International Journal of Scientific Research in Multidisciplinary Studies
Vol.**10**, Issue.**4**, pp.**01-09**, April **2024**
E-ISSN: 2454-9312 P-ISSN: 2454-6143
Available online at: www.isroset.org

Research Article

Analysing the Surface Water Class and Correlation Study of Pond Water

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Received: 21/Feb/2024; **Accepted**: 23/Mar/2024; **Published**: 30/Apr/2024

Abstract— The water resources are most significant for the natural ecosystem and human improvement. Kanchipuram has many legendary temples, climatic variation and urbanisation cause a reduction in the temple pond water level. The water quality study of seventeen historical temple ponds was done. The subsequent parameters, pH, electrical conductivity, dissolved oxygen, total dissolved solids, total hardness, total nitrogen, total phosphate, and the biological parameter, total coliform count, have been measured. The research work was done in the periods of 2017, 2018, 2019, and 2020. The results were compared with ISI-IS: 2296-1982 class A, B, C, D, and E standards for surface water. The pH value was greater in the minimum temple pond water; the other parameters were within the limit compared with the class B, C, D, and E standards. Analysing the results exposed temple pond water useful for bathing, swimming, fish culture, irrigation, etc. The pond water is useful for drinking purposes after purification. Correlation analysis shows total dissolved solids have a good correlation with electrical conductivity (r=1) in four years. Conservation and renovation are important for maintaining the ponds in good condition in the future.

Keywords— Correlation, Parameter, Pond water, Quality, Temple, Water.

1. Introduction

Water is a major factor in the environment. The occurrence of water in ponds, lakes, rivers is less than one percent [1]. In clean water aquaculture, the worth of water is the most important factor. Studying the water quality parameters helps increase strategies to monitor these parameters and execute schemes to retain the quality of water. An adequate quantity of good quality water is essential for an aquaculture operation. Ponds are used for artificial penetration of the underground water. The quality of pond water is based on physical, chemical, and biological factors [1]. Ponds are located inside or outside the temples. The temple management instructs limitations over the misuse of ponds; it will maintain in cleanliness. Pollution is a severe problem, as seventy percent of surface water and ground water resources have been infected by organic, inorganic, and biological contamination [2]. Water quality maintenance is significant in pond water aquaculture since water quality imbalance causes pressure, reduced growth, and humanity in the culture of species [3]. Limnology is the common term for the physico - chemical and biological study of various water quality parameters. Limnology is a division of science that deals with the biological creation of inland waters and all the causal influences that come with them [4]. Limnology is also defined as the learning of the serviceable relationship and productivity of water affected by biotic communities by physico, chemical and biotic ecological factors [5]. Forel (1841 – 1912), the founder and father of limnology, observed and documented freshwater occurrences. A water quality parameter study on holiest temple ponds in Kanchipuram was designed to review the deterioration of water value due to pollution in continuous years [6]. The correlation learning of water quality constraints is applicable to the outcome as a probable relationship, which can be beneficial in monitoring. The correlation study suggests more appealing approaches to inferring water quality as time-saving and profitable techniques. This correlation analysis endeavors to discover the nature of the relationship among the variables and thus offers a mechanism for forecasting. Tourism in Kanchipuram has grown significantly, and a study of the temple pond water quality is critical for societal purposes. Pond renovation work is current task, so determining the current condition and pollution levels of ponds is necessary research work in the Kanchipuram temples.

2. Related Work

Yogesh Mishra (2023) explored the physico-chemical features of four ponds in Kaushambi district. The ponds are polluted by anthropogenic activities. The sample points are three from Ichhna village and one from Saraiakil village. The water quality parameters - transparency, temperature, dissolved oxygen, pH, CO_2, alkalinity and total solids are tested. The measurement was done from March 2021 to February 2022. The water is in an alkaline state throughout the year. The biodiversity and the creation of fish depend upon the physico-chemical features of the ponds [7].

Kishore and Gujjar (2023) The investigation revealed that measurement of physico-chemical parameters such as temperature, pH, electrical conductivity, free carbon dioxide, chloride, total dissolved solids, dissolved oxygen, total alkalinity, total hardness. There is a mesotrophic status of the Dantaramakki, and Hiremagaluru Ponds water in Chikmagalur, precautionary measures are essential to avoid additional deterioration of the pond water class [8].

Frank C.et al. (2023) results indicate that Aboh Mbaise Local Government Area, Imo State, Nigeria pond water is of poor quality, the water quality index for the five ponds ranges from 1338.71 - 3322.81. There is a good correlation between the Total Bacterial Counts from Shigella and Salmonella counts and the faecal contamination from both human and animal wastes. The pond water is unhealthy for the inhabitants of the study area, but after treatment, the pond water is useful for food preparation and other household purposes [9].

Pryuttma, and Abhay Prakash (2023) revealed that the iron level was much lower in pond water compared to the underground water in Khagaria District, Bihar. The total dissolved solids in pond water are much lower than in pump water. The total hardness of pond water was lower than that of underground water. The alkalinity of pond water was in the range of 100-160 mg/l. The alkalinity of underground water ranged from 240-360 mg/l [10].

Rakesh Kumar Baser (2023) investigated the water quality of the Hameer Pond, Kishangarh, Rajasthan. The physico-chemical properties have changed in the form of nutrient improvement, which is due to the dumping of industrial and domestic wastes and its overflow in and around the catchment area of the pond. These anthropogenic activities increase the water values of pH, TDS, turbidity, BOD, phosphate etc [11].

Anurag Tewari, P.P. Paroha and Sadhna Awasthi (2023) conducted correlation study in the Jajmau area of Kanpur city. Correlation values lie between 0.31to 0.5, where 32 parameters were found to be negatively correlated, and 46 were positively correlated. Total hardness, conductivity, pH, and total alkalinity values were found to be higher when compared with water quality standards. Significant positive correlations were observed for turbidity, total hardness, phosphate and chromium, a negative correlation was observed for nitrogen, sulphate, fluoride and Chromium [12].

Hao Li, et al. (2022) showed that there is a greater difference in the correlation coefficient between the two indicators at various periods of the same sample point. The correlation between the two indicators in the abundant-water season is greater than that in the flat-water season [13].

Adinath T. et al. (2023) concluded that water quality analysis showed that Total Phosphorus values was greater in the summer, when reservoir water levels were lowest. The correlation between Total phosphorus and Chl-a was greater (0.926). Eutrophication depends on the availability of phosphorus in the water, which increases with chlorophyll-a concentration. A positive correlation between temperature and DO might be possible because higher summertime water temperatures boost photosynthetic activity. The study was done in the Udgir, District Latur, Maharashtra, from August, 2017 to January, 2019 to investigate trophic status of the Tiru reservoir. Twenty (20) water quality parameters had been collected monthly from five sampling sites [14].

Mohammad Mehdi Heydari et al. (2013) concluded that in 21 sample wells of Kashan city, central Iran, from October 2006 to May 2007 (25 - 30 °C), some of the water samples are not drinkable. Hydro chemical facies using a piper diagram specify that in most parts of the city, NaCl dominates. All samples showed sulphate and sodium ions higher and K+ and F- content lower than the permissible limit. A strongly positive correlation is observed between TDS and EC (R = 0.995) and Ca^{2+} and TH (R = 0.948). The results showed that regression relations have the same correlation coefficients: (I) pH -TH, EC -TH (R = 0.520), (II) NO3- -pH, TH-pH (R = 0.520), (III) Ca^{2+}-SO_4 2-, TH- SO_4 2-, Cl- - SO_4 2- (R = 0.630) [15].

P. Shroff et al. (2015) focused on the determination of parameters such as pH, Colour, Electrical Conductivity, Total Hardness, Calcium, Magnesium, Total Alkalinity, Total Dissolved Solids, Silica, Chloride, Sulphate, Fluoride, Sodium, Chemical Oxygen Demand and metals Copper and Manganese. The correlation matrix of Valsad district suggests that Electrical Conductivity of groundwater is significantly correlated with eight out of seventeen water quality parameters[16].

Sandeep Kumar Shukla and Rajni Kant Sharma (2023) conducted a study on Wainganga River. The results showed that correlation and regression analysis are useful methods for rapid monitoring, and management of water quality. It is time saving and cost-effective technique. In this study, regression equation recognized between different water quality parameters can be employed to forecast the range of other parameters if its counterparts are known [17].

3. Theory

The theory of research work is to analyse the quality of pond water and find the suitability of usage based on BIS surface water class. Correlation analysis gives the capacity of one parameter to another parameters. The temple pond is our historical representation, and the preservation of this ponds in this generation is most important. The temple ponds are useful for storing water during rainy season, they act as a water storage reservoir. The temple ponds observe positive energy and give people a peaceful mind when they are visiting.

4. Methodology

The pond water quality assessment research works will be performed based on the following methodology. Figure 1. shows the methodology of work.

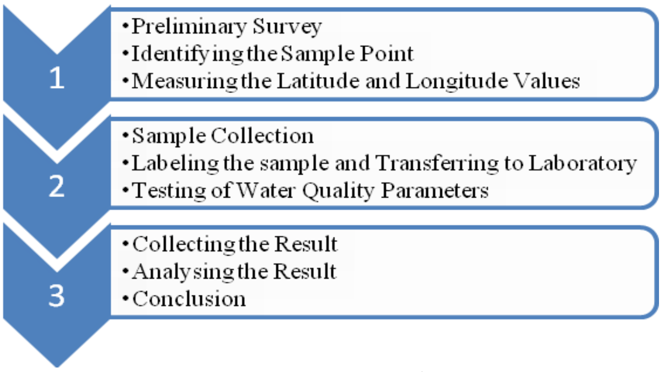

Figure 1. Methodology of work

The methodology has divided into three phases.

- The first phase consists of selecting a location point, visiting Kanchipuram city, and identifying the presence of temples and water at the temple point. The latitude and longitude values were measured with the help of Global Positioning System (GPS) device. This data's useful for drawing the base map, and it gives the area of the project.
- The second phase consists of the collection of temple water as per the standard procedure, and the water sample is transferred to the laboratory within 24 hours. The quality of the water tested as per the standard procedure given for each test.
- The third phase consists of collecting and analysing the result, based on that, the quality of water was finalised and the usage of water was found, and correlation analysis was done to find the relation between water quality parameters.

4.1 Study Area

Kanchipuram is 75 km from Chennai, it is one of the districts in the state of Tamil Nadu in India. The total geographical area of the district has 4,432 km^2, it is one of the seven holy cities in the country, an important industrial city nearer to Chennai. At present due to environmental impacts few temple ponds have water. The latitude and longitude values of sample points were measured with the GPS device. The names and location of the sample points as shown in Table 1, base map for study areas shown in Figure 2.

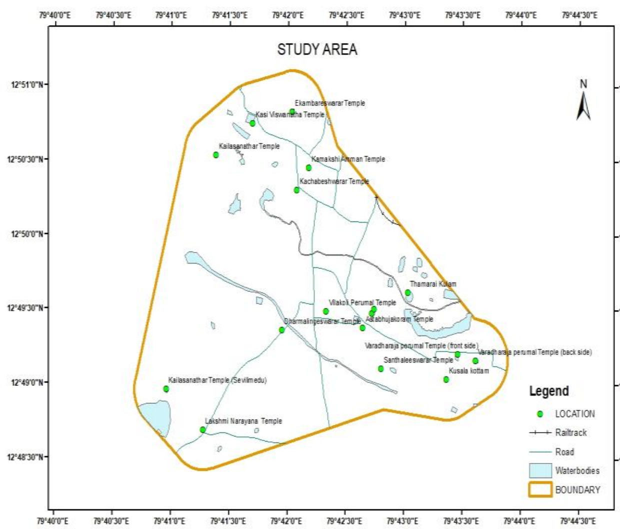

Figure 2. Base Map for the Study Area

4.2 Sample Collection

The source of water for the temple ponds is rain water during the monsoon period, and other sources are temple usage water. The pollution created in pond water due to anthropogenic activities and waste mixed during runoff in the monsoon period. Pond water samples have been collected by hygienic bottles. The bottles were completely washed while collecting the water samples and properly labelled. The obtained results were compared with as per ISI-IS: 2296-1982 tolerance limits. Based on the tolerance limits the classifications of water given as follows Class, A - Drinking water source without conventional treatment, after disinfection, B - Outdoor bathing, C - Drinking water with conventional action followed by disinfection, D – fish culture, wildlife propagation, E – irrigation, industrial cooling, controlled waste disposal. The Tolerance limit for surface water classes A, B, C, D, E has shown in Table 2.

Table 1. Name and Location Details of the Sample Points

SP	Name of the Temple	Latitude	Longitude
P1	Lakshmi Narayana	$12^0$48'41.49"N	$79^0$41'16.84"E
P2	Kamakshi Amman	$12^0$50'27.21"N	$79^0$42'11.00"E
P3	Kailasanathar (Sevilimedu)	$12^0$50'32.20"N	$79^0$41'23.16"E
P4	Kasi Viswanatha	$12^0$50'45.09"N	$79^0$41'41.92"E
P5	Astabhujakoram	$12^0$49'22.97"N	$79^0$42'38.90"E
P6	Puniya Koteeswarar	$12^0$49'28.67"N	$79^0$42'43.49"E
P7	Kusala kottam	$12^0$49'02.28"N	$79^0$43'22.15"E
P8	Kachabeshwarar	$12^0$50'18.43"N	$79^0$42'04.80"E
P9	Varadharaja perumal (front side)	$12^0$49'12.36"N	$79^0$43'27.98"E
P10	Varadharaja perumal (back side)	$12^0$49'10.05"N	$79^0$43'36.98"E
P11	Sonnavannam Saitha Perumal	$12^0$49'30.39"N	$79^0$42'44.74"E
P12	Dharmalingeswarar	$12^0$49'21.91"N	$79^0$41'57.44"E
P13	Ekambareswarar	$12^0$50'49.88"N	$79^0$42'02.16"E
P14	Santhaleeswarar	$12^0$49'06.54"N	$79^0$42'48.52"E
P15	Vilakoli Perumal	$12^0$49'29.64"N	$79^0$42'20.13"E
P16	Kailasanathar Temple	$12^0$48'57.82"N	$79^0$40'58.01"E
P17	Thamarai Kulam	$12^0$49'37.33"N	$79^0$43'02.15"E

Table 2. Standard Tolerance Limit for Surface Water A, B,C,D,E

Parameters	Standard value				
	A	B	C	D	E
pH	6.5 to 8.5	6.5 to 8.5	6.5 to 8.5	6.5 to 8.5	6.0 to 8.5
Electrical conductivity (µmho/cm)	----	----	-----	----	2250
Dissolved Oxygen (mg/l)	6	5	4	4	----
Total Dissolved Solids (mg/l)	500	----	1500	----	2100
Total Hardness (mg/l)	----	----	----	----	----

Total Nitrogen (mg/l)	----	----	----	----	----
Total Phosphate (mg/l)	----	----	----	----	----
Total Coliform Count (MPN)	----	500	5000	----	----

5. Results and Discussion

Quality test of water is necessary before it is used for drinking, domestic, agricultural or industrial purposes. The selection of parameters for testing of water depends on what purpose, what extent we need its quality and purity. Water contains dissimilar kinds of floating, suspended and microbiological impurities. Physical test is for finding appearance, temperature, color, odour, etc [18], chemical tests conducted for its BOD, dissolved oxygen, hardness, Nitrogen, Phosphate etc. A biological test is used to find the living organism present in water [19]. The presence of TCC is not suitable for drinking, the water for other purposes based on the purity of water. The minimum, maximum, mean values of water quality parameters as shown in Table 3.

5.1 pH

The pH (Potential Hydrogen) of water is the logarithm of the reciprocal of the hydrogen ion action at a particular temperature. pH is a sign of the survival of biological life, as most of them thrive in a fairly narrow, critical pH range [20]. The variation in pH value of seven is mostly due to the hydrolysis of salts of strong bases and weak acids, or vice versa [21]. Dissolved gases like carbon dioxide and hydrogen sulphide affect the pH of water. A lower pH value will produce a sour taste, and an upper value greater than 8.5 a bitter taste. Higher values of pH cause the scale formation in water heating equipment, and a pH value below 6.5 causes corrosion in pipes [22]. The minimum (6.9) and maximum (9.3) values of pH in the year 2018, in the years 2019 and 2020, the pH values are safe limits according to BIS surface water standards. The maximum value is due to discharge of more wastage into the temple water and poojas performed in the pond water. The mean value of pH at all sample points in every year larger than 7, indicating that the water is alkaline in nature due to the presence of carbonates and bicarbonates of alkaline earth metals. The result predicted that Kanchipuram temple ponds are alkaline in nature. Figure 3. Shows the yearly variation of mean pH values.

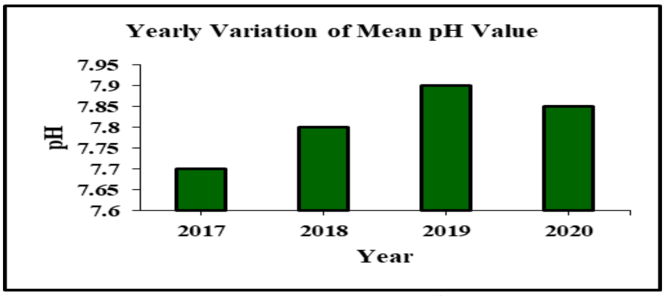

Figure 3. Yearly Variation of pH.

5.2 Electrical Conductivity

EC is a supportive tool to evaluate the purity of water. The variations in electric conductivity are due to fluctuations in total dissolved solids and salinity. The foundation of EC may be the excessive number of dissolved salts caused by irrigation, management, minerals from wastage and rainfall. [23]. The mean value of Electrical conductivity varies from 812 µmhos/cm to 1077 µmhos/cm. The electrical conductivity value increases every year. The increasing value of solid material shows the increasing EC value. The minimum value of the EC in 2018 was 135 µmhos/cm and the maximum value of EC in 2020 is 3012 µmhos/cm. The greater value shows more solid particles present in pond water is due to poojas performed and disposing of the waste. Figure 4. Shows the yearly variation of electrical conductivity.

Table 3. Minimum, Maximum, Mean Values of Water Quality Parameters

Water Quality Parameters	Year	Minimum	Maximum	Mean
pH	2017	7.3	9.1	7.7
	2018	6.9	9.3	7.8
	2019	7.3	8.9	7.9
	2020	7.2	8.7	7.85
EC (µmho/cm)	2017	203	2040	812
	2018	135	1853	867
	2019	360	2320	932
	2020	403	3012	1077
DO(mg/l)	2017	6.2	7.9	7.1
	2018	6.2	7.8	6.8
	2019	6.6	7.6	7.1
	2020	6.5	7.2	6.78
TDS(mg/l)	2017	132	1326	484
	2018	114	1204	565
	2019	212	1380	554
	2020	242	1782	636
TH(mg/l)	2017	116	387	223
	2018	83	316	169
	2019	81	342	201
	2020	97	428	243
TN(mg/l)	2017	2.4	13.7	6.4
	2018	8.7	13.8	11.3
	2019	6.9	22.3	14.2
	2020	5.3	26.5	11.76

TP(mg/l)	2017	2.6	11.8	7.8
	2018	4.7	8.6	6.9
	2019	3.5	17.3	10.1
	2020	3.8	14.3	8.56
TCC(MPN)	2017	500	2300	1039
	2018	700	2300	1559
	2019	400	2100	1217
	2020	450	2800	1550

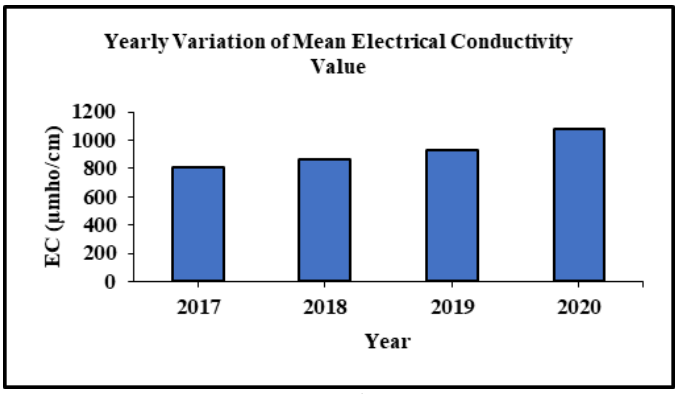

Figure 4. Yearly Variation of Electrical conductivity

5.3 Dissolved oxygen

The dissolved oxygen plays a significant role in the survival of aquatic life. The presence of dissolved oxygen is important to preserve the higher forms of natural life [24]. Estimating the value of dissolved oxygen is a key examination in water pollution and waste treatment evolution control. The permissible value of DO is 5mg/l as per the Indian standard. The dissolved oxygen range of 6.8 – 7.1 mg/l is allowed for pond eco system. Ponds have high DO due to the increased solubility of oxygen at a minor temperature. Dissolved oxygen higher than 5.00 mg/l helps the rapid growth of flora and fauna [25]. The minimum (6.2 mg/l) and maximum (7.2 mg/l) value of measured dissolved oxygen values in 2017 and 2018. The presence of DO in every year is safe for surface water. In Kanchipuram temple ponds, the DO value indicates the presence of a greater number of living organisms. Figure 5. shows the yearly variation of Dissolved oxygen.

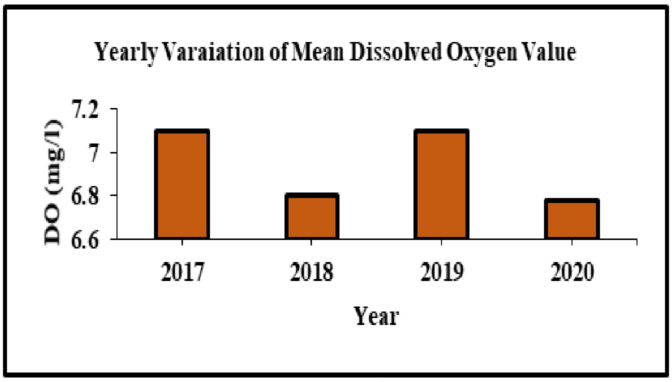

Figure 5. Yearly Variation of Dissolved oxygen

5.4 Total Dissolved Solids

The Total Dissolved Solids are the suspended and dissolved matter present in water. The TDS in water are composed of carbonates, bicarbonates, chlorides, phosphates and nitrates of calcium, magnesium etc, organic matter, salt and, other particles [26]. In the ambient environment, these proportioned compounds are creating a balanced solution. If any supplementary inputs of dissolved solids are added to the system, the balance is altered, and unfavourable effects may occur. Input components come from natural and anthropogenic sources. The high total dissolved solids content is due to the presence of high salt content. The higher concentration of total dissolved solids enriches the nutrient of the water bodies, which leads to eutrophication in the aquatic ecosystem. Total dissolved solids are due to improper surrounding sanitation and also to the disposal of waste around the temple tank [27]. The total dissolved solids in the year 2020 were the minimum (242 mg/l) and maximum (1782 mg/l). This maximum value is greater than BIS surface water standards. This greater value is due to more rain, the maximum number of solid particles disposed into the pond and disposal of pooja waste. In the years 2017, 2018, and 2019 the TDS values were within the standard limit. TDS ranged from 484 to 634 mg/l. Figure 6. Shows the yearly variation of Total dissolved solids.

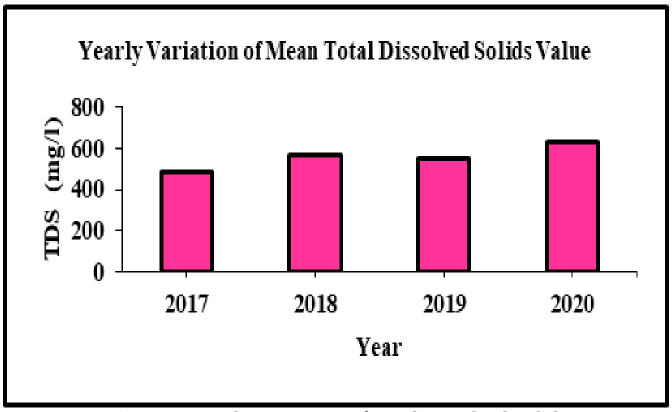

Figure 6. Yearly Variations of Total Dissolved Solids

5.5 Total Hardness

The hardness of water is an amount of its ability to form precipitates with soap and scales with certain anions existing in the water. Magnesium and Calcium play a crucial role in irritating the toxic effects of several ions in nullifying excess produced acid. In the river atmosphere, calcium serves as one of the important micronutrients in organisms [28]. Magnesium is commonly found to be related to calcium in all varieties of water. For chlorophyll growth, magnesium is needed. It acts as a limiting factor for the considerable growth of phytoplankton. The total hardness value ranged from 169 to 243 mg/l. The minimum (81 mg/l) and maximum (428 mg/l) value are within the limit. In BIS surface water standards, no limit is given for total hardness, the measured values are within 500 mg/l, hence the pond water is within a safe limit. The increase of TDS reflects the total hardness of both values, which will be greater in 2020. Figure 7. Shows the yearly variation of Total Hardness.

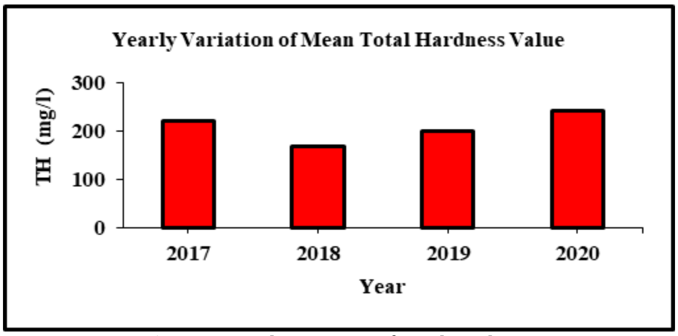

Figure 7. Yearly Variation of Total Hardness

5.6 Total Nitrogen

Nitrates generally occur in trace quantities in surface waters, but may attain high levels in some ground water [29]. The existence of nitrates in the water levels is evocative of some bacterial activities and growth [30]. The main root cause of spreading nitrate in the environment is agricultural releases and the decomposition of organic matter. The crucial incursion of water and resultant land drainage cause a drastic rise in nitrate in pond water. In the study period, the TN value varies from 6.4 to 11.8 mg/l. The total nitrogen value is continuously increasing every year. In BIS surface water, no standards are given for total nitrogen. The total nitrogen value greater in the year 2020. This greater value is due to the decomposition of nitrogen discharging material in the pond water. Figure 8. Shows the yearly variation of Total Nitrogen.

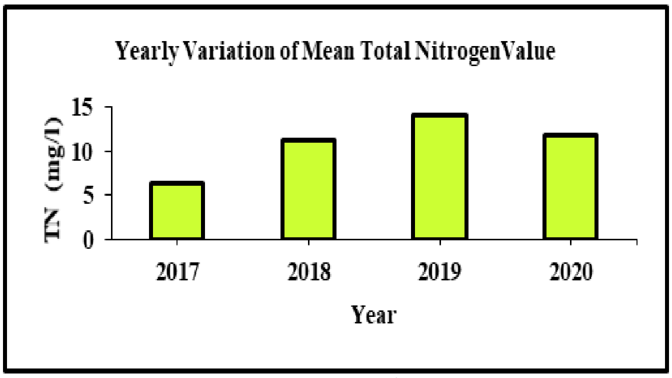

Figure 8. Yearly Variation of Total Nitrogen

5.7 Total Phosphate

Phosphorus is the limiting nutrient in the primary production of fresh water [31]. At present, many freshwaters experience influxes of nitrogen and phosphorus from outside sources. The increasing concentration of phosphorus allows plants to assimilate more nitrogen before the phosphorus is exhausted. If sufficient phosphorus is available, high concentrations of nitrates will lead to phytoplankton, and macrophyte (aquatic plant) production [32]. This is caused by the use of fertilizers. The maintenance of the fertility of the water group's needs significant phosphate nutrient. The minimum (2.6 mg/l) and maximum (17.3 mg/l). In the year 2018 the TN value was greater. The granulated phosphate value is not good for health. In the present study, the total phosphate ranges from 7.8 – 10.1 mg/l. The greater values of phosphate can be due to the speedy evaporation and mineralization of decomposed constituents in pond water. Figure 9. Shows the yearly variation of Total Phosphate.

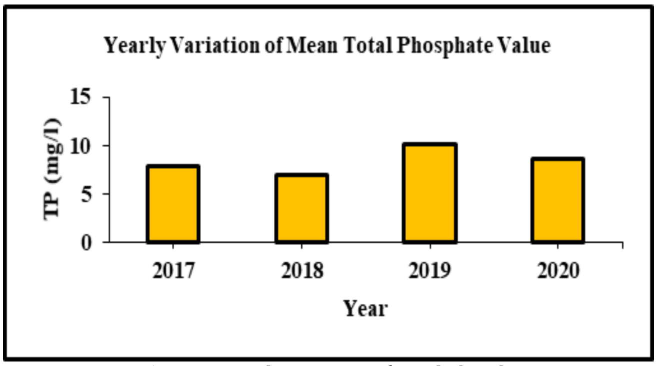

Figure 9. Yearly Variation of Total Phosphate

5.8 Total Coliform Count

A microbiological test is used to detect the level of pollution caused by living things. These tests are based on coliform bacteria as the indicator organism. The presence of these indicative organisms is evidence that the water has been polluted with faeces of humans or other warm-blooded animals [33]. The presence of coliforms produces pathogenic diseases in fishes. The minimum (400 MPN) in the year 2019, maximum (2800 MPN) in the year 2020. The TCC value varies from 1039MPN to 1559MPN, the presence of total coli form count is not suitable for drinking purposes. The coliform count is not suitable for bathing, it will create skin problems and un preferable health problems. This formation of total coliform count is due to decomposing of pooja waste and the disposal of cloths into the pond water. The measured values of TCC in all seventeen stations were below the permissible limit comparing to class C, D, E standards. Figure 10. Shows the yearly variation of mean total coliform count values.

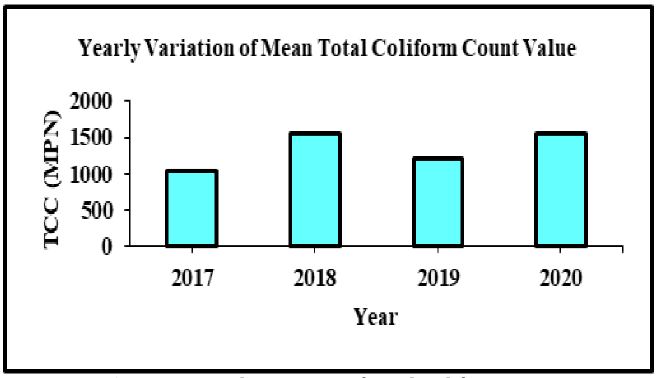

Figure 10. Yearly Variation of Total Coliform Count

5.9 Correlation analysis

The relationship among all the eight water quality parameters was determined with the help of thirty-six results for each water quality parameter obtained from the analysis of collected water samples from the river. Karl Pearson's correlation coefficient (r) was calculated by applying the mathematical formula describes below. The x and y are any two variables (water quality parameters in the current study) and n is the number of observations [34]. Then the correlation coefficient (r), among the variables x and y is given by the following relation:

The equation of correlation coefficient is given as the formula:

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2}} \quad (1)$$

Where, x (the values of the x variable) and y (the values of the y variable) represents two different water quality parameters.

n = number of data points, and all the summations are to be taken from 1 to n.

Correlation analysis determines the closeness of the connection between selected independent and dependent variables. The correlation coefficient (r) gives the degree of association between two variables. If the r value is closer to +1 or –1, it displays the probability of a positive and negative direct relationship between the variables. It represents the strong correlation between the parameters, when r is in the range of +0.8 to 1.0, –0.8 to – 1.0, and moderate correlation, when the r value is in the range of +0.5 to 0.8, –0.5 to –0.8, weak correlation, when r is in the range of +0.0 to 0.5, –0.0 to –0.5 very weak correlation between the parameters [35]. The correlation study was useful for analysing the relation between rain fall and crop production because it showed a high correlation between them [36]. Correlation coefficients among various water quality parameters in the years 2017, 2018, 2019, and 2020 are represented in Table 4, Table 5, Table 6, and Table 7 respectively.

Table 4. Correlation Coefficients Among Various Water Quality Parameters in the Year 2017

Correlations - 2017

	pH	EC	DO	TDS	TH	TN	TP	TCC
pH	1							
EC	.689	1						
DO	-.747	-.473	1					
TDS	.689	1.000	-.473	1				
TH	.087	.411	-.036	.411	1			
TN	-.055	-.010	.028	-.010	-.316	1		
TP	.665	.639	-.630	.639	.194	-.271	1	
TCC	-.076	.316	.150	.316	.308	.056	.186	1

Table 5. Correlation Coefficients Among Various Water Quality Parameters in the Year 2018

Correlations - 2018

	pH	EC	DO	TDS	TH	TN	TP	TCC
pH	1							
EC	.095	1						
DO	-.383	.397	1					
TDS	.090	1.000	.398	1				
TH	-.209	.753	.534	.752	1			
TN	.366	.673	.294	.677	.442	1		
TP	.371	.526	.224	.529	.449	.882	1	
TCC	.318	.340	-.207	.343	.061	.495	.439	1

Table 6. Correlation Coefficients Among Various Water Quality Parameters in the Year 2019

Correlations - 2019

	pH	EC	DO	TDS	TH	TN	TP	TCC
pH	1							
EC	.070	1						
DO	-.105	.591	1					
TDS	.070	1.000	.587	1				
TH	-.108	.869	.557	.869	1			
TN	.192	.454	.185	.455	.614	1		
TP	.315	.175	-.184	.178	.403	.789	1	
TCC	.051	.384	.197	.385	.365	.295	.380	1

Table 7. Correlation Coefficients Among Various Water Quality Parameters in the Year 2020

Correlations - 2020

	pH	EC	DO	TDS	TH	TN	TP	TCC
pH	1							
EC	.240	1						
DO	.382	.144	1					
TDS	.244	1.000	.150	1				
TH	.296	.831	.434	.833	1			
TN	.200	.660	.001	.661	.618	1		
TP	.358	.683	.161	.687	.680	.712	1	
TCC	.355	.420	.221	.422	.311	.309	.501	1

A correlation is a statistical connection used for the measurement of the strength and statistical significance of the relationship between two or more variables. Correlation analysis of various water quality parameters was carried out using computer software SPSS. This analysis provides indirect means for rapid monitoring of water quality. A highly positive correlation is observed between total dissolved solids and Electrical Conductivity (r = 1) in continuous measurements over four years. In the year 2017, there was a weak correlation between pH with EC (r = 0.689), TDS (r = 0.689), TP (r = 0.665), EC with TP (r = 0.639), TDS with TP (r = 0.639). In the year 2018, there was a moderate correlation between TN with TP (r = 0.882), a weak correlation between EC with TH (r = 0.753), TN (r = 0.673), TDS with TH (r = 0.752), and TN (r = 0.677). In the year 2019, there was a moderate correlation between EC with TH (r = 0.869), and TDS with TH (r = 0.869), a weak correlation between TH with TN (r = 0.614), and TN with TP (r = 0.789). In the year 2020, there will be a moderate correlation between EC with TH (r = 0.831), and TDS with TH (r = 0.833), and a weak correlation between EC with TN (r = 0.660), TP (r = 0.683), a weak correlation between TDS with TN (r = 0.661), TP (r = 0.687), a weak correlation between TH with TN (r = 0.618), TP (r = 0.680), and TN with TP (r = 0.712). These correlations suggested that electrical conductivity and total dissolved solids had a moderate correlation with total hardness in the years 2019 and 2020. Interrelationship studies between different variables are very helpful tools in promoting research and opening new frontiers of knowledge. The study of correlation reduces the range of uncertainty associated with decision making. This correlation calculation concluded that the correlation studies of the water quality parameters have great significance in the study of water resources. A higher level of DO in water increase the growth of aquatic organisms in that water. Mostly, a greater level of DO indicates good quality of water. Total coliform count in untreated domestic water causes the unhygienic nature of the water, lack of proper inspection and maintenance introduces these waterborne pathogens, thus making the water polluted and insecure for human consumption [37].

6. Conclusion

The present study was carried out in the temple pond water. The dissolved oxygen value helps with organism and plant growth. The pH value indicates that water has an alkaline nature. In the years 2017 (9.1) and 2018 (9.3) the pH value was greater than BIS surface water standards, and it shows the water is more basic in nature, it causes health effects when used for drinking and bathing so applying proper treatment before it can be used for various purposes. The total dissolved solids is greater in the year 2020 (1780 mg/l) and total hardness, total nitrogen has greater in the year 2020. The measured water quality parameters were mostly within the normal range as compared to the surface water quality standards. The presence of coliform count shows water is unfit for directly drinking purposes. The presence of TCC is not suitable for usage purposes, and it will create bad smell in the pond water. It affects the environment and life system. This presence of TCC is normal in all pond water, based on the type of coliform presence, it affects the quality less and greater value. it should be treated before it can be use. Decomposition of coliform by chlorination and purification process desalination, and addition of any purification material will treat the water in good quality. The presence of other parameters reflects pond water being good for fish culture, temple usage, and gardening. The correlation study found a greater correlation with the variations in the water quality parameters due to the inflow of urban runoff water with wastages. It acts as a reservoir for saving water during rain and is useful for increasing the ground water level to the adjacent area. This study reflects the surface water condition of Kanchipuram city. Monitoring the quality of pond water will protect the heritage structure and increase the ground water, which will be helpful for future generation.

Conflict of Interest
This work not having any conflict of interest.

Funding Source
This work was not supported by any agency.

Authors' Contributions
The author made the effort for the collection of samples, report generation, and calculation.

Acknowledgements
My gratefully thanks to my friends, project students for doing this project and preparing journal paper.

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