

## STUDIES ON PHYSICOCHEMICAL CHARACTERS OF FOUR PONDS IN TIRUNELVELI DISTRICT

**T. Selvamohan\* , G. Karthick, M. Ramya ,V. Sarojini ,V. Sedhu and G. Seetha**

\*Department of Zoology, Rani Anna Government College for Women, Tirunelveli, India.

**Email:** [tsmohan71@gmail.com](mailto:tsmohan71@gmail.com)

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### ABSTRACT

The paper reports the analysis of pond water, which is the source of human consumption. The pond water is contaminated with the domestic wastes, Agricultural wastes and municipal wastes. The collected pond water samples are analyzed for parameters, like Appearance and color, Turbidity , Total dissolved solids, Total hardness , Iron , Manganese, Fluoride, sulphate, phosphate ,Tidys, pH, Electrical conductivity, Nitrate, calcium, Chloride, Magnesium, sodium and potassium also analyzed.

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## INTRODUCTION

Water is very precious for every living organism on this earth. The available fresh water to man is hardly 0.3 to 0.5% of the total water available on the earth and therefore its judicious use is imperative. In today's scenario, unplanned urbanization, rapid indiscriminate use of artificial chemicals cause of heavy and varied pollution in aquatic environments leading to deterioration of water quality and depletion of aquatic fauna including fish. Discharge of urban, industrial and agricultural wastes have increased the quantum of various chemicals that enter the receiving water, which considerably alter their physicochemical characteristics (Deshmukh and Ambore, 2006; Patil *et al.*, 2009). Nutrients like phosphorus and nitrogen from the domestic wastes and fertilizers accelerate the process of eutrophication (Rao and Valsaraj, 1984; Jalizadeh *et al.*, 2009). The aquatic environment with its water quality is considered the main factor controlling the state of health and disease in both cultured and wild fishes (Osman, 2010). Ponds, as sources of water, are of fundamental importance to man. However, pond may have been a natural water sources exploited by man at different time to meet different needs or may have been created for a multitude of different purpose (Rajagopal *et al.*, 2010).

## MATERIALS AND METHODS

Samples for physical and chemical examinations were collected. Before collecting the sample, the bottles were rinsed well with the same water sample. Then they can were stopper tightly. Appearance and color, Turbidity, Total dissolved solids, Total hardness, Iron and Manganese, Fluoride, sulphate, phosphate and Tidys is calculated by the following method of APHA (1985).The method described by Rao (1993) was followed for the estimation of water pH,

Electrical conductivity, Nitrate, calcium, Chloride, Magnesium, sodium and potassium

### Free ammonia

Ammonia react with phenol and hypochloride at the high pH with sodium nitropruside as a catalyst and result in the formation of Indophenol, a blue coloured compound. The intensity of the colour was proportional to the ammonia concentration. The absorption of which was read at 640 nm spectrophotometrically.

### 2.15 Nitrite

The nitrite content of water sample was estimated by sulphanilamide (Spectrophotometric) method (APHA, 1985). 50 ml of sample was taken in a clean conical flask. To this, 1 ml of sulphanilamide solution was added. After 3 minutes, 1 ml of N-1 naphthyl ethylene diamine hydrochloride solution was added. The optical density of this mixture measured at 543 nm in a Spectrophotometer.

## RESULT & DISCUSSION

The Physico- chemical analysis of four water samples (ponds) were given in the following tables. The samples were analyzed in the Tamil nadu Water Analysis Department (TWAD), Tirunelveli. Appearance is the common physical factor to the fresh water system. In the most of the ponds (Table 1, 3 and 4) show the turbid appearance. Only the Palamadai pond shows the clear appearance. It is due to the environmental factor and agriculture effluent discharge. In naturally, the water has no colour. But the water express the colour of something present on it. On that, the Deivanayagaperi pond and Kidarakulam pond shows the brownish colour. It means, the water contain high amount dissolved solid as mud or the presence of the dead plant materials. In the Palamadai pond, water is colourless that means there is no dissolved particles and detrained plant materials. In the

Kidarakulam pond shows the high pH value of 7.33. The lowest pH value is found out in Kuruvankottai pond at pH 6.61. It shows the pH value is presence between 6.5 – 7.5. The similar findings were also reported by Jacklin Jenni and Regini Balasingh (2011). In their finding pH level is vary between 6.1 – 7.5.

Among the four ponds, the alkalinity level is high in the Kidarakulam pond as 190. The least value is find out in Deivanayagaperi pond as 8.5. Raj Narayana *et al.* (2007) reported that the alkalinity level is increase due to the conversion of the insoluble carbonates into soluble bicarbonates. Total hardness values ranged from 11 – 356 mg/L of which higher value of 356 mg/L at Kidarankulam pond, the minimum value (11 mg/L) is observed in Deivanayagaperi pond. Water becomes a conductor of electric current when substances are dissolved in it and the conductivity is proportion to the amount of dissolved substances (Bhaderia, 1998). Conductivity merely measures the concentration of substances in selection (Michael, 1986). The present study electric conductivity varied from  $1382 \pm 61$  to  $46 \pm 1.1$  uhmOS/cm. Turbidity was found maximum  $56.5 \pm 41.5$  in Kuruvankottai pond against the minimum pond of  $2.5 \pm 1$  in Palamadai pond. Calcium was found higher (68 mg/L) in Kidarankulam pond and lower (2 mg/L) in Deivanayagaperi pond.

Kavitha Shani and Geetha Yadhav (2012) reported that, calcium is found in greater abundance in all natural water and its main source is weathering of rocks from which it leach out. In the present study, magnesium high amount (44.5 mg/L) in Kidarakulam pond, and also least amount (1 mg/L) in Deivanayagaperi pond. Kiran (2010) reported that magnesium content lower than calcium ions in natural water. But due to the addition of animal waste and other waste into the water body increase the magnesium level.

The presence of sodium is high in Kidarakulam pond as 142 mg/L compared with other three ponds. The lowest value is recorded as 5.5 mg/L in Deivanayagaperi pond. The maximum value of potassium is present on the Kidarakulam pond as 14.5 mg/L. The minimum value is present on Deivanayagaperi pond as 0.5 mg/L. The potassium level is very low in the natural ponds compared with fish ponds. Iron level is ranged from 0.12 – 7.71 mg/L. The high amount is find out in Kidarakulam pond and the low amount found out in Palamadai pond. The free ammonia values are varied from 0.56 – 7.28. The high value is found in Kuruvankottai pond and least amount is found in Palamadai pond. Abdo (2005) reported that the amount of free ammonia level is increase due to the denitrification process. In that  $\text{NO}_2^-$  and  $\text{NO}_3^-$  is reduced to  $\text{NH}_3$ . It is expressed in the pond by high algal blooming to create the greenish colour appearance to the water. The amount of nitrite is very low in the all of the four ponds examined.

It is in trace amount as 0.03 – 0.05. The nitrate level is ranged between 0.5 – 2 mg/L in the four ponds. The high amount is observed in Kidarankulam pond. In the present study, the presence of chloride is maximum (290 mg/L) in Kidarakulam pond and minimum (6 mg/L) level in Deivanayagaperi pond. The reason of chloride is high amount of contamination with organic wastes (Kavitha Shani (2012). They also got the result in the range of 140 – 173 mg/L. Fluoride is the toxic substances to the human. It cause the various health problem to the human and animals. The Indian Government Standardize the fluoride level as 1.6 in the aquatic system. May our results also fulfill this level. In this, the Kidarakulam pond have the higher value of 1.2 mg/L fluoride. The lowest amount of fluoride is estimated in Deivanayagaperi

pond as 0.10. Sulphate in the four ponds is ranged from 6.5 – 87 ± 7 mg/L. The high (87 mg/L) is found in the Kidarakulam pond.

Phosphate level ranged between 0.13 – 30.58. The highest value is found in Kuruvankottai pond. Jacklin Jenni and Regini Balasingh (2011) found out the phosphate value have 6.0 mg/L indicates the presence of the pollution. The maximum 947.5 mg/L in Kidarakulam pond and the minimum of 32.5

± 7.5 mg/L value is found in Deivanayagaperi pond. The pH alkalinity in all the four ponds is nil. Manganese level is varied in 0 – 2.88 mg/L in the four ponds. In the Palamadai pond, the manganese is nil. The high amount of manganese 2.88 ± 0.88 in Kidarakulam pond. The manganese plays a main role in hardness of water. The results obtained as 6.32 – 28.64 mg/L. This results were indicates the level of organic content present in the pond waters.



**Table 1:** Physicochemical parameters recorded in Deivanayagaperi pond

Sl. No.	Parameters	Pond A
1	Appearance	Turbid
2	Colour (Pt.Co-Scale)	Sl. brownish
3	Turbidity NT units	35 ± 0
4	Total dissolved solids mg/L	32.5 ± 7.5
5	Electrical Conductivity Micro mho/cm	46 ± 11
6	pH	6.71 ± 0.09
7	pH Alkalinity as CaCO <sub>3</sub> mg/L	0 ± 0
8	Total alkalinity as CaCO <sub>3</sub> mg/L	8.5 ± 0.5
9	Toal Hardness as CaCO <sub>3</sub> mg/L	11 ± 2
10	Calcium as Ca mg/L	2 ± 1
11	Magnesium as Mg mg/L	1 ± 0
12	Sodium as Na mg/L	5.5 ± 1.5
13	Potassium as K mg/L	0.5 ± 0.5
14	Iron as Fe mg/L	6.47 ± 0.59
15	Manganese mg/L	2 ± 0.5
16	Free Ammonia as NH <sub>3</sub> mg/L	1.92 ± 0
17	Nitrite as NO <sub>2</sub> mg/L	0.04 ± 0.03
18	Nitrate as NO <sub>3</sub> mg/L	0.5 ± 0.5
19	Chloride as Cl mg/L	6 ± 2
20	Fluoride ass F mg/L	0 ± 0
21	Sulphate as SO <sub>4</sub> mg/L	6.5 ± 2.5
22	Phasphate as PO <sub>4</sub> mg/L	0.13 ± 0.11
23	Tidys Test 4 hrs as O <sub>2</sub> mg/L	14.56 ± 2

**Table 2:** Physicochemical parameters recorded in Palamadai pond

Sl. No.	Parameters	Pond B
1	Appearance	Clear
2	Colour (Pt.Co-Scale)	colour less
3	Turbidity NT units	2.5 ± 0.5
4	Total dissolved solids mg/L	215 ± 0
5	Electrical Conductivity Micro mho/cm	316 ± 0
6	pH	6.82 ± 0.09
7	pH Alkalinity as CaCO <sub>3</sub> mg/L	0 ± 0
8	Total alkalinity as CaCO <sub>3</sub> mg/L	94 ± 6
9	Toal Hardness as CaCO <sub>3</sub> mg/L	81 ± 1

10	Calcium as Ca mg/L	18 ± 0
11	Magnesium as Mg mg/L	9 ± 0
12	Sodium as Na mg/L	33 ± 3
13	Potassium as K mg/L	4 ± 0
14	Iron as Fe mg/L	0.12 ± 0
15	Manganese mg/L	0 ± 0
16	Free Ammonia as NH <sub>3</sub> mg/L	0.56 ± 0.08
17	Nitrite as NO <sub>2</sub> mg/L	0.03 ± 0.01
18	Nitrate as NO <sub>3</sub> mg/L	1 ± 0
19	Chloride as Cl mg/L	38 ± 2
20	Fluoride as F mg/L	0.25 ± 0.05
21	Sulphate as SO <sub>4</sub> mg/L	6.5 ± 0.5
22	Phosphate as PO <sub>4</sub> mg/L	0.15 ± 0.09
23	Tidys Test 4 hrs as O <sub>2</sub> mg/L	6.32 ± 2

**Table 3:** Physicochemical parameters recorded in Kidarakulam pond

Sl. No.	Parameters	Pond C
1	Appearance	Turbid
2	Colour (Pt.Co-Scale)	Sl. brownish
3	Turbidity NT units	41 ± 3
4	Total dissolved solids mg/L	947.5 ± 48.5
5	Electrical Conductivity Micro mho/cm	1382 ± 61
6	pH	7.33 ± 0.02
7	pH Alkalinity as CaCO <sub>3</sub> mg/L	0 ± 0
8	Total alkalinity as CaCO <sub>3</sub> mg/L	190 ± 42
9	Toal Hardness as CaCO <sub>3</sub> mg/L	356 ± 36
10	Calcium as Ca mg/L	68 ± 6
11	Magnesium as Mg mg/L	44.5 ± 5.5
12	Sodium as Na mg/L	142.5 ± 7.5
13	Potassium as K mg/L	14.5 ± 0.5
14	Iron as Fe mg/L	7.71 ± 1.12
15	Manganese mg/L	2.88 ± 0.88
16	Free Ammonia as NH <sub>3</sub> mg/L	3.2 ± 1.6
17	Nitrite as NO <sub>2</sub> mg/L	0.05 ± 0.05
18	Nitrate as NO <sub>3</sub> mg/L	2 ± 2
19	Chloride as Cl mg/L	290 ± 30

20	Fluoride ass F mg/L	1.2 ± 0
21	Sulphate as SO <sub>4</sub> mg/L	87 ± 7
22	Phosphate as PO <sub>4</sub> mg/L	0.23 ± 0.04
23	Tidys Test 4 hrs as O <sub>2</sub> mg/L	23.85 ± 7.45

**Table 4:** Physicochemical parameters recorded in Kuruvankottai pond

Sl. No.	Parameters	Pond D
1	Appearance	Turbid
2	Colour (Pt.Co-Scale)	Sl. greenish
3	Turbidity NT units	56.5 ± 41.5
4	Total dissolved solids mg/L	344.5 ± 27.5
5	Electrical Conductivity Micro mho/cm	506.5 ± 40.5
6	pH	6.6 ± 0.1
7	pH Alkalinity as CaCO <sub>3</sub> mg/L	0 ± 0
8	Total alkalinity as CaCO <sub>3</sub> mg/L	121 ± 3
9	Toal Hardness as CaCO <sub>3</sub> mg/L	134 ± 14
10	Calcium as Ca mg/L	24 ± 10
11	Magnesium as Mg mg/L	18 ± 3
12	Sodium as Na mg/L	50 ± 5
13	Potassium as K mg/L	4.5 ± 0.5
14	Iron as Fe mg/L	2.94 ± 0.59
15	Manganese mg/L	0.44 ± 0.06
16	Free Ammonia as NH <sub>3</sub> mg/L	7.28 ± 0.72
17	Nitrite as NO <sub>2</sub> mg/L	0.04 ± 0.04
18	Nitrate as NO <sub>3</sub> mg/L	0.5 ± 0.5
19	Chloride as Cl mg/L	61 ± 5
20	Fluoride ass F mg/L	0.3 ± 0.1
21	Sulphate as SO <sub>4</sub> mg/L	30.58 ± 30.43
22	Phosphate as PO <sub>4</sub> mg/L	1.62 ± 1.62
23	Tidys Test 4 hrs as O <sub>2</sub> mg/L	28.64 ± 15.84

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