

Seasonal variations in physico-chemical characteristics of Ravivar Peth Lake at Ambajogai District. Beed Marathwada Region, India.

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ABSTRACT:

The present study deals with the assessment of water quality of the Ravivar Peth Lake, Dist. Beed Marathwada Region, India. The physico-chemical characteristics were studied and analyzed during January – December of the year 2004. Seasonal variations at three different sampling sites of the Ravivar Peth Lake were observed. Conductivity, pH, Total Dissolved Solids (TDS), Total Suspended Solids (TSS), Nitrate, Sulphate and Phosphate were studied at these studies. The results revealed that the condition of this lake in different seasons showed fluctuations in physico-chemical parameters and showed pollution status of this lake.

Keywords:

Physico-chemical parameters, seasonal variations, Ravivar Peth Lake.

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Article Citation:

Raut KS, Shinde SE, Pathan TS and Sonawane DL.

Seasonal variations in physico-chemical characteristics of Ravivar Peth Lake at Ambajogai Dist. Beed Marathwada Region, India.

Journal of research in Biology (2011) 4: 258-262

Web Address:

[http://jresearchbiology.com/
Documents/RA0060.pdf](http://jresearchbiology.com/Documents/RA0060.pdf)

Dates:

Received: 13 Jul 2011 / **Accepted:** 21 Jul 2011 / **Published:** 16 Aug 2011

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INTRODUCTION

The life is linked with the quality of environment, hence the biological components of freshwater depends solely on physicochemical conditions. Analysis of physico-chemical parameters of water is essential. The changes in the physico-chemical characteristics adversely affect the living things in an environment. These water bodies pose different problems, pollution being the main and it has been rendered unfit for use and toxic for flora and fauna of the lake. Water bodies situated in the urban areas are under the pressure of various human activities such as cloth washing, bathing, and dyeing of cloths.

The quality of surface water including lakes and rivers depends on its physical, chemical and biological properties. The physicochemical properties give limited picture of water quality at particular point of view, while the living organisms act as continuous monitors of water quality over a period of time. Water quality analysis is important to preserve and protect the natural ecosystem. Analysis of physico-chemical parameters of water is essential, to assess the quality of water for the best usage like irrigation, drinking, bathing, fishing, industrial processing and so on. Water quality deals with the physical, chemical and biological characteristics in relation to all other hydrological properties. (Shinde et al, 2010).

Keeping this view in mind present study has been undertaken to assess seasonal mean values and seasonal standard deviation of different parameters in Ravivar Peth Lake Dam.

In India some hydrobiological work on historic water bodies have been done (Dhere and Gaikwad, 2006; Sharma et al, 2007; Pejaver and Gurav, 2008; Ingole et al, 2009; and Shinde et al, 2010). This essential resource is increasingly scarce in many parts of the world due to severe impairment of water quality. The increasing anthropogenic influences in recent years in and around aquatic systems and their catchments areas have contributed to a large extent to deterioration of water quality and declining of water bodies leading to their accelerated eutrophication.

MATERIALS AND METHODS

The water samples for physico-chemical analysis were collected from Ravivar Peth Lake, geographical coordination 18° 45' N and 76° 10' E Aurangabad, (M.S) India, at 3 different sites viz., Station A (Gaothana Site), Station B (Domestic Site) and station C (Temple Site) in the early

morning between 8 am to 11 am in the first week of every month from January - December 2004. The samples were collected in acid washed five liter plastic container from a depth of 5-10 cms below the surface of water. The samples were analyzed immediately in the laboratory

The physico-chemical characteristics of the Lake water like Conductivity, pH, Total Dissolved Solids (TDS), Total Suspended Solids (TSS), nitrate, sulphate and phosphate were determined in monthly variation according to standard methods (APHA, 2005 and Trivedy and Goel, 1984).

RESULTS AND DISCUSSION

The monthly physico-chemical parameters data of Ravivar Peth Lake at Ambajogai Dist. Beed Marathwada Region India have been presented were given below.

PHYSICO-CHEMICAL CHARACTERISTIC

Conductivity

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.

The electric conductivity ranged from 897.6 to 493.9 $\mu\text{mhos/cm}$. Electric conductivity was maximum during summer $1680.43 \pm 380.80 \mu\text{mhos/cm}$ and minimum during winter $1072.62 \pm 104.49 \mu\text{mhos/cm}$. The overall mean was $1446.07 \pm 489.42 \mu\text{mhos/cm}$ (Table 1). Electric conductivity increases with increase in total dissolved solids.

The seasonal variation in the conductivity may be due to the increase in concentration of salts because of discharge of domestic effluents and organic matter from the nearby residential areas into the Lake. High level of conductivity reflects the pollution status as well as trophic levels of the aquatic body (Anitha, 2002). In the present investigation, the maximum conductivity was recorded in summer season and minimum during winter. Chandrashekhar and Kodarkar, (1996) reported similar observations in Saroornagar Lake, Hyderabad.

pH

pH values are expressed as the negative logarithm of hydrogen ion concentration. For acidic water, pH varies for 0 to 7 and for alkaline water pH varies from 7-14. It determines the solubility of chemical nature of most of substances. Medium values are favorable for biological production.

The pH values ranged from 6.82 to 9.5. The



maximum pH was recorded in summer 8.54 ± 0.61 and minimum was in winter 7.51 ± 0.45 with slight increase in monsoon 8.05 ± 0.38 . The overall mean was 8.03 ± 0.64 (Table 1).

In the present investigation, the maximum pH was recorded in summer may be due to decreased volume of water by evaporation and monsoon and minimum in winter season may be due to short day length and decrease in photosynthetic activity. Salve and Hiware, (2006) reported the maximum pH in summer and minimum in winter with slight increase in monsoon.

Yeole and Patil, (2005) reported the pH values in the range of 7.0 to 9.5 in Yedashi Lake. Bai, (1989) recorded the pH of polluted water in the range of 8.0 to 9.0. Pawar and Pulle, (2005) observed the pH in range of 7.0 to 8.7 and stated that the pH of water is important for the biotic communities because most of the plant and animal species can survive in narrow range of pH from slightly acidic to slightly alkaline condition.

Total Dissolved Solids (TDS)

These are composed of inorganic salts like calcium, magnesium, potassium, sodium, bicarbonates, chlorides, sulfates and some heavy metal compounds; besides organic matter in small quantity also contributes the amount of total dissolved solids in water.

Total dissolve solids were ranged for 493.4 to 942.3 mg/l. Total Dissolve Solids were maximum during monsoon 840.3 ± 77.55 mg/l and were minimum during winter 564.93 ± 59.10 mg/l. The overall mean Total Dissolve Solids were 700.86 ± 128.31 mg/l (Table 1).

In the present investigation the higher values of TDS in monsoon may be due to surface runoff, precipitation and decaying matter from catchments area. Salve and Hiware, (2006) reported seasonal analysis and stated that low total dissolved solids recorded in winter season while maximum value in monsoon due to addition of solids from surface runoff in Wanparakalpa reservoir, Nagapur near Parali Vaijanath Dist. Beed, Maharashtra.

Total Suspended Solids (TSS)

Total suspended solids are the cause of suspended particles into the water body influences turbidity and transparency.

Total suspended solids were ranged from 35.1 to 182.3 mg/l. Total suspended solids were maximum during monsoon 146.3 ± 20.87 mg/l and were minimum during winter 70.01 ± 22.23 mg/l. The overall mean Total suspended solids were 99.79 ± 40.08 mg/l (Table 1).

In the present investigation, the high values of total suspended solids during monsoon may be due to siltation, deterioration and heavy precipitation. Khabade et al, (2002) recorded maximum TDS during monsoon and minimum during winter and summer at Lodhe water reservoir, Tasgaon. Khanna and Bhutiani, (2003) reported maximum TDS in monsoon, moderate in summer and minimum in winter, which supports the findings of present observations under study.

Nitrate

Nitrogen is less soluble in water than oxygen. But as it constitutes 78% of atmosphere, it still accounts for 65% of the dissolved gases at equilibrium. Nitrogen is important as it is a necessary element in the structure of protein,

Table-1. Seasonal variations in physico-chemical parameters of Ravivar Peth Lake, Dist. Beed Marathwada Region, India. (During January - December 2004).

Parameter	Range	Summer	Monsoon	Winter	Average
Conductivity ($\mu\text{mhos/cm}$)	897.6 to 493.9	1680.43 ± 380.80	1585.18 ± 610.8	1072.62 ± 104.49	1446.07 ± 489.42
pH	6.82 to 9.5	8.54 ± 0.61	8.05 ± 0.38	7.51 ± 0.45	8.03 ± 0.64
Total dissolve solids (mg/l)	493.4 to 942.3	697.35 ± 38.71	840.3 ± 77.55	564.93 ± 59.10	700.86 ± 128.31
Total suspended solids (mg/l)	35.1 to 182.3	83.04 ± 23.40	146.3 ± 20.87	70.01 ± 22.23	99.79 ± 40.08
Nitrate (mg/l)	8.3 to 21.9	15.28 ± 4.60	12.17 ± 4.50	18.73 ± 3.31	15.39 ± 4.88
Sulphate (mg/l)	20 to 41.71	29.17 ± 7.72	36.56 ± 3.22	30.11 ± 4.51	31.95 ± 6.28
Phosphate (mg/l)	0.23 to 0.887	0.43 ± 0.16	0.77 ± 0.08	0.38 ± 0.13	0.53 ± 0.21

chlorophyll, RNA and DNA etc. It is essentially required by all living organisms, being a necessary element of biochemical substances.

The nitrate ranged from 8.3 to 21.9 mg/l. Nitrate values were maximum during winter 18.73 ± 3.31 mg/l and minimum during monsoon 12.17 ± 4.50 mg/l. The overall mean was 15.39 ± 4.88 mg/l (Table 1).

Johnson and Kauser, (2004) stated that nitrate in piped municipal water remained constant in summer and monsoon 0.2 mg/l. but increased in winter to 0.9 mg/l. High values of nitrates in winter may be due to high rain fall observed during winter season 665 mm in October 2004 and 902 mm in October 2004 and 2005. The increased Nitrate value due to Lake Runoff, land drainage and input of fertilizers from adjacent and agricultural fields and oxidation of ammonia similar results have been reported by Anbazhagan, (1988).

Sulphate

The most abundant form of sulphur is anion sulphate (SO_4^{-2}). Sulphate is ecologically important for the growth of plants and its short supply may inhibit the development of planktons. Sulphur is also important in protein metabolism.

Sulphate ranged from 20 to 41.71 mg/l. The higher values of sulphate were recorded in monsoon 36.56 ± 3.22 mg/l and lower in summer 29.17 ± 7.72 mg/l. The overall mean was 31.95 ± 6.28 mg/l (Table 1).

In the present investigation, the Sulphate values were maximum during monsoon and minimum during winter. Maximum Sulphate concentration during monsoon may be due to the dilution and utilization of Sulphate by aquatic plants. However, the low Sulphate concentration was noted during winter may be due to biodegradation and low water level. Similar results have been reported by Reddy et al, (2009); Telkhade et al, (2008).

Phosphate

In water bodies phosphate occurs both in its inorganic and organic forms as organic phosphorous and orthophosphate, Phosphate plays a dynamic role by acting as the limiting nutrient presence of phosphate in water and waste water analysis has a great significance.

Phosphate concentration ranged from 0.23 to 0.88 mg/l. The phosphate values were maximum during monsoon 0.77 ± 0.08 mg/l and minimum during winter 0.38 ± 0.13 mg/l. The overall mean was 0.53 ± 0.21 mg/l (Table 1). Maximum during monsoon might be due to the washing activities,

there is an entry of detergents in the water body and less water quantity and during summer season the relatively low level of Phosphate have been reported which may be attributed to abundance of Phytoplankton's.

Saikh and Yeragi, (2004) have reported that, increase in phosphate is a result sewage contamination record. Urban water bodies subjected to pollution from domestic sewage exhibit high levels of phosphate and show all the signs of eutrophication Adarsh et al, (2006).

CONCLUSION

The present study show detailed physico-chemical characteristics and quality of water in Ravivar Peth Lake, Dist. Beed Marathwada Region, India.

The summer, monsoon and winter seasons shows different seasonal fluctuations in various physico-chemical parameters.

Data indicated that among the physico-chemical parameters of the lake water, the level of Conductivity, pH, TDS, TSS, nitrate and sulphate were above the permissible limits prescribed by ISI and WHO for drinking water. So the lake water is not suitable for drinking purpose.

It is being polluted by different sources like, municipal wastes, agricultural wastes, domestic wastes etc.

The continuous biomonitoring of Ravivar Peth Lake is needed as it affects the flora and fauna of the lake.

It can be concluded that physico-chemical parameters are important to determine the quality of aquatic environment.

ACKNOWLEDGMENT

The authors are thankful to Head, Dept of Zoology, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad India for providing laboratory and library Facilities and also thankful to principal, Dr. R. J. Parlikar madam for kind assistance and all society members of Late L. D. Shikshan Prasarak Mandal; Parli Vaijnath Dist. Beed.

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