

Study of Physicochemical Parameters of Belgaon Freshwater Reservoir of Aasthi Tahsil, Beed District. (MS). India.

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Abstract : The study was administered throughout the year 2016 to 2017 and 2017 to 2018 to analyze the monthly physico-chemical parameters includes Air temperature, water temperature, transparency, pH, free CO₂, total hardness, Alkalinity, chlorides and dissolved oxygen. The present study deals with the physico-chemical investigation of Belgaon freshwater reservoir. The water is used for irrigation of the nearby agriculture fields. The results showed that each one the parameters are within the permissible limit and monthly variation was detected during the study period. The monthly analysis over the period of two years suggests that the water of Belgaon Reservoir is suitable for agriculture, drinking, fish culture, and domestic uses.

Keywords: Physico-chemical parameters, freshwater, reservoir, Belgaon.

I. INTRODUCTION

Ever since the pre-historic times man has been intimately associated with water¹. Water is a basic and primary need of all vital processes and it is now well established that the life first arose in aquatic environment². The physicochemical analysis is that the prime thought to assess the standard of water for its best utilization like drinking, irrigation, fisheries, and industrial purpose and useful in understanding the complicated processes, an interaction between the environmental condition and biological processes within the water³. The freshwater comes on the land by hydrological cycling process. It is consumable, useful, healthy and clean water for the organisms living on the land. The entire life of the organisms on the land, their evolution and development depends on desirable quality of freshwater. The certain useful contents existing on the natural and are mixing in the water. The water with some definite concentration of mixed contents from land becomes very suitable for drinking. Such water becomes basic need of all land and aquatic organisms. This exists in rivers, streams, ponds, lakes, reservoirs, tanks, pools, marshes, bogs and even underground water forms. This freshwater is a base for all organisms. According to ⁴Pollution of water is measured by assessing the physiochemical Parameters of water⁵. There are trends in developing countries to use waste matter effluent as fertilizer has gained abundant importance because it is taken into account a supply of organic matter and plant nutrients and is smart plant food⁶. However, the usage of water by man for survival is as necessary as that of fish. Since 'good' water quality will manufacture healthier humans than one with 'poor' water quality. Limnological investigations of reservoirs are necessary to evaluate potential fish production and to supply information that might be helpful in fisheries developmental designing. Keeping these aspects in sight several limnological studies are carried out on reservoirs everywhere the country⁷. Industrial development (Either new or existing trade expansion) leads to the generation of industrial effluents, and if untreated results in water, sediment and soil pollution⁸ Individuals on the globe are below tremendous threat because of unwanted changes within the physical, chemical and biological characteristics of air, water, and soil. These are associated with animal and plants and eventually affecting that⁹

RESEARCH METHODOLOGY

2.1. Study Area:

During this study, Belgaon reservoirs were chosen from the Ashti Tehsil of Dist: Beed. (M.S). Water samples were collected on a monthly basis throughout 8 am to 11 am in the morning, from three different sampling sites of the reservoir and delivered to the laboratory with the assistance of airtight plastic containers of ten liters capability. Water samples were analyzed for numerous Physio-chemical parameters. (Kodarkar et al; 1998, Trivedy and Goel, 1984 and APHA, 1985).

2.2. Temperature (°C):

The atmospherical temperature and water temperature was recorded by Centrifuge mercury-in-glass thermometer (Graduated from 0 °C to 110 °C).

2.3. pH scale (Hydrogen ion Concentration):

The water pH scale determined by field pH scale meter (Hanna –Model Champ).

2.4. Light Transparency (cms):

Light Transparency of water was measured by a Secchi disc.

2.5. Chlorides (mg/l):

Chlorides were determined by the method represented by Trivedi and Goel (1988).

2.6. Free carbon dioxide (mg/l):

Chlorides were titrated by the method described by Trivedi and Goel (1986).

2.7. Total Dissolved Solids (mg/l):

Total Dissolved Solids (TDS) and total suspended solids (TSS): the whole dissolved solids (TDS) were analyzed in the laboratory because the residue left after evaporation of the filtered water samples whereas suspended solids were analyzed by calculating the distinction between total solids and total dissolved solids (TSS= TS- TDS).

2.8. Total hardness (mg/l):

The total hardness was analyzed by using the standard technique as described by APHA (1992).

III. RESULTS AND DISCUSSION

Temperature plays the most role within the physico-chemical and physiological characters of biotic elements of the aquatic system. The atmospheric temperature and water temperature values lie between 19.03°C to 32.33°C in the year 2016-17 and 20.27°C to 32.23°C in the year 2017-18 respectively. Similar results were conjointly determined by¹⁰. Equally¹¹ discovered that his study showed fluctuation between 19°C to 33°C from January to December 2009. As expected, summer months like March, April and May recorded. High temperature and winter with low-temperature detectable changes were additionally noted throughout the observation. According to Welch (1952), the response of water temperature to air temperature depends on the dimensions of the water body.

3.2. Water Temperature:

Water temperature is important parameters and it affects the chemical and biological changes in the aquatic organisms¹². Water temperature affects the expansion and reproduction of living organisms. In the present study the average water temperature values lie between 16.10°C to 29.03°C in the year 2016-17 and 17.63°C to 29.87°C in the year 2017-18 respectively. ¹³Observed that water temperature fluctuates between 21°C to 29°C during limnological studies of Udaipur lakes. ¹⁴Observed during their study water temperature fluctuated between 22.02°C to 26.04°C in the Alisagar and Ashok Sagar lakes temperature of the water was measured at +0.1 °C accuracy by thermometer at the spot.

3.3. Transparency:

The transparency is important to determine the productivity of the water body. *Secchi disks* have played a very important role in hydrologic optics (Preisendorfer, 1986). Average range of Transparency values recorded between 53.67cm to 180.33 in the year 2016-17 and 56.33 to 162.00 in the year 2017-18 respectively. The monthly variation in transparency ranges between 32.5 cm to 62 cm, with an average of 45.06 cm¹⁵. ¹⁶Due to dissolved and un-dissolved inorganic and organic material water get turbid and results in the lowest transparency¹⁷, Similar trend has given by¹⁸

3.4. pH:

Changes within the pH scale value of water are necessary to several organisms. Most organisms have adapted to life in water of a particular pH scale and will die if it changes even slightly. This is very true of aquatic macroinvertebrates and fish eggs and fry. The pH scale could be a important issue determining the health of a waterway. (<https://www.water-research.net/index.php/ph-in-the-environment>). During present study the average value of pH observed in the Balegaon reservoir during study period 2016-2017 ranged between 07.32 mg/l to 08.16 mg/l, while during the study period 2017-2018, and the average value of pH observed in the reservoir it ranged between 07.35 mg/l to 07.75 mg/l respectively. pH values are in accordance with earlier work observed Maximum and minimum values of 8.9 and 7.3 were recorded in the Anasagar Lake, Ajmer, Rajasthan lake water¹⁹. ²⁰Recorded pH ranged between 7.09 to 8.10 during the year 2008-09. ²¹Reported that the value of pH ranges from 8 to 9 in Indian waters. ²²studied the Mansarovar reservoir and recorded the pH in a range of 7.2 to 9.5. ²³observed the minimum pH was recorded in the month of January and the maximum in the month of June during the year 2008-2009.

3.5. Free CO₂:

Free CO₂ is essential for the growth and development of flora and fauna. It depends on the respiration of living organisms. Although CO₂ is a minor component of air it is abundant in water because of its solubility which is 30 times more than that of oxygen, and the amount of CO₂ in water normally shows an inverse relationship with oxygen²⁴. The Free CO₂ average values fluctuate from 3.39 mg/l to 10.36 mg/l in the year 2016-17 and 03.19 mg/l to 10.29 mg/l in the year 2017-18. Similarly, ²⁵recorded the range between 1.7 mg/ltr to 2.8 mg/ltr from Alisagar dam. ²⁶Reported a minimum CO₂, 4.40 mg/ltr in a month of June and maximum 44.0 mg/ltr in the month of August from a religious lake Budha Pushkar near Ajmer, Rajasthan.

3.6. Total Hardness:

The term "hardness" is applied to the soap neutralizing power and increases the boiling point of water. (<http://sciencefairwater.com/chemical-water-quality-parameters/primary-anions-and-cations/hardness/>). The average values of Total Hardness fluctuate from 37.96 mg/l to 67.36 mg/l in the year 2016-17 and 40.16 mg/ to 69.64 mg/l in the year 2017-18. ²⁷Stated that the total hardness ranged from 180-240 mg/l in different seasons total hardness ranged between 73.00 mg/ltr to 157.00 mg/ltr during the year 2008-09. ²⁸Reported the range of hardness between 76.3 ppm to 172 ppm in Sadatpur reservoir at Ahemadnagar. The minimum total hardness was recorded in the month of February and maximum in the month of May. ²⁹Reported total hardness was high throughout summer than rainy season and winter season. ³⁰Observed the range of total hardness 230 mg/L to 457 mg/L with no significant variation.

3.7. Alkalinity:

In water chemistry, alkalinity is defined as the capacity of the solution to neutralize an acid. Alkalinity is commonly reported in terms of a similar amount of carbonate. However, a more meaningful and useful statement of the alkalinity is obtained by expressing the results of the determination as concentrations of bicarbonate and carbonate. (<http://sciencefairwater.com/chemical-water-quality-parameters/ph/alkalinity/>). The average values of Alkalinity fluctuate from 56.67 mg/l to 134.67 mg/l in the year 2016-17 and 59.67 mg/ to 153.67 mg/l in the year 2017-18. Increase in atmospheric temperature and the consequent increase in the photosynthetic process in the hot season, alkalinity values usually decrease in summer. The alkalinity below 50 mg/l indicates low photosynthetic rate³¹. A similar trend of inclined alkalinity during winter was given by³² and ³³. Parallel range and similar trends were recorded by³⁴. The values of total alkalinity in Bernal water body fluctuated from 158.3 to 301.8 mg/l and 132.5 to 280.1 mg/l during the first and second year, respectively³⁵.

3.8. Chlorides:

Chloride is a very important parameter in accessing water quality. It controls the salinity of water and osmotic stress on biotic communities³⁶. The average values of Chlorides fluctuate from 15.81 mg/l to 65.18 mg/l in the year 2016-17 and 16.87 mg/ to 66.24 mg/l in the year 2017-18. A similar trend of chloride ion concentration was given by³⁷. The chlorides ranged from 59.6 to 19.88 mg/l with the highest concentration in post monsoon period and therefore the minimum was seen during the monsoon period as a result of the constant dilution by rainwater³⁸. The monthly variation within the chloride values range between 14.2 mg/l and 36.82 mg/l³⁹. ⁴⁰Recorded chloride content ranged between 37.22 to 51.13 mg/lit and 35.50 to 49.40 mg/lit during 2005-06 and 2006-2007 respectively.

3.9. Dissolved Oxygen:

Dissolved oxygen refers to the amount of free, non-compound oxygen present in water or different liquids. It is a very important parameter in assessing water quality attributable to its influence on the organisms living within a body of water. In limnology (the

study of lakes), dissolved oxygen is an essential factor second only to water itself⁴¹. The average values of Dissolved oxygen fluctuate from 03.80 mg/l to 14.12 mg/l in the year 2016-17 and 03.64 mg/ to 14.64 mg/l in the year 2017-18. ⁴²Observed during his study that the monthly variations in dissolved oxygen values range from 6.4 mg/l to 15.2 mg/l. ⁴³Observed the dissolved oxygen values fluctuate from 3.6 mg/l to 15.2 mg/l. According to⁴⁴ the monthly variations in dissolved oxygen values range from 6.4 mg/l to 15.2 mg/l at Khanapur reservoir.

Table 1.1: Monthly Average Values of Physico-chemical Parameters of Belgaum Reservoir during the study year 2016-2017 and 2017-2018.

Sr. No.	Parameters	Study Period	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
1	Air Temperature	2016-17	23.17	25.67	30.13	32.33	27.47	23.33	24.27	23.03	22.63	22.33	19.60	19.03
		2017-18	23.63	25.43	31.20	32.23	27.67	23.47	24.60	23.80	24.47	22.97	20.27	20.93
2	Water temperature	2016-17	22.00	25.17	27.13	29.03	25.87	20.93	23.17	21.63	19.43	18.27	16.10	16.93
		2017-18	22.73	22.73	27.03	27.83	26.63	21.50	23.67	22.30	19.97	19.10	17.63	18.07
3	Transparency	2016-17	153.67	119.67	45.33	52.33	64.00	78.67	99.67	112.67	137.67	170.33	167.67	164.67
		2017-18	137.00	102.67	56.33	69.33	79.33	97.67	103.33	117.67	134.67	162.00	160.33	153.67
4	pH	2016-17	7.45	7.64	7.42	7.38	7.34	7.38	7.50	7.59	7.70	8.16	7.22	7.45
		2017-18	7.55	7.56	7.73	7.65	7.43	7.35	7.70	7.62	7.54	7.75	7.46	7.65
5	Free CO ₂	2016-17	3.55	4.46	5.19	4.79	5.60	6.42	10.36	9.81	6.52	5.65	4.39	3.39
		2017-18	3.19	4.47	5.29	4.62	5.84	6.24	10.29	8.92	6.30	5.83	5.43	3.50
6	Total Hardness	2016-17	37.96	44.26	61.46	73.69	67.36	64.46	62.44	57.66	54.57	51.72	49.40	47.42
		2017-18	40.16	46.31	63.25	69.54	75.68	66.43	64.37	59.38	56.43	53.54	51.47	49.30
7	Alkalinity	2016-17	56.67	83.67	64.67	86.67	124.67	74.67	72.67	130.67	134.67	128.33	89.67	84.67
		2017-18	86.67	59.67	67.67	89.67	127.67	77.67	75.67	133.67	153.67	137.67	92.67	87.67
8	Chlorides	2016-17	37.95	38.68	65.18	54.01	50.55	48.25	15.81	26.51	47.75	45.68	39.55	39.21
		2017-18	39.01	39.74	66.24	55.07	51.61	49.31	16.87	27.57	48.81	46.74	40.61	40.27
9	Dissolve O ₂	2016-17	9.97	10.52	5.81	5.61	5.77	4.78	4.69	3.80	8.84	7.52	14.12	11.44
		2017-18	10.28	10.91	6.17	6.03	5.62	4.70	5.04	3.64	8.59	7.33	14.64	11.19

All the values were subjected for analysis of variance not significant at (P < 0.05)

All parameters are in mg/l except Temperature (°C), Transparency (cm)

IV. Conclusion: As all parameters are within the acceptable limit, it can be concluded that water from Belgaon reservoir can be used for irrigation purpose, drinking, fish culture, healthy water body for the growth aquatic organisms and of especially for future domestic purposes.

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