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RESEARCH ARTICLE

A Comparative Investigation On Physico-Chemical Properties of Temple Tanks in and around Capecomorin

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ABSTRACT:
The India's land ends or the tip of the peninsular India also referred as land of ThrivenySangamam is our Kanyakumari. It is also popularly known as Cape Comorin is supposed to be a famous pilgrim centre and a beach resort. The nearby town, administrative headquarters of Kanyakumari district is Nagercoil. This town is famous for many temples. Thousands of devotees visit various temples here and make bath in temple pond water to get rid of their sins. In this study we have taken effort water samples from three different locations namely, Vishnukoil, Krishnankoil and Nagarajakoil to understand the physico-chemical properties such temple ponds. Analysis of various samples significantly resulted in varied reports on pH, Electrical conductivity, Total dissolved solids, Hardness, chloride, sodium, and potassium.

KEYWORDS: water analysis, nagarajakoil, devotees, physico-chemical properties.

1. INTRODUCTION:

All the living organisms on the earth requires water for their survival and growth. Water is the most essential compound for ecosystem. This precocious natural resource gets highly polluted due to the growth of human population and industrialization, high usage of fertilizers in the agriculture field.Daily use of this contaminated water the living body (humans and animals) suffers from various water borne diseases. Thus the quality of drinking water should be checked at regular time interval. The biological phenomenon of water system is difficult to understand fully and however its chemistry reveals much about themetabolism of the ecosystem and explains the general hydro - biological relationship [1]. In India, now a days water pollution is a major problem. The surface water and ground water reservoir are contaminated by toxic organic and inorganic pollutants.

Due to this reason many types of pollutions are introduced such as air pollution, sound pollution, water pollution, oil pollutionand soil pollution [2]. Polluted water is not suitable for drinking, agricultural or industrial purpose. Also it destroys the aquatic life and reduces its reproductive ability. The effects of water pollution not only devastating people but also the animals, birds and fish [3].

The various sources of water to the temple tanks are rainfall, feeding from nearby channels, seepage, and agricultural drainage or from the river if any flows along the temples largely affected the quality of the water.

For the present discussion, temple tanks in and around Nagercoil town were selected. They are Vishnukoil temple tank at Parvathipuram, Krishnankoil temple tank at Krishnankoil and Nagarajakoil temple tank at Nagercoil. Various diagnostic studies of water samples were done by drawing samples from the temple starting from August 2017 upto November 2017 on every fortnight interval basis. Earlier studies reveal that Nagarajakoil temple tank was found to be highly polluted when compared to other two temple tank water [4]

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MATERIALS AND METHODS:

The selected three temple tanks were selected in and around of Nagercoil, Kanyakumari District are site I (Parvathipuram)from Vishnukoil; site II (Krishnankoil) from Krishnankoil; siteIII (Nagarajakoil) from Nagercoil.

The samples are collected from each sampling location, surface water was collected and stored in clean polyethylene bottles.Temperature of water was measured using mercury thermometer. The pH of the water sample was determined with BDH wide and narrow range indicator paper at the sites during the collection of samples. The results were also verified in the laboratory with the help of portable standard gun type grip pH meter which contain glass electrode. Before operation, electrode was standardized by buffer solution of 4 and 9.2 pH.Electrical conductivity was determined with Conductivity Bridge which operates under the principle of wheat stone bridge employing a cathode ray tube as null indication.

Total dissolved solids were determined either from the difference of the total solids and total suspended solids or transferred filtrate to a weighed (W1) evaporating dish. The precipitate was dried for at least one hour in an oven at 180□C, cooled and weighed (W2).
Total dissolved solids = Total solids – Total suspended solids

$$\text{Total Dissolved solids} = \frac{(w_2 - w_1) \times 1000}{\text{ml. of Sample}} \quad \ldots\ldots(1)$$

Total hardness:

Total hardness was estimated as method described by APHA (2005). 50ml of sample water was estimated against N/50 EDTA solution (ethylene diaminetetra acetic acid) using total harness indicator tablet and ammonia buffer as reagents. The value was expressed in mg/l.

$$\text{Total hardness} = \frac{\text{ml of EDTA used} \times 1000}{\text{ml. of Sample}} \quad \ldots\ldots (2)$$

Chlorides:

Chloride was determined by precipitation titration method (Argentometric method) by adding potassium chromate as indicator in the sample and titrate the water sample with silver nitrate till the color change from yellow to reddish orange precipitate.

Sodium:

Sodium has been determined by means of Flame photometry.

RESULT AND DISCUSSION:

pH

The pH values of water samples under study showed alkaline nature during the end of the monsoon season (VarshaRitu season) in all the sampling points and generally slightly acidic during autumn season (SharadRitu) and at beginning of prewinter season (HemantRitu) shown in Fig 1. The alkalinity of water has been associated to the evaporation of water during sunny season and also due to the usage of water for bathing and washing purpose by the devotees.The alkaline nature of water is due to rise of high temperature which reduces the solubility of carbon dioxide [5] and the alkalinity is also due to photosynthetic activity occurred in water [6&7]. The acidic nature of water during rainy season can be concluded as arising due acids rain water (arising from atmospheric pollution)which gets dissolved in temple tank water.

Theobserved variation of pH in water mostly arisesdue to the abnormal climatic change in the environment which affects the aquatic ecosystem directly or indirectly. This also shows a dramatical change in thephysiological behavior of biotic or abiotic aquatic ecosystem.

The exceptional observation in this study was found in S3, where the water was found to be significantly acidic during the month of November due to heavy rainarised as a result of cyclone Ockhi.This change in pH was highly due to discharge of agricultural wastes, human anthropogenic activities and surface runoff [8].

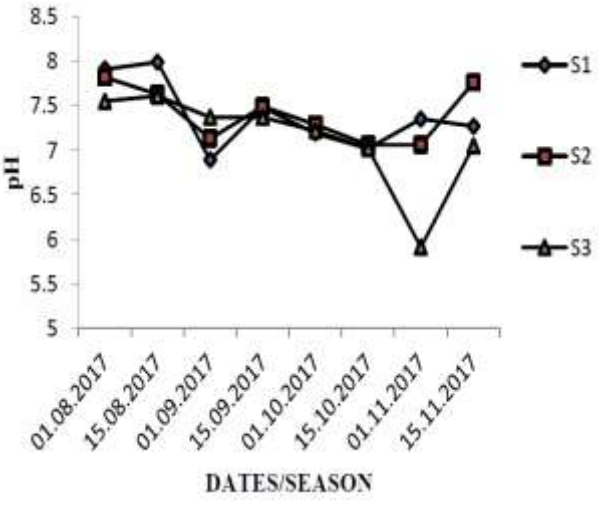

Fig 1 Seasonal variation of pH in the water sample

Electrical Conductivity:

The electrical conductivity is another important factor which determines the quality of water. Electrical conductivity is an ability of an aqueous solution to

carries electric current. This ability is due to the presence of ions, their total concentration, mobility, valence, relative concentrations and temperature of measurement. In this current study the conductivity varies from 0.2 to 0.5mho. For the sample S3 electrical conductivity is found to be very high that isapproximately 1.2 to 1.6 mhoshown in figure 2. High electrical conductivity is due to high total dissolved solids and salinity. The sample shows high acidic nature too. As the acidity is high, conductivity will also be high.

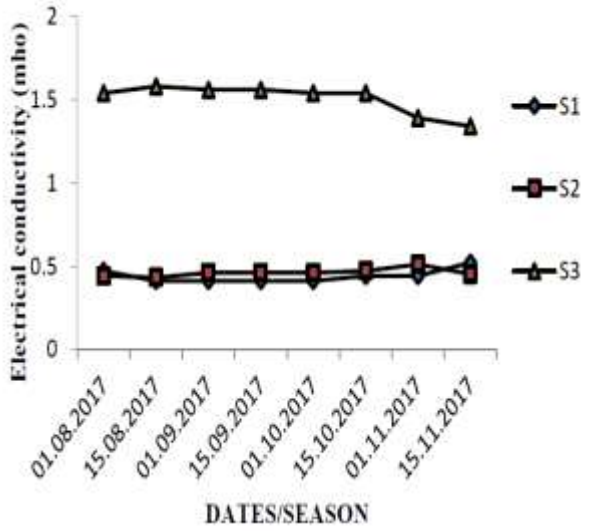

Fig 2 Seasonal Variation of ElecticalCoynductivity of the water sample

Total Dissolved Solids:

The Total Dissolved Solidsare the suspended and dissolved matters present in water. The Total Dissolved Solids in water are composed mainly of carbonates, bicarbonates, chlorides, phosphates and nitrates of calcium, magnesium, sodium, potassium, manganese, organic matter, salt and other particles. In this study total dissolved solids of water samples varied from 114.61 to 331.69 mg/l for the samples S1,S2. From the figure 3, it is noted that, sample S3 shows is an exceptional case, which shows higher Total Dissolved Solids value of 1010.11mg/l. The high Total Dissolved Solids contend is due to the presence of high salt content. This is also confirmed by the result of high electrical conductivity. The higher concentration of Total Dissolved Solids enriches the nutrient of water body which leads to eutrophication in the aquatic ecosystem. Total dissolved solids are due to improper surrounding sanitation [9] and also due to the disposal of waste around the temple tank [10].

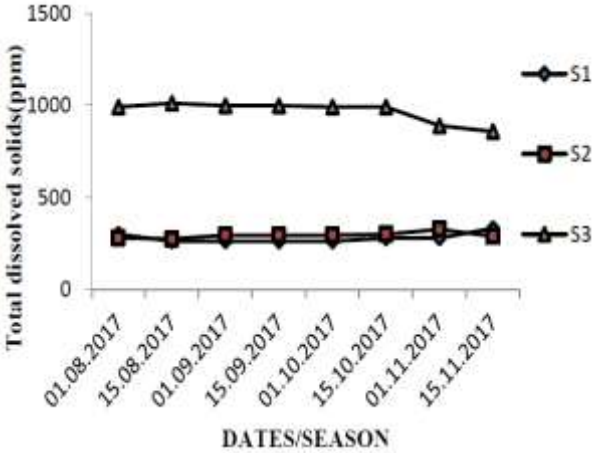

Fig 3 Seasonal variation of Total dissolved solids present in the water sample

Hardness:

Hardness is another physical parameter which arise due to the presence of chlorides, sulphates, carbonates and bicarbonates of calcium and magnesium salt. The seasonal variation of harness of water sample is shown in figure 4.The hardness was also found to be high for the sample S3, which may due to the presence of high calcium and magnesium salt content. The hardness was found to be low at the month of October for the sample S2. Hardness above 300ppm is considered as very hard water [11]. Water samples in sample S1 falls under very hard water category [12]. Higher hardness is due to human activities in and around the temple tank [12]. Hardness of water increases due to washing of clothes, agricultural runoff and automobile cleaning [13].

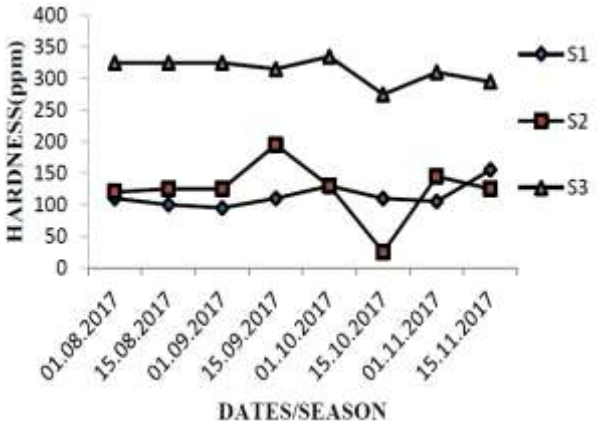

Fig 4 Seasonal variation of Hardness present in the water sample

Chloride:

Chloride is yet another factor which governs the quality of water; generally it is one of the major anion generally present in natural water. The chloride ion combines with calcium, magnesium or sodium and shows hardness which is noted in figure 5. The higher chloride content

in ponds may be due addition of human faces and sewage inflow. The study shows less chloride content except S3, which shows higher chloride content than the ISI standard. This shows that S3 temple tank water is more polluted due to domestic or sewage waste.High pollution of water leads to high chloride content of water[14]. Eutropication is another reason for increasing percentage of chloride content. When concentration of chloride is above 250ppm, it alters the taste of water and impart health issues to human beings [15].

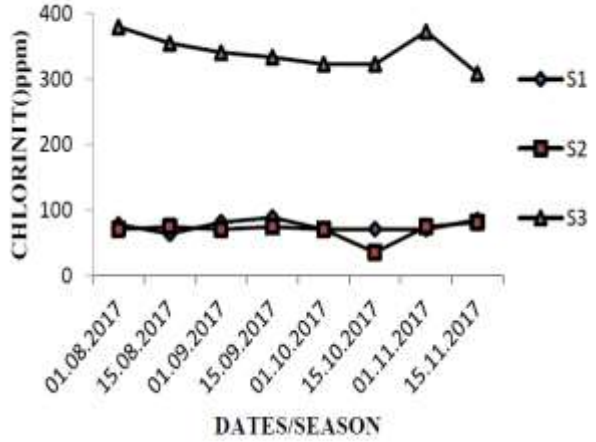

Fig 5 Seasonal variation of chloride content in the water sample

Sulphates:

In all the temple tank water samples analysis for the presence of sulphate, resulted in zero value (Fig 6), which implies that none of temple water tank were contaminated with sulphates.

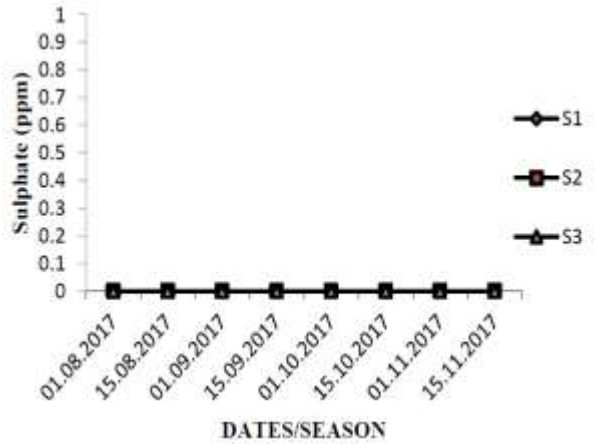

Fig 6 Seasonal variation of sulphate ion in the water sample

Sodium:

Sodium content was found to be high in the present investigations. In the surface water, the concentration of sodium may be less than 1 mg/l or exceed 300 mg/l depending upon the geographical area(Fig 7). In the present study sodium content found to be high for S3 temple tank water.

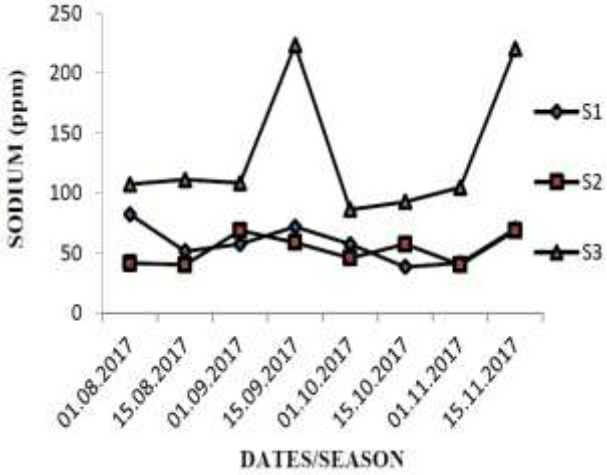

Fig 7 Seasonal variation of Sodium in the water sample

Potassium:

The concentration of potassium is quite lower than that of sodium. Potassium concentration in the present study varied from 33 to 8.23ppm of which higher value (33ppm) was observed in Nagarajakoil temple tank while the lower value (8.23ppm) was recorded in Vishnukoil temple tank which is shown in Fig 8. Mostly potassium remains in solution and does not undergoes precipitation [16].

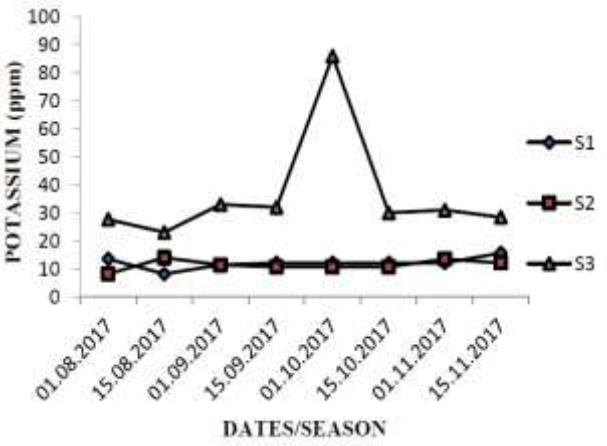

Fig 8 Seasonal variation of Potassium in the water sample

CONCLUSION:

In kanyakumari district almost all the big temples have tanks in their premises. Though the sizes of the tanks vary from temple to temple, the utility of the water in the temple tank remains almost similar. The pilgrims take bath; wash their clothes and utensils associated with the prashatham to the temple. The public in and around the temple locality uses the water of the tank for similar purposes.

Most of the physico-chemical parameters analyzed in this venture study showed variations from one temple tank to another as well as among the samples drawn from one season to another. This showed clear patterns of variation generally attributed to biological activities and those associated with the day-to-day activities in the temple. The activities of men and cattle in and around the temple and the environment around the tank also influenced the quality of the water in the temple tank.

1. The Vishnu temple tank the water which was alkaline in August 2017 has turned near neutral in September 2017 and become acidic in November 2017.
2. The Nagarajakoil temple tank located in the heart of the town turned alkaline in August 2017 and turned to highly acidic, recording an acidic pH of as high as 5.31 in first fornight of November 2017. The Muthu theatre pond located nearby which usually remains polluted during the period has caused the seepage and contributed to the pollution in the nagarajakoil temple tank.
3. The result obtained at Krishnan koil temple tank located at Krishnan koil shows that the water was not polluted as noticeable.
4. Generally noted that higher pH levels in the water of the most of the temple tanks is due to the high temperature and increased photosynthesis activities of phytoplankton present in the water.
5. The temperature also influences the electrical conductivity which is interrelated to solubility. The evaporation of water during the period of August 2017 with the absence of rain fall has contributed to increase of ionic concentrations in the waters of the most of the temple tanks.
6. The conductivity of Nagarajakoil temple tank was found to be high conductivity of 1.56 d/m over the seasons of the study. The Total dissolved solids was also found to be high with a maximum of 1010.11mg/lit during the second fortnight August 2017.
7. The hardness of Nagarajakoil temple tank water increased three fold during the August and September 2017 as compared to October and November 2017 which is attributed to the increased use of soaps and detergents by the pilgrims and visitors during that hot period, for bathing and washing.
8. Undetermination of sulphate throughout the study period indicating that there is no anaerobic decomposition.
9. The highest sodium content of water was determined in Nagarajakoil temple tank ranging from 104.5ppm to 223.08ppm and with correspondingly higher chlorine content was observed in the analytical data, it points to the NaCl geochemical type of water in this temple tank.
10. In conjunction with all parameters studied, analyzed and discussed earlier, Nagarajakoil temple tank water remained more polluted in comparison with the rest of the temple tanks.

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