

Analysis of physico-chemical parameters of Lal Nala Dam of Samudrapur Tehsil.

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ABSTRACT

This paper presents physico-chemical status of water of a fresh water reservoir Lal Nala situated in Samudrapur tehsil of Wardha district. Seasonal variations in different physico-chemical parameters were studied for one year from Feb. 2016 to Jan. 2017 and the reservoir water quality was analyzed. Water samples were collected from three different sites of reservoir for analysis. The parameters studied during one year span are atmospheric temperature, water temperature, pH, turbidity, transparency, conductivity, total dissolved solids, dissolved oxygen, free carbon dioxide, total hardness, total alkalinity, nitrate, chloride, sulphate, biological oxygen demand and chemical oxygen demand. Evaluation of physicochemical parameters was carried out to assess the quality of water and each parameter was compared with standard desirable limits which are set by different agencies. The results revealed that the condition of reservoir water is satisfactory for human use.

Keywords: Physico-chemical Parameters, Lal Nala dam, Monthly Variations, Samudrapur tehsil.

INTRODUCTION

Water is one of the essential requirement for sustaining the life activities of all ecosystems. Fresh water is essential for drinking, domestic use, fisheries, agricultural and industrial uses.

These kind of use can lead to deterioration in water quality and quantity that impact not only the aquatic ecosystem but also the availability of water for human needs. All life on earth depends on good water quality. The Environmental pollution ultimately contaminates water of rivers, lakes and dams. The causes of water pollution are the discharge of domestic and industrial wastes into different sources of water like rivers, ponds, lakes and dams. Assessment of water quality is important task to preserve the water body and also to know the pollution status. The increasing population needs safe and clean water. So the water bodies in use therefore demands protection for safe and good quality water, as the only medium where aquatic communities reside.

Reservoirs are the huge source of water especially in summer days. It becomes necessary to conserve and maintain these water resources for future generations. Various Physico-chemical parameters like atmospheric temperature, water temperature, pH, turbidity, transparency, conductivity, total dissolved solids, dissolved oxygen, free carbon dioxide, total hardness, total alkalinity, nitrate, chloride, iron, sulphate, biological oxygen demand, chemical oxygen demand are more important in determining the potability of water.

Studies on water quality are done by various researchers in India [1-16]. After going through literature survey it was found that no work was done on Lal nala dam of Samudrapur tehsil. So as previously no work was done on this water body the present work was undertaken to investigate the physico-chemical parameters for a year span.

METHODOLOGY

Lal Nala dam is located in Samudrapur tehsil of Wardha district. It was constructed by Maharashtra government as a part of Irrigation project in 2006. Its height is 13.9 m. and length is 3450 m. with maximum storage capacity is 28.1 MCM. Lal Nala Dam is earth fill Dam. The Dam has 5 Radial Type of spillway gates. It has catchment area of 10.774 thousand hectares. In, rainy season Lal Nala dam is popular,

tourist spot for local people due to its scenic beauty and good biodiversity of birds.

The analyses of Physico-Chemical parameters for checking water quality from three different sites of dam is done every month at 8 to 10 am.in the morning. Monthly analysis of Physico-Chemical parameters was estimated at one year span from Feb. 2016 to Jan. 2017. Atmospheric temperature, water temperature, pH, were estimated in sampling sites itself and other parameters like transparency, conductivity, turbidity, total dissolved solids, dissolved oxygen, free carbon dioxide, total hardness, total alkalinity, nitrate, chloride, Iron, sulphate, biological oxygen demand, chemical oxygen demand were examined in the laboratory by using standard Methods [17].

RESULTS AND DISCUSSION

The variations of various physico-chemical parameters of lake water are shown in Table 1. Temperature of water and air was maximum in summer and minimum in the winter season. Organisms in water have varying sensitivities to temperature. The water Temperature was constantly lower than atmospheric temperature. The maximum atmospheric temperature was recorded 40.26 ± 2.32 °c during summer and minimum Value was recorded 24.77 ± 1.83 °c during winter. In monsoon the temperature was 35.26 ± 5.69 °c. Water temperature was 34.20 ± 3.87 °c in summer, 24.77 ± 1.83 °c in winter season. Higher temperature in summer is due to low water level, high solar radiation and clear atmosphere and lower temperature recorded in winter may be due to high water level, less solar radiation, and low atmospheric temperature [12,15].

pH is a distinct water parameter. PH range was found between 0 to 14. The maximum pH was recorded (7.29 ± 0.18) in summer season and minimum (7.12 ± 0.21) in monsoon season.

The maximum turbidity was recorded 1.58 ± 0.18 in Monsoon and minimum in (0.66 ± 0.21) summer season.

Tabel 1: Physico chemical parameters of Lal Nala Dam

Sr.No.	Parameters	Seasons		
		Summer	Monsoon	Winter
1	Atmospheric Temp	40.26 ± 2.32	35.26 ± 5.69	24.77 ± 1.83
2	Water Temp	34.20 ± 3.87	32.32 ± 5.34	21.78 ± 2.19
3	pH	7.29 ± 0.18	7.12 ± 0.21	7.27 ± 0.12
4	Turbidity	0.66 ± 0.21	1.58 ± 0.18	1.12 ± 0.16
5	Transparency	54.07 ± 6.35	15.02 ± 2.82	37.18 ± 0.51
6	Conductivity	138.4 ± 10.18	137.5 ± 9.63	130.5 ± 2.11
7	TDS	142.5 ± 3.78	160.5 ± 6.01	146.5 ± 9.69
8	DO	5.85 ± 0.46	6.60 ± 0.29	7.47 ± 0.26
9	CO ₂	1.77 ± 0.13	1.29 ± 0.14	1.07 ± 0.16
10	Total Hardness	93.16 ± 8.94	82.88 ± 19.00	39.64 ± 17.42
11	Total Alkalinity	82.75 ± 6.02	42.42 ± 23.48	65.58 ± 12.93
12	Nitrate	0.04 ± 0.04	0.05 ± 0.05	0.006 ± 0.005
13	Chloride	16.55 ± 2.82	9.11 ± 0.55	13.99 ± 2.43
14	Sulphate	0.80 ± 0.23	0.79 ± 0.18	0.42 ± 0.04
15	BOD	3.63 ± 0.95	1.73 ± 0.53	2.41 ± 0.58
16	COD	7.87 ± 0.98	4.26 ± 1.64	7.66 ± 0.16

The transparency of water is mainly affected by factors such as biological productivity, suspended particles and water colour. Water body indicates high transparency values in summer season and low transparency values in monsoon season. The transparency in Lal Nala reservoir ranged maximum in summer (54.07 ± 6.35) and low value during monsoon season (15.02 ± 2.82). The transparency was recorded in cm.

Electrical conductivity was maximum in summer 138.4 ± 10.18 µmhos/cm and minimum in winter 130.5 ± 2.11 µmhos/cm.

TDS was maximum during monsoon 160.5 ± 6.01 mg/l. and minimum in summer 142.5 ± 3.78 mg/l. The dissolved oxygen value depends on density of phytoplanktons, salinity, and temperature. All living things on earth need oxygen to survive. The maximum dissolved oxygen 7.47 ± 0.26 mg/l. was recorded during the winter season of the year and minimum in summer season 5.85 ± 0.46 mg/l.

Carbon dioxide needs for respiratory activity of living things. The maximum concentration CO₂ 1.77 ± 0.136 mg/lit was recorded during the summer season and minimum in winter season 1.07 ± 0.16 mg/lit.

Total Hardness is one of the properties of water which prevents the foam formation using soap. Maximum in summer with 93.16 ± 8.94 mg/l and minimum in 39.64 ± 17.42 mg/l.

Present investigation show the higher value 82.75 ± 6.02 mg/l summer season and lower in monsoon season 42.42 ± 23.48 mg/l.

Nitrate is produced from oxidation of nitrogen gas by bacteria, blue green algae and leguminous plants which hold the protein. In water body the normal concentration in industrial area is up to 5 mg/l. seasonally it maximum in monsoon 0.05 ± 0.05 mg/l and minimum in winter 0.006 ± 0.005 mg/l.

Chloride is maximum in 16.55 ± 2.82 mg/l summer, minimum in monsoon 9.11 ± 0.55 mg/l. Chloride plays an important role in metabolic activities.

Sulphate is a combination of sulfur and oxygen. Presence of high level of sulphates indicates the pollution status from organic matter. It fluctuate in between maximum 0.80 ± 0.23 mg/l and minimum 0.42 ± 0.04 mg/l in summer season and winter respectively. BOD is one of the important parameter

which indicates the status of water pollution. BOD is an indicator of the pollution. In summer season BOD is higher 3.63 ± 0.95 mg/l than monsoon 1.73 ± 0.53 mg/l and winter 2.41 ± 0.58 mg/l. similar findings were reported [4,10,11].

COD measures the overall level of organic contamination of reservoirs. Maximum COD estimated in summer with 7.87 ± 0.98 mg/l and minimum in 1.66 ± 0.16 mg/l. After comparison of all parameters with various standard limits they are found in limits. Our findings are supported by Works of researchers [4,8,9].

CONCLUSION

The analysis of physico-chemical parameters of Lal Nala Dam reveal that all parameters are in permissible range. The concentration of parameters was lower than the maximum permissible limits of ISI and WHO standards when comparisons were made. Water temperature was lower than atmospheric temperature in summer, monsoon and winter season also. The pH values are slightly neutral and within a permissible limits in three seasons. Turbidity and transparency are in negative correlation such as turbidity maximum in monsoon and transparency minimum in monsoon. Total hardness and alkalinity are maximum in summer season. Dissolve oxygen in desirable limits of WHO, so it shows good quality of water. BOD and COD are within limits, set by WHO, so pollution is not there.

All parameters such as Atmospheric temperature, water temperature, pH, Turbidity, Transparency, Conductivity, Total Dissolved Solids, Dissolved Oxygen, Free Carbon Dioxide, Total Hardness, Total Alkalinity, Nitrate, Chloride, Sulphate, Biological Oxygen Demand, Chemical Oxygen Demand were found in within limits and below the permissible limits of pollution. Lal Nala reservoir is oligotrophic in nature with no evident trace of pollution as per our studies.

Conflicts of interest: The authors stated that no conflicts of interest.

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