Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 7, Issue, 04, pp.14963-14967, April, 2015

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

RESEARCH ARTICLE

SEASONAL CHANGES IN THE PHYSICO-CHEMICAL CHARACTERISTICS OF SELECTED TEMPLE PONDS IN TIRUCHIRAPPALLI DISTRICT (TAMILNADU, INDIA)

***,[1]Bharathiraja, S. and [2]Ebanasar, J.**

[1]Research Scholar, Bharathiar University, Coimbatore, Tamilnadu, India
[2]Head, Department of Zoology and Wildlife Biology, Government Arts College, Udhagamandalam -643 002, Nilgris- Dist, Tamilnadu, India

ARTICLE INFO

Article History:
Received 14th January, 2015
Received in revised form
22nd February, 2015
Accepted 10th March, 2015
Published online 30th April, 2015

Key words:
Total Dissolved Solids,
Electrical Conductivity,
Water quality.

ABSTRACT

This study focused upon the seasonal variation of physico-chemical parameters in Rockfort Thayumanavar temple pond, Samayapuram Mariaman temple pond, Gunaseelam Prasanna vengadajalapathy temple pond and Vayalur Murugan temple pond water. Water quality is assessed during September 2012 – September 2013 using standard procedures. Water samples were assessed by analyzing various physico-chemical parameters such Turbidity, Electrical Conductivity, Total Dissolved Solids (TDS), Tolal alkalinity, Magnesium, Chloride and Fluoride of the temple ponds water in Tiruchirappalli district. The highest value of the physic-chemical characteristics such as (EC – 2230 µmhos/cm, TDS – 1561mg/l, $CaCO_3$ – 516, Mg – 48 mg/l, Cl – 380 mg/l) present in Rockfort temple pond. The lowest value of EC – 515 µmhos/cm, TDS – 361mg/l, Cl – 64 mg/l present in Gunaseelam temple pond and $CaCO_3$ – 116, Mg –3mg/l present in Vayalur Murugan temple pond. There is no change in fluoride value (0.2mg/l) in every month of all the four temple ponds during the study period. Thus the present study reveals that the water of the temple ponds can be polluted moderately and unfit for human consumption. It needs sufficient treatment and management.antibacterial activity against multidrug resistant *Staphylococcus aureus*- MRSA and VRSA.

INTRODUCTION

Water is an essential requirement for all forms of life, needs protection from pollution which otherwise pose a threat to human life. Environmental conditions such as salinity, oxygen, temperature and nutrients influence the composition, distribution and growth of its biota. The quality of water usually described according to its physical, chemical characteristics. The survival of aquatic life is in danger due to the chemicals discharged into the water. The Man Biosphere Programme (MAB) of UNESCO has laid emphasis on the studies of impact of various human activities on water and other resources. Accurate and timely information on the quality of water is indispensible to shape a sound public policy and to implement the water quality improvement programmes efficiently (Kumar *et al*., 2005; Medudhula *et al*., 2012). Ponds can be defined as the smallest shallow bodies of standing water in which extensive plant and organisms are distributed. The quality of water is very important for many freshwater ecosystems, because any change in water has a direct impact on species composition abundance stability and productivity of aquatic organisms (Bahura, 1998, and Jenila *et al*., 2012).

Corresponding author: Bharathiraja, S.
Research Scholar, Bharathiar University, Coimbatore, Tamilnadu, India

The growing problem of degradation and human activities on pond ecosystem has made it important monitor water quality of temple ponds to evaluate their state of pollution. Being a holy pond most of the religious activities are performed on the temple ponds. Temple devotees use the holy water for washing their limbs, sometimes they make a holy dip into the water, and people believe that it can wash all their sins away. However, temple ponds located outside temples are used by people for bathing and even washing clothes (Sulabha and Prakasam, 2006). The main objectives of the study to analyze water samples for physico-chemical parameters and suggest management options needed for each pond under investigation.

MATERIALS AND METHODS

Study area

Samples of water were collected for a period of thirteen months (September 2012 – September 2013) from the four temple ponds. These temple ponds are located in and around of Tiruchirappalli district. Using the GPS to locate the sampling location latitudes North and longitudes East lies between Rockfort Thayumanavar temple pond (10º 82'N and 78º 69'E), Samayapuram Mariaman temple pond (10º 92'N and 78º 74'E), Gunaseelam Prasanna vengadajalapathy temple pond (10º 92 N

and 78º 66'E) and Vayalur Murugan temple pond (10º 82'N and 78º 62'E).

Collection of water samples

The surface water sampling was carried out in the morning between 6 am to 8 am every month from September 2012 – September 2013 at regular interval. During this period the season was rainy, winter and summer. The water samples were collected in a 2 litre capacity plastic bottles brought to the laboratory within 5 hrs of collection.

Analysis of water sample

Physico-chemical parameters of the temple ponds water such as Turbidity, Electrical Conductivity, Total Dissolved Solids (TDS), Total alkalinity, magnesium, chloride, Fluoride and Sulphate were determined in monthly variation according to standard methods (BIS and CPHEEO).

RESULT AND DISCUSSION

Electrical Conductivity

The various physio-chemical characteristic of selected temple ponds during the study period is showed in Table 1 – 4. The conductivity is a numerical expression of its ability to carry on electric current, which in ionic strength as conductivity is a measure of total ions. The ionic strength of a sample depends on ionization of solutes and other substances dissolved in it (Raut et *al*., 2011). Electrical conductivity is a tool to assess the purity of water. In the present study, the Electrical conductivity found in the range between 1585 – 2230 µmhos/cm at Rock Fort temple pond, 748 – 1584 µmhos/cm at Samayapuram temple pond, 515 – 1345 µmhos/cm Gunaseelam temple pond and 560 - 983 µmhos/cm at Vayalur temple pond. The maximum value was observed at Rock Fort temple pond and minimum at Gunaseelam temple pond respectively.

Total Dissolved Solids

These are composed of inorganic salts like Calcium, Magnesium, Potassium, Sodium, Bicarbonates, Chlorides, Sulfates and some heavy metal compounds. Besides these, organic matter in small quantity also contributes the amount of total dissolved solids in water. They are very useful parameters describing the Chemical constituents of the water and can be considered as general of edaphically relation that contributes to productivity within the water body (Goher, 2002). In the present study, the total dissolved solids lies between 1110 – 1561 mg/l at Rock Fort temple pond, 524 – 1109mg/l at Samayapuram temple pond, 361 – 942 mg/l Gunaseelam temple pond and 392 – 689 mg/l at Vayalur temple pond. The TDS of water is probably the most used criterion of its quality. The total dissolved solids (TDS) consist mainly of bicarbonate, carbonate, sulphate, chloride, nitrate and other substance. The huge amount of dissolved solids present in the water is a consideration for its suitability for domestic use only & not for drinking purpose.

Total alkalinity

The capacity of water to neutralize a strong acid is known as alkalinity and is characterized by the presence of hydrogen ion; most of the alkalinity of water is due to dissolution of carbonate (Pawar and Shembekar 2012). The value of alkalinity provides idea of naturals salts present in water. In studied water samples alkalinity found in ranged from 352 to 516 mg/l at Rock Fort temple pond, 200 to 384 mg/l at Samayapuram temple pond, 132 to 376 mg/l at Gunaseelam temple pond and 116 to 248 Vayalur temple pond. Alkalinity is itself not harmful to human beings (Trivedy and Goel, 1986).

Magnesium

The magnesium concentration of the present study was ranged from 16 – 48 mg/l at Rock Fort temple pond, 14 – 31 mg/l at Samayapuram temple pond, 9.0 to 26 mg/l at Gunaseelam temple pond and 3.0 – 20 mg/l at Vayalur temple pond. However, in all the temple pond magnesium content is found in lower level. The most common source of Magnesium in groundwater is through the erosion of rocks, such as limestone, dolomite, and minerals, such as calcite and magnesite. The magnesium concentration of the collected water samples occurs within the permissible limit.

Chloride

Chloride anion is generally present in natural waters. Chlorides as chloride anions (Cl-) are major anions in wastewater. The chloride concentration is higher in organic wastes and its higher level in natural water is definite indication of pollution from domestic sewage. The ecological significance of chloride lies in its potential to regulate salinity of water and exert consequent osmotic stress on biotic communities. The increase in chloride concentration in Lakes, Rivers and dams is due to the discharge of municipal and industrial wastes reported by Kant and Raina, 1990. Chloride usually occurs as NaCl, $CaCl_2$ & $MgCl_2$ and in widely varying concentrations, in all natural waters. They enter water by solvent action of water on salts present in the soil, from polluting material like sewage and trade wastes. Chlorides when reaches concentration above 250mg/l; imparts an unacceptable taste to waters although no adverse effect have been observed on human beings regularly consuming water with much higher concentrations of chloride. But it may affect to a person who already suffer from disease of heart and kidney (Manivasagam 1983). In the present study, the chloride values were in a ranged from 262 – 380 mg/l at Rock Fort temple pond, 92 – 272 mg/l at Samayapuram temple pond, 64 - 184 mg/l at Gunaseelam temple pond and 86 – 152 Vayalur temple ponds. The maximum value was observed at Rock Fort pond and minimum at Gunaseelam pond. Hence, all the temple pond water samples showed satisfactory level (Under limit).

Fluoride

The fluoride concentrations for each temple pond of were all lower than WHO maximum acceptable concentration (1.5 mg/l) for drinking water (WHO, 2006). The high concentration of fluoride as recorded may be attributed to the presence of both organic and inorganic compounds containing fluoride in water such as Hydrofluoric acid (HF), Sodium fluoride (NaF) and Uranium hexafluoric (UF6) (McDongh *et al.*, 2004 and Ezeribe *et al.*, 2012). Fluoride, although known to prevent early stage tooth decay, high level of its concentration in drinking

water and food have been found to have serious health effects in humans and animals, like mottled teeth that occur in children (Mcdongh *et al.*, 2004 and Ezeribe *et al.*, 2012). There is no change in fluoride value (0.2mg/l) in every month of all the four temple ponds during the study period.

Therefore, to improve the quality of water there should be continuous monitoring of pollution level and maintain the favorable conditions essential for fish survival, growth and reproduction in the temple ponds in Trichirappalli district, Tamilnadu, India.

Table 1. Seasonal variation in the Physico-chemical characteristics of Rockfort Thayumanavar temple pond

Month	Electrical Conductivity µmhos/cm	Total Dissolved Solids (mg/l)	Total alkalinity (mg/l)	Magnesium (mg/l)	Chloride (mg/l)	Fluoride (mg/l)
Sep' 2012	1780	1246	400	20	312	0.2
October	1650	1155	388	18	282	0.2
November	1620	1134	392	16	262	0.2
December	1654	1158	368	24	292	0.2
January	1690	1183	380	25	296	0.2
February	1684	1179	392	22	292	0.2
March	1585	1110	352	22	280	0.2
April	1845	1292	384	34	332	0.2
May	1795	1257	424	23	300	0.2
June	1865	1306	440	22	312	0.2
July	1832	1282	424	28	312	0.2
August	2230	1561	516	19	380	0.2
Sep'2013	2200	1540	492	48	370	0.2
Range	1585 – 2230	1110 - 1561	352 – 516	16 - 48	262 - 380	0.2
Mean	1802.30	1261.76	411.69	24.69	309.38	0.2

Table 2. Seasonal variation in the Physico-chemical characteristics of Samayapuram Mariyamman temple pond

Month	Electrical Conductivity µmhos/cm	Total Dissolved Solids (mg/l)	Total alkalinity (mg/l)	magnesium (mg/l)	Chloride (mg/l)	Fluoride (mg/l)	Sulphate (mg/l)
Sep' 2012	1323	926	384	24	172	0.2	23
October	1175	823	360	22	144	0.2	20
November	1220	854	352	22	156	0.2	18
December	1090	763	312	18	140	0.2	23
January	1165	816	328	30	162	0.2	26
February	1245	872	360	24	160	0.2	26
March	1290	903	360	24	172	0.2	28
April	1559	1091	348	27	272	0.2	26
May	1390	973	380	16	192	0.2	31
June	1462	1023	384	20	224	0.2	15
July	1584	1109	384	31	240	0.2	46
August	757	530	200	15	104	0.2	15
Sep'2013	748	524	216	14	92	0.2	20
Range	748 – 1584	524 - 1109	200 - 384	14 – 31	92 - 272	0.2	15 – 46
Mean	1231.38	862.07	336	22.07	171.53	0.2	24.38

Table 3. Seasonal variation in the Physico-chemical characteristics of Gunaseelam PrasannaVengadajalapathy temple pond

Month	Electrical Conductivity µmhos/cm	Total Dissolved Solids (mg/l)	Total alkalinity (mg/l)	Magnesium (mg/l)	Chloride (mg/l)	Fluoride (mg/l)
Sep' 2012	640	448	196	15	72	0.2
October	590	413	176	16	72	0.2
November	595	417	184	13	68	0.2
December	580	406	184	14	66	0.2
January	610	427	184	14	72	0.2
February	795	557	240	19	100	0.2
March	1345	942	376	26	184	0.2
April	Nil	Nil	Nil	Nil	Nil	Nil
May	Nil	Nil	Nil	Nil	Nil	Nil
June	Nil	Nil	Nil	Nil	Nil	Nil
July	Nil	Nil	Nil	Nil	Nil	Nil
August	515	361	132	13	64	0.2
Sep'2013	547	383	152	9	64	0.2
Range	515 – 1345	361 - 942	132 – 376	9.0 - 26	64 - 184	0.2
Mean	690.77	483.77	202.66	15.44	84.66	0.2

Table 4. Seasonal variation in the Physico-chemical characteristics of Vayalur Murugan temple pond

Month	Electrical Conductivity µmhos/cm	Total Dissolved Solids(mg/l)	Total alkalinity (mg/l)	Magnesium (mg/l)	Chloride (mg/l)	Fluoride (mg/l)
Sep' 2012	842	589	208	12	132	0.2
October	760	532	204	3	112	0.2
November	820	574	212	18	122	0.2
December	865	606	224	15	120	0.2
January	923	646	224	16	152	0.2
February	965	676	248	19	144	0.2
March	983	688	240	20	152	0.2
April	Nil	Nil	Nil	Nil	Nil	Nil
May	Nil	Nil	Nil	Nil	Nil	Nil
June	Nil	Nil	Nil	Nil	Nil	Nil
July	Nil	Nil	Nil	Nil	Nil	Nil
August	690	483	148	16	92	0.2
Sep'2013	560	392	116	4	86	0.2
Range	560 – 983	392- 688	116 – 248	3.0 - 20	86 - 152	0.2
Mean	823.11	576.22	202.66	13.66	123.55	0.2

Table 5. Minimum and maximum values of different parameters in four temple pond water samples

Parameters	Rockfort	Samayapuram	Gunaseelam	Vayalur
Electrical Conductivity µmhos/cm	1585 – 2230	748 – 1584	515 - 1345	560 - 983
Total Dissolved Solids (mg/l)	1110 – 1561	524 – 1109	361 - 942	392- 688
Total alkalinity (mg/l)	352 – 516	200 – 384	132 - 376	116 - 248
Magnesium (mg/l)	16 – 48	14 – 31	9.0 - 26	3.0 - 20
Chloride (mg/l)	262 – 380	92 – 272	64 - 184	86 - 152
Fluoride (mg/l)	0.2	0.2	0.2	0.2

Table 6. Mean values of four temple pond water samples

Parameters	Rockfort	Samayapuram	Gunaseelam	Vayalur
EC µmhos/cm	1802.30	1231.38	690.77	823.11
TDS (mg/l)	1261.76	862.07	483.77	576.22
Total alkalinity (mg/l)	411.69	336	202.66	202.66
Magnesium (mg/l)	24.69	22.07	15.44	13.66
Chloride (mg/l)	309.38	171.53	84.66	123.55
Fluoride (mg/l)	0.2	0.2	0.2	0.2

(All parameters are expressed in mg/l except Electrical Conductivity in µmhos/cm)

Table 7. Water Quality Parameters and Its Permissible Standards for Drinking Water

S.No	Parameters	Permissible Std	Agency
1	Electrical Conductivity	300	BIS
2	Total Dissolved Solids	1000	WHO
3	Total alkalinity	600	BIS
4	Magnesium	100	BIS
5	Chloride	250	CPHEEO
6	Fluoride	1.5	WHO

Table 8.Water Quality Index Scale

WQI	Quality Rating
0 – 25	Excellent
26 – 50	Good
51 – 75	Moderately Polluted
76 -100	Very Poor
100 and above	Unsuitable for Drinking

REFERENCES

APHA, 1985. Standard methods of the Examination of water and waste water. 16th ed.

APHA., AWAA, WPLF, Washington DC PP1-1268.

Bahura, C. K. 1998. A Study of Physico-Chemicalcharacteristic of a highly eutrophic

Bureau of Indian Standards (BIS), Indian standards for drinking water specification, BIS,10500: 2010.

CPHEEO: Indian Standard methods for the examination of water and waste water. Central Public Health And Environmental Engineering Organization.

Das, J.2002. Hydrology andpricey in this region. The range varies 7.4-8.9. The Betwa assessment of lotic water quality in Cuttack City,River a non perennial river. The main source of pollutants India water Air and soil pollut, 150: 163-175.

Ezeribe, 2012, A.I.1, Oshieke, K.2 & Jauro, A.3,2012, phisico-chemical properties of well water samples from some villages in Nigeria with Cases of Standared and Mottle Teet, *Science World Journal* Vol 7 (No 1)

Goher, M.E.M., 2002. Chemical studies on the precipitation and dissolution of some chemical element in Lake Qarun, Ph.D. Thesis fac of sci, Al-Azhar University, Egypt.

Jenila. G. J, Madhusoodanan Pillai. G and Radha Krishnan Nair. C, 2012. Water quality of ponds around Marthandam and Nagercoil town in Kanyakumari district, TamilNadu-India. *Int. J. Cur. Tr. Res* (2012) 1 (3): 121-127

Kant, S. and A.K. Raina, 1990. Limnological studies of two ponds in Jammu II Physiological parameters. J. *Env. Biol*., 11(2): 137.

Kumar Rakesh, R.D. Singh and K.D. Sharma, 2005.WaterResources of India, *Current Science,* (5): 794-811.

Manivaskam.N,1986. Physico-chemical examination, sewage and industrial, Pragati Prakashan Meerut.

McDongh, M., John, C., Michael. P. 2004. Systematic Review ofwater fluoridation. *Bristish Medical Journal* 321 (7265): 855- 859.

Medudhula. Thirupathaiah, Ch. Samatha and Chintha Sammaiah, 2012. Analysis of water quality using Physicochemical parameters in lower manair reservoir of Karinagar district, Andhra Pradesh *International Journal of Environmental Sciences*, (1): 172-180.

Pawar S.B and V. S. Shembekar 2012. Studies on the physico-chemical parameters of reservoir at Dhanegoan district Osmanabad (M.S.), India. *Journal of Experimental Sciences*, 3(5): 51-54

Raut KS, Shinde SE, Pathan TS and Sonawane DL. 2011 Seasonal variations in physico- chemical characteristics of Ravivar Peth Lake at Ambajogai Dist. Beed Marathwada Region, India. *Journal of research in Biology* 4: 258-262

Sulabha.V and V. R .Prakasam 2006: Limnological features of Thirumullavaram temple pond of Kollam municipality, *Kerala Journal of Environmental Biology,* 27(2) pp.449-451.

Trivedy, R.K. and P.K. Goel, 1986. Chemical and biological methods for water pollution studies. *Environmental publications*, Karad

WHO, 1984, Guidelines for Drinking Water Quality, Health Criteria and other supporting information. Geneva. *Mecmillan/Eeuteric* Vol.2.

****