Quadrat was thrown randomly on water surface of water body and calculated the percentage frequency of macrophytic species.

STATISTICAL ANALYSIS:

Aquatic macropytes were subjected to diversity analysis using different indices like Shannon - Weiner index (H) (1963), Simpson Dominance index (D) and Simpson index of diversity (I-D) (1949).

Shannon – Weiner index was calculated by using the formula:

$\overline{H} = \sum$ pi log 2pi

Where,

H – Shannon –Weiner index

Pi – ni / N

ni – Number of individuals of each species in the sample.

N – Total number of individuals of all species in the samples.

SIMPSON'S DIVERSITY INDICES:

Simpson's index of dominance was calculated by using the formula:

$$D = \sum \frac{ni\ (ni-1)}{N(N-1)}$$

Where,

ni - The total number of individuals of a particular species.

N - The total number of individuals of all species.

RESULTS AND DISCUSSION:

Table:1 Monthly variations of Physical, Chemical and Faecal Coliform parameters of Kadamba pond at Keelakalamparai during the month of Febrauray 2022 to April 2022.

S.NO	PARAMETERS	FEBRUARY	MARCH	APRIL	LIMITATION
1	pH	7.20 ± 0.05	6.65 ± 0.01	6.95 ± 0.03	6.5 -8.5
2	DO	0.68 ± 0.03	0.84 ± 0.05	1.2 ± 1.05	-
3	TDS	212 ± 1.65	180 ± 1.60	207 ± 1.62	500
4	TA	100 ± 1.58	80 ± 1.51	92 ± 1.55	200
5	Faecal Coliform	1000 ± 2.60	1000 ± 2.60	1100 ± 2.90	Nil /100 ml

pH:

The highest concentration of pH was observed as 7.20 ± 0.05 during the month of February 2022. Whereas, the lowest concentration was observed as 6.65 ± 0.01 during the month of March 2022.

The highest pH value was observed during the month of February 2022. It is probably dense aquatic vegetation as well as decomposition of organic matter by microbes. similar observations were made by Aijun Li et al., 2022.

.

DISSOLVED OXYGEN (DO):

In the present investigation DO (2005), ranges between 0.68 ± 0.03 mg / l to 1.20 ± 1.05 mg / l. The maximum value (1.20 ± 1.05 mg/l) was recorded in the month of April 2022 and minimum value (0.68 ± 0.03 mg/l) in the month of February 2022.

The highest level of DO has been attained during the month of April 2022 might be due to low level of temperature of the geographical area holds the high level of DO similarly (Ajayan and Parameswara, 2014) observed the findings in lake koppa.

Total Dissolved Solids (TDS):

During the month of February 2022, the highest value of total dissolved solids was revealed as 212 ± 1.65 mg/l. The lowest value 1.80 ± 1.60 was revealed in the month of March 2022 (Table:1).

The highest value of TDS measured may be due to geological ground waters environment having changes in the major ion. Similarly reported by (Sonawane, 2011). The ground water chemistry changes when the water flows through the geological environment.

TOTAL ALKALINITY (TA):

During the study period, the alkalinity range was high in the month of February 2022 as 100 ± 1.58 mg/l and low in the month of March 2022

as 80 ± 1.51 mg/l.

During the present investigation the alkalinity range high was due to the surface run-off from the agricultured field which contains the highest concentration of calcium carbonates and bicarbonate ions. A similar view has been expressed by (kensa, 2011).

FAECAL COLIFORM:

The maximum faecal coliform counts were obtained as 1100 ± 2.90 per 100 ml during the month of April 2022. The faecal coliform counts observed high might be due to high concentration of organic matter of faecal origin arises from the nearby residential inhabitant. These studies of (Prakash Chandra Mishra, 2005).

All the values of the physico – chemical parameters were within the permissible limits except the faecal coliform parameter. Hence it is reported the water is bacteriologically not safe for drinking purposes.

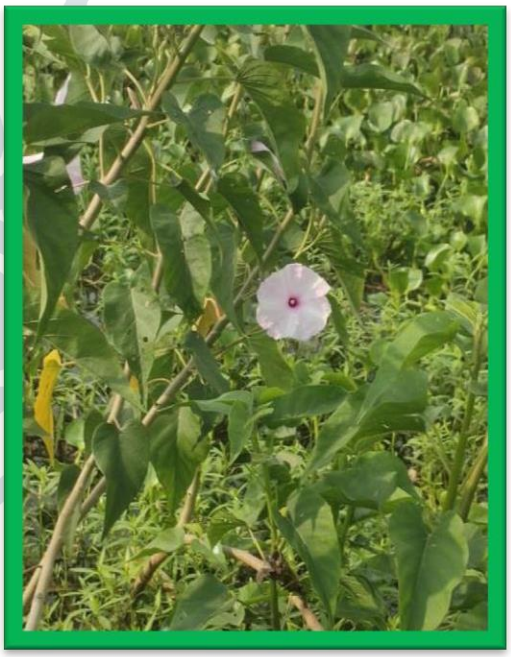
DIVERSITY INDICES FOR AQUATIC MACROPHYTES:

Table: 2 Classification list of Aquatic Macrophytes in Kadamba Pond at Keelakalamparai.

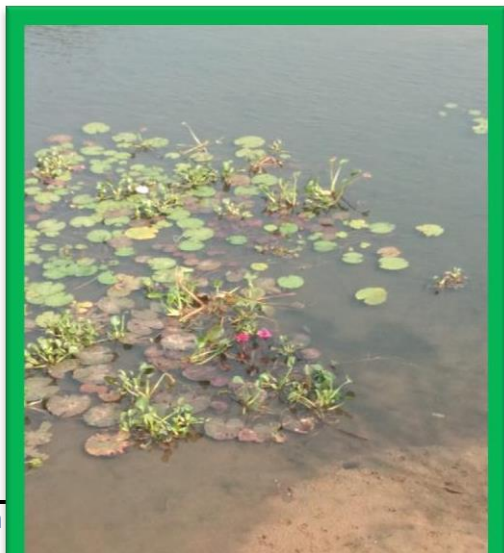
S.NO	FAMILY	ORDER	COMMON NAME	SCIENTIFIC NAME
1	Pontederiaceae	Commelinales	Water hyacinth	*Eichhornia crassipes*
2	Nelumbonaceae	Proteales	Sacred lotus	*Nelumbo nucifera*
3	Menyanthaceae	Asterales	Yellow Floating heart	*Nymphoides peltata*
4	Nymphacaceae	Nymphaeales	Whait water lily	*Nymphaea alba*
5	Solanaceae	Solanales	Jimsonweed	*Datura stramonium*
6	Convolvulaceae	Solanales	Wild sweet potato	*Ipomoea pandurata*

Datura stramonium

Eichhornia crassipes



Ipomoea pandurata



Nymphaea alba *Nymphoides peltata* *Nelumbo nucifera*

Plate:1 Photo showing aquatic macrophytes in Kadamba pond at Keelakalamparai.

In order to assess the species diversity, all the genera were identified and they were counted individually every month study of species diversity was made during February 2022 to April 2022 only. Taxonomic classifications of the macrophytes represented into six families were tabulated in table 2.

A total number of six species (Plate :1) of macrophytes were recorded during the study period. In the month of February 2022, the Simpson's dominance (D) was 0.035 while the Shannon Weiner diversity index was 0.303. In the month of March 2022, the Simpson's dominance (D) was 0.048 whereas Shannon Weiner index ($\overline{H}$) was 0.298. The month of April 2022 the Simpson's dominance (D) was 0.058 and the Shannon Weiner index ($\overline{H}$) was 0.439.

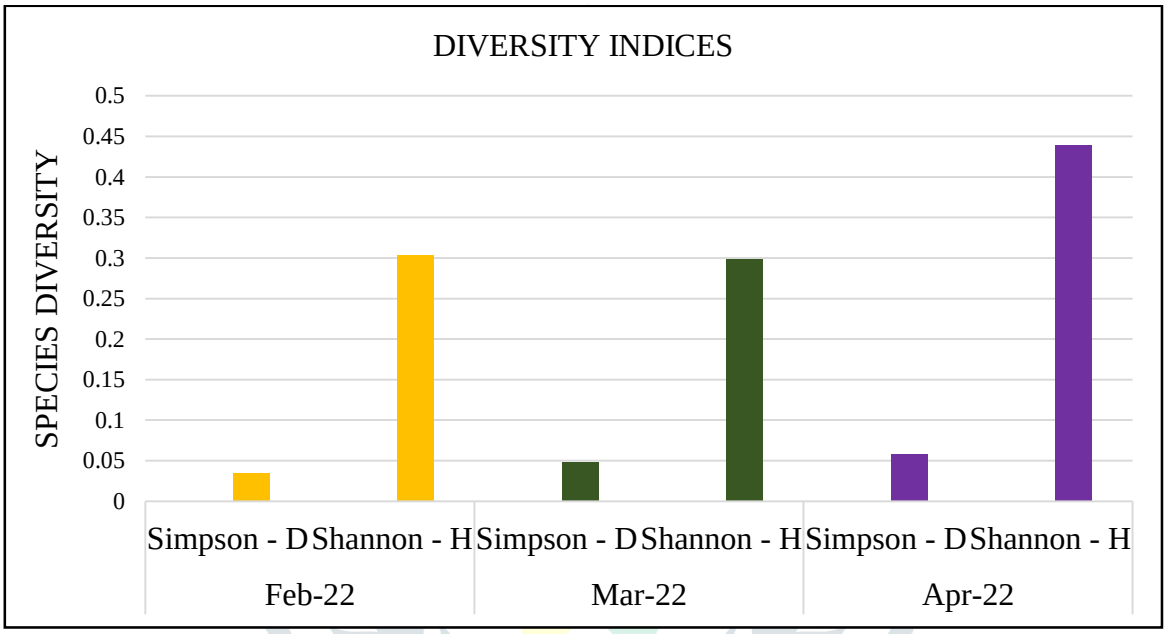


Figure:2 Macrophytic species with their diversity Indices in Kadamba Pond during Feb 2022 to April 2022.

Species diversity indices reported that the month of April 2022 revealed both the Simpson's dominance (D) and Shannon Weiner index (H) was high compared to February and March 2022. (Fig.2).

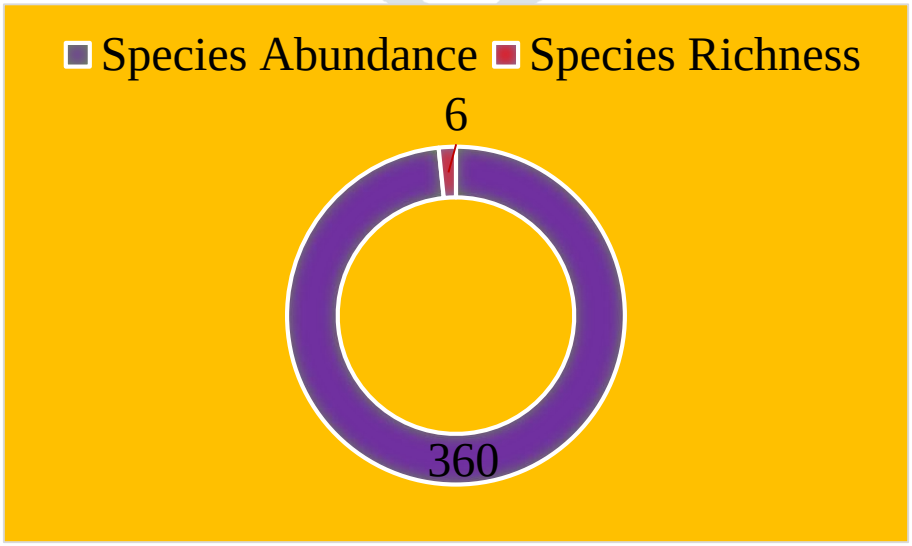


Figure:3 Species Abundance and Species Richness in the Kadamba Pond at Keelakalamparai.

The present investigation represented *Nymphoides peltata* species was dominant. It is considered a noxious weed

because it can form dense mats that shade out native aquatic plant species, thereby reducing biodiversity and also inhabit recreation (Fig.3). Similarly reported by *Nymphoides pellata* (J.G.Gmel.) Kuntze. *Weed Research and information center (2013) pp.1*.

CONCLUSION:

The present investigation represented *Nymphoides peltata* species was dominant. It is considered a noxious week because it can form dense mats that shade out native aquatic plant species, thereby reducing biodiversity and also inhibit recreation. The aquatic macrophytes are species abundance and species richness. The aquatic macrophytes were able to grow rapidly to dense proportions. This dense growth is a sign of pollution.

RECOMMENDATIONS:

1. There is a need of awareness among the local people to maintain the pond.
2. The water source should be protected from pollution.
3. The water in a pond must remain clean if it is to provide a healthy environment for the organisms.
4. Stop discharge of human faeces in the bank of the pond.
5. Proper management practices such as planting trees around ponds, removal of sediments from the bottom of pond and removal of floating debris from the pond surface.

REFERENCES:

[1] Ajayan, K. V and parameswara Naik.T.(2014) physico - chemical characteristics of a fresh water lake koppa, Bhadravathi taluk, Shimogo district Karnataka, India *International Res.J.Environ sci.vol 3 (11) 52-56*.

[2] AijunLi,Ze Shi, Yuzhong Yin, Yuguo Fan, Zhiyi Zhang, Xiaomeng Tian, Yonggui Yang, Lingwu Pan (2022). Excessive use of chemical fertilizers in catchment areas raises the seasonal pH in natural freshwater lakes of the subtropical monsoon climate region. *Elsevier Journal Ecological Indicators volume 154 October 2023, 110477*

[3] APHA (2017) standard methods for the examination of water and waste water. 23rd Edition, American Public Health Association, American water works association, water environment federation..

[4] Boyd. C.E. Tucker, C.S. (1998). Pond Aquaculture Water Quality Management, Kluwer, Norwell, MA.

[5] Fassett, N. C. (2006) A manuel of Aquatic plants. Agrobois, ISBN10:81775403781, ISBN13: 9788177540376.

[6] Holm. L. Doll.J. Holm.E. Pancho.J. Herberger.J, (1997). World weeds natural histories and distribution John wiley and sons 112 app.

[7] Iwama G.K.Vijayan, M.M. and Morgan,J.D.(2000). The stress response in fish. Ichyology, *Recent research advances 450PP. Oxford and IBH publishing Co.Pvt. Ltd., N.Delhi.*

[8] Mary Kensa V.(2011) Inter – relationship between physico – chemical parameters and phytoplankton diversity of two perennial ponds of Kulasekharam area, Kanyakumari district, Tamilnadu. *Plant Sciences Feed 1 (8): 147-154.*

[9] Prakash Chandra Mishra (2005) some aspects of the quality in and around Rourkela. Ph.D., Thesis, Deemed university, Rourkela.

[10] Sculthore, C.D.(1971). The Biology of Aquatic Vascular plants.

[11] Sonawane,L.(2011) Physico – chemical profile of sukharna River, in Aurangabad (M.S.) India. *The Ecoscan 5 (3 and 4):121-126.*

[12] Thilaga, A.Sobhana, S.S and Kumar, K.L.(2005). Studies on nutrient content of the Ooty Lake with reference to pollution. *Nat.Env and poll Tech 4(2): 299-302.*

[13] *Weed Research and information center (2013).pp.1* https://wric.ucdavis.edu/information/natural%20areas/wr_N/Nymphoides.pdf.