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Water Quality of Temple Ponds in Dindigul and Madurai District of Tamil Nadu

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Abstract

The present study deals with the water quality of temple ponds in Dindigul and Madurai district of Tamil Nadu. Ten temple pond water samples were collected from Dindigul and Madurai District. Tamil Nadu, India. Physico-chemical parameters such as pH, EC, color, total dissolved solids, dissolved oxygen, dissolved carbondioxide, total hardness, calcium, sodium, potassium, chloride, magnesium, BOD and COD were estimated. The total dissolved solids, dissolved oxygen and chloride were within the permissible limit of BIS standards. The other parameters such as EC, magnesium, sodium, calcium, BOD and COD were not within the permissible limit. The water quality index (WQI) was between 34.5 and 61.5. It is inferred from the results that the water from temple ponds are between moderate and slight in the rating scale.
Key words : Water quality, Temple ponds, Dindigul, Madurai.

In recent times temple ponds are disappeared because buildings are built around the ponds and which prevent the entry of water during rainy season. On the other hand, sewage water flows into the temple ponds, the devotees and public wash their clothes with detergents and thus pollutes the water and making it unfit for drinking and other purposes. A number of diseases like malaria, filarial, jaundice, gastro-enteritis and cholera are caused by contaminated water. Abdul Jammel (1) studied the quality of pond water in and around. Tiruchirapalli city and found that water contain high level of inorganic salts and total hardness with high electrical conductance. Though several authors (2—4) studied the quality of ground water the studies related to the quality of water from temple ponds in Dindigul and Madurai districts are totally wanting. Hence the present study was carried out.

Methods

Temple pond water samples were collected from 10 different places (Table 1) in Dindigul and Madurai districts Tamil Nadu, India in 10 liter polyethylene cans and transported to the laboratory. Immediately after transportation physico-chemical parameters such as pH, EC, color, total dissolved solids, dissolved oxygen, dissolved carbondioxide, chloride, total hardness, BOD, COD, magnesium, potassium, calcium and sodium were estimated (5). Water quality index was calculated following Harton (6) as modified by Tiwari and Mishra (7). In this method rating scales (in the form of step-wise function) were assigned to each water quality parameter considered and each parameter was weighed according to its relative significance to overall quality. These weights assigned to various water quality parameters considered here are given in Table 2. The weight ranges from 1 to 4. For example

Table 1. List of temple pond water samples taken for analysis.

	Name of the temple pond and Place
1	Kottai Mariamman Temple pond, Dindigul
2	Sownthiraraja Perumal Temple pond, Thadikombu
3	Arulmigu Mariamman Temple pond, Dindigul
4	Abirami Amman Temple pond, Dindigual
5	Pathrakaliyamman Temple pond, Dindigul
6	Srinivasa Perumal Temple pond, Dindigul
7	Arulmigu Meenakshiamman Temple pond, Madurai
8	Inmaiyilum Nanmaitharum Temple pond, Madurai
9	Arulmigu Koodalazhakar Temple pond, Madurai
10	Sri Madhana Gopalaswamy Temple pond, Madurai

Table 2. Parameters—Their water quality, BIS Standards and assigned weights (from literature).

	Parameters	BIS Standards Permissible	Excessive	Weights (w)	Unit weights (wi)
1	pH	7—8.5	6.5—9.2	4	0.24
2	EC	750	1500	2	0.12
3	TDS	500	2100	1	0.06
4	Total hardness	300	500	1	0.06
5	Chloride	200	1000	4	0.24
6	Calcium	75	175	1	0.06
7	Sodium	20	60	1	0.06
8	Potassium	5	20	1	0.06
9	Magnesium	30	150	2	0.12
10	BOD	<5	<5	3	0.18

pH and chloride are important parameters and hence 4 were assigned. The weights for the remaining parameters have been assigned according to their relative importance. The unit weight (wi) for the ith parameters (1 = 1.2..... 10) was calculated from the following equation.

$$Wi \frac{W}{10} \sum wi \quad 1 \qquad ....1$$

Which ensure that

$$\sum^{10} wi = 1 \; i = 1 \qquad ....2$$

The rating scale for the 10 water quality parameters considered here given in Table 3. Here the range of the values of each parameter has been divided into 5 intervals. The rating qi (varying from 0 to 100) corresponding to each range and extent of pollution, corresponding to various value ranges in descriptive terms are given in Table 2. These ranges have been fixed in such a way that a rating qi 100 implies that excessive value of BIS given in Table 2. Other ratings namely qi 25, 50 and 75 correspond to the values lying somewhere between the permissible and excessive values of BIS standards for drinking water. The Water Quality Index (WQI) is the aggregate of the multiplication of pi and wi of the ith parameters.

$$\text{i.e.} \quad \frac{WQI}{i=1} \quad 10 \sum piwi \qquad ....3$$

Based on WQI value quality status is assigned 75—100, the parameters are in "permissible" as shown in Table 3.

Results and Discussion

The various physico-chemical parameters of water samples taken from temple ponds in Dindigul and Madurai districts are presented in Table 4. The pH of the water samples are slightly alkaline in nature indicating the presence of weak basic salts. The electrical conductivity was high (3,500 m.mhos) in Sownthiraraja Perumal temple pond and it was due to high level of dissolved ionic substances. The electrical conductivity was low (2,600 m.mhos) in water taken from Kottai Mariamman temple pond. The quantity of total dissolved solids was low in all samples and are

Table 3. Rating scales for water quality parameters.

	Parameters	Range of values Extent of pollution Permissible	Slight	Moderate	Excessive	Severe
1	pH	7.0—8.5	8.6—8.8	8.8—8.9	9.0—9.2	>9.2
2	EC	0—750	750—900	901—1200	1201—1500	>1500
3	TDS	0—500	501—1000	1001—1500	1501—2100	>2100
4	Total Hardness	300—350	351—400	401—450	451—500	>500
5	Chloride	200—700	701—800	801—900	901—1000	>1000
6	Calcium	75—100	101—125	126—150	151—175	>175
7	Sodium	20—30	31—40	41—50	51—60	>60
8	Potassium	5—9	9—11	11—13	13—20	>20
9	Magnesium	0—30	31—60	60—90	90—120	>120
10	BOD	0.0—1.0	1.1—3.0	3.1—4.0	4.1—5.0	>5.0
	Rating	100	75	50	25	0

Table 4. Physico-chemical characteristics of different temple ponds. 1. Kottai Mariyamman Temple pond, Dindigul; 2. Sownthiraja Perumal Temple pond, Dindigul; 3. Mariyamman Temple pond, Dindigul; 4. Abiramiamman Temple pond, Dindigul; 5. Pathirakaliyamman Temple pond, Dindigul; 6. Srinivasa Perumal Temple pond, Dindigul; 7. Arulmigu Meenakshiamman Temple pond, Madurai; 8. Inmaiyilum Nanmaitharum Temple pond, Madurai; 9. Arulmigu Koodalazhagar Temple pond, Madurai; 10. Srimadhana Gopalaswamy Temple pond, Madurai.

	Parameters	Ponds 1	2	3	4	5	6	7	8	9	10
1	Color	Light green	Pale	Colour-less	Colour-less	Light green	Colour-less	Light green	Dark green	Colour-less	Colour-less
2	Temperature (C)	28.4	27.8	28.7	28.5	28.3	29.1	29.8	30	30	30
3	pH	7.50	7.84	7.73	7.71	7.43	7.84	7.75	7.40	7.85	7.64
4	EC (m.mhos)	2600	3500	3100	3000	2900	3100	3300	2800	2900	3300
5	TDS h	947	1043	983	891.1	843.7	810.6	1010	1200	910.7	947.31
6	Total hardness (m/l)	343	314	297	307.1	321.3	347.8	407	375.2	363.3	386.1
7	Dissolved oxygen ,,	1.94	2.07	1.98	1.72	1.81	2.02	0.97	0.98	1.75	2.01
8	Dissolved CO_2 ,,	127	109.4	129.2	140.9	101.1	97.3	87.4	91.8	47.3	72.3
9	Choloride ,,	274.3	251.8	212.2	198.5	257.0	317.0	417.8	357.9	210.5	267.9
10	BOD ,,	18.75	21.11	17.11	12.5	14.9	18.5	18.7	21.2	17.5	21.3
11	COD ,,	97.41	89.10	81.41	76.4	86.5	89.4	97.1	97.4	67.1	86.9
12	Calcium (ppm)	36.2	38.07	43.14	37.4	37.2	73.5	126	135.5	67.34	47.7
13	Sodium ,,	113.39	97.49	57.63	61.5	86.5	67.3	47.3	63.7	59.9	59.8
14	Potassium ,,	86.58	63.12	33.41	41.9	63.9	43.2	37.4	39.1	46.83	45.8
15	Magnessium ,,	181.02	161.3	119.1	177.0	112.5	125.3	120.5	146.3	152.1	126.2

well within the permissible limit of BIS. The dissolved oxygen content of different water samples ranged between 0.99 and 2.07 mg/liter. The dissolved carbondioxide ranged between 47.31 and 140.90 mg/liter. The chloride content ranged between 198.52 to 417.81 mg/liter. The total hardness of different temple ponds were within the permissible limit. The BOD and COD of all the samples were comparatively high but not within the level of drinking water standards laid by BIS. The potassium content varied between 33.41 and 86.58 mg/liter. The sodium content was higher (113.9) in Kottai Mariamman temple pond and lower (47.31) in Arulmigu Meenakshamman temple pond. The calcium content was also high (126 mg/liter) in Arulmigu Meenal shiamman temple pond and low (36.2 mg/liter) in Kottai Mariamman temple pond. The magnesium content of different water samples are high and are not within the permissible limit of BIS.

Table 5. Water quality index (WQI) of water collected from fen different temple ponds.

	Name of the pond	WQI
1	Kottai Mariyamman Temple pond, Dindigul	58.5
2	Sownthiraraja Perumal Temple pond, Thadikombu	57
3	Arulmigu Mariamman Temple pond, Dindigul	61.5
4	Abirami Amman Temple pond, Dindigul	34.5
5	Pathrakaliyamman Temple pond, Dindigul	58.5
6	Srinivasa Perumal Temple pond, Dindigul	58.5
7	Arulmigu Meenakshiamman Temple pond, Madurai	54
8	Inmaiyilum Nanmaitharum Temple pond, Madurai	55.5
9	Arulmigu Koodalazhakar Temple pond, Madurai	57
10	Sri Madhana Gopalaswamy Temple pond, Madurai	57

The water quality index (WQI) of water taken from ten different temple ponds in Dindigul and Madurai district was calculated and it is shown in Table 5. The results indicate that out of the ten parameters studied only four (pH, total dissolved solids, total hardness and chloride) were within the permissible limit of BIS standards in almost all the water samples. The WQI was between 34.5 and 61.5 which showed that the pollution level of these samples was between slightly and moderate in the rating scale. From the data analyzed it was found that among 10 samples analyzed in different areas of temple ponds in Dindigul and Madurai districts the temple ponds may be divided into moderately and slightly polluted on the basis of water quality index (WQI). Similar studies were reported on the water quality characteristics of temple ponds near Machalipatinum (8). Arun

Prasath (9) evaluated the physico-chemical and bacteriological quality of water from temple tanks in and around Madras city. Among the parameters analysed EC, sodium, potassium, magnesium, BOD and COD were found to be high in all samples and most of them are above the permissible limit and are responsible for water pollution of these temple ponds in Dindigul and Madurai districts and makes the water unsuitable for drinking purposes.

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