Assessment of lentic Water Parameters

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Abstract: *Assessment of lentic water quality was carried out in Amaravati dam to find out the suitability of lentic water for drinking and domestic purposes. Three water samples were collected randomly from different sites of the Amaravati Dam and tests were conducted to measure physicochemical parameters viz. Air temperature, water temperature, pH, Dissolved oxygen, Free CO_2, Total Alkalinity, carbonate, Bicarbonate, Phosphate, Nitrate, Total Hardness, Chloride, Total Solids and Total Suspended solids. Readings were compared with WHO standards in relation to domestic purposes. It is proved that most of the water samples qualified the standards but there is observable trend in pollution.*

Key Words: *Lentic water, Domestic, Physicochemical parameters, Pollution, Total Dissolved solutes (TDS), Total Suspended Solids (TSS).*

1. INTRODUCTION:

Water is a wonderful universal solvent. It has unique properties to dissolve and carry variety of chemicals in suspended form. It is the "elixir" of life. Modern civilizations are dependent on water for irrigation, industries, domestic needs, shipping & increasing importance of sanitation and disposal of waste. 75 percent of earth surface is covered with salty and fresh water. It is present in oceans, ponds, dams, lakes, streams, rivers, mountains with ice caps etc. About 97 percent of earth's water is found in ocean, 2 percent frozen ice at poles and remaining 1 percent as fresh water in rivers, streams, lakes, ponds and ground water. Study of fresh water inhabitants and their interaction with changing environment is known as limnoloz. Limological observations are required to study water quality ,living organisms found in water are reliable indicators of water quality; Most organisms are being extensively used as indicators of water pollution, ,Ashutosh Tripathi (2018), Hence aquatic organisms are biological indicators which provide a direct clue and quick information about aquatic systems. The ecological study of algal diversity and physicochemical analysis of lentic hydrosphere of Amaravati dam was done in present investigation. This study is necessary for human health and aquatic life of micro and macro organisms present in dam. It is essential to study the algal community in dams and compare with algal flora of different habitats

2. MATERIALS AND METHODS:

2.1 General Geography and Climatology:

Dhule District in Maharashtra state India formerly known as west khandesh lies between 20^0 38' and 22^0 3' North latitude and 73^0 47' and 75^0 55' East longitude. It covers an area of 32, 47706 Acre. Climate is one of the most important factors that govern organic resources of any region. Climate of Dhule District is generally dry and hot except in monsoon season. Although there are four seasons in western Indian, the year is broadly divisible into three seasons in present investigation.

2.3. Study Areas:

Amaravati dams Dhule District of North Maharashtra was selected for the present investigation. Description of Amaravati dam (Plate 1 and 2): Amaravati Dam is located near Malpur village Taluka Shindkheda, District Dhule. The construction of dam was started 1979 and complete 2005. Main water sources of Amaravati dam are Amaravati River, Nai River and Ghushri nalla. Amaravati River is left bank tributary of Tapi River (Plate-1). Amaravati dam is earthen dam with gated spillway in gorge. The total length of dam is 3.85 km and maximum height of dam is 17.90 m. It is situated in 74^0 30' S longitude and 20^0 30' N latitude. The total submerged area of dam is 1366.90 acres including rivers and nalla and total irrigation area is 73685 acres. Three stations were selected for the collection of water samples collections from Amaravati Dam viz. ADS-I, ADS-II, ADS-III (Plates-3, 4 and 5 respectively). The water samples were collected at monthly intervals in morning from water surface layer about one feet length from each station.

i. ADS-I (Plate 3): It is near main gate of Amaravati Dam. At this station during the study period, there is no disturbance of humans and animals.

ii. ADS-II (Plate 4): It is near water supply well. At this station there is no disturbance of humans and animals.
iii. ADS-III (Plate 5): This station of dam is at right canal outlet gate, where water is diverted to the canal for agriculture and drinking purposes. At this station during study period, the water was utilized for cattle wadding and fishing.

2.4. Field Work:

Water samples were collected from all three stations of Amaravati Dam from November, 2006 to October, 2007. The collections of water samples were collected in acid washed plastic cans with 4 liters capacity from all three stations of study areas. For estimation of dissolved oxygen separate samples were collected in 250 ml. BOD glass bottles and fixed in field where water temperature of each site was recorded periodically using mercury centigrade thermometer at depth of 4 to 6 cm from the surface layer of water. pH of water was examined in field at the time of collection by using universal pH indicator and digital pH meter.

2.5. Laboratory Work:

The physico-chemical analysis of water samples were carried out by standard methods of APHA (1975) and Trivedy and Goel (1984). Parameters like Air temperature, water temperature, pH, Dissolved Oxygen, free CO_2, Total Alkalinity, Carbonate, Bicarbonate, Hardness, Chloride, Total solids, Total dissolved solids, Total Suspended Solids, Nitrate and Phosphate were recorded from three stations of dam. The methods for analysis of physico-chemical parameters are shown in table 2.1.

Table 2.1. The methods of physico-chemical parameters used for analysis of water samples of Amaravati Dam.

Sr. No	Physico-chemical parameters	Method used for water analysis
1	Air Temperature	0.1 ^{0}C to 0.2 ^{0}C accuracy mercuric thermometer
2	Water temperature	0.1 ^{0}C to 0.2 ^{0}C accuracy mercuric thermometer
3	pH	Systeronics, reference glass-electrode and digital pH meter
4	Dissolved O_2	Azide modification by Winkler's method
5	Free CO_2	Titration method
6	Total Alkalinity	Strong acid titrate with sample
7	Carbonate	Strong acid titrate with sample
8	Bicarbonate	Strong acid titrate with sample
9	Phosphate	Stannous chloride method using spectrophotometer and standard curve
10	Nitrate	Phenol disulfonic method using spectrophotometer and standard curve
11	Hardness	EDTA method
12	Chloride	Silver nitrate titration method
13	Total solids	Oven dried water samples
14	Total Dissolved Solids	Oven dried water samples
15	Total Suspended Solids	By calculation method

3. RESULTS AND DISCUSSION:

The Physicochemical characteristics of water sample have been presented.

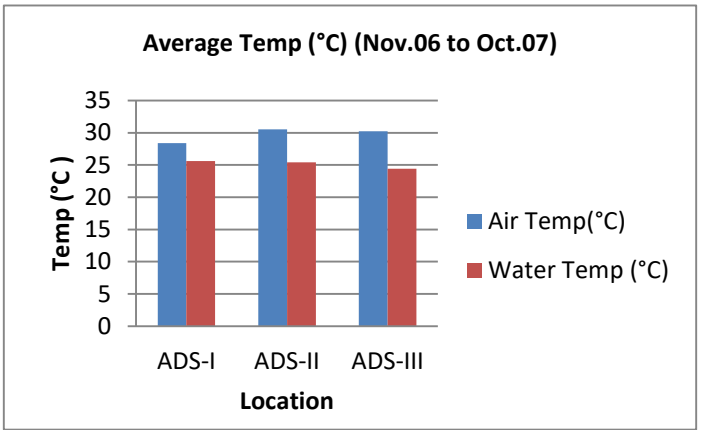
3.1. Air Temperature:

In present study, the values of air temperature indicating maximum and minimum are shown in (Plate-4). Maximum air temperature recorded was 36 ^{0}C in May, 2007. Minimum air temperature was 24 ^{0}C in November, 2007. There is no significant change in minimum air temperature values.

3.2. Water Temperature:

Surface water temperature was recorded for all three stations during the one year study. Water temperature was less than air temperature, except for months of winter season. In present study air and water temperature showed similar trend of being lower during November to February and higher from March to October (Plate-4). The water temperature ranged from 20.1 ^{0}C to 30.7 ^{0}C, 22 ^{0}C to 29.5 ^{0}C and 21 ^{0}C to 29.66 ^{0}C with an average value 25.62 ^{0}C, 25.4 ^{0}C and 24.43 ^{0}C at ADS-I, ADS-II and ADS-III respectively. The maximum temperature recorded was 30.7 ^{0}C in June, 2007 at ADS-I and minimum temperature 20.1 ^{0}C in January, 2007 at ADS-I .

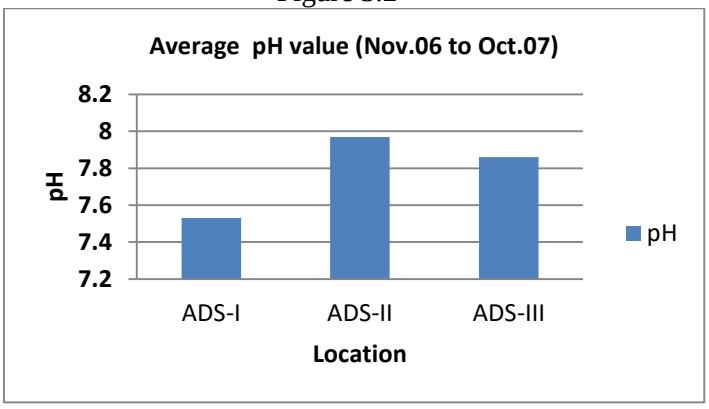
Figure 3.1



3.3. pH:

Seasonal fluctuations of pH were observed at all the three stations. There is no significant difference in average value of pH at all the three stations of dam (Figure 3.2). The maximum pH value was 8.39 in the month of January, 2007 at ADS-II (Plate-4) and the minimum pH value was 7.3 in July, 2007 at ADS-I (Plate-3). The values of pH at all three stations of were greater than 7.3 throughout the investigation, indicating alkaline nature of water.

Figure 3.2



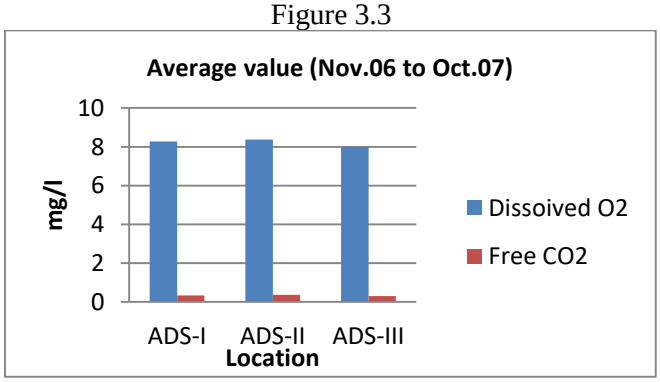
3.4. Dissolved Oxygen (DO):

Seasonal variations in the concentration of DO were observed at all three stations. Values of DO were ranged from 6.3 mg/l to 13.38 mg/l, 6.08 mg/l to 13.79 mg/l and 5.27 mg/l to 10.14 mg/l with an average value 8.27 mg/l, 8.38 mg/l and 8.00 mg/l at ADS-I, ADS-II and ADS-III respectively (Figure 3.2). The average value of DO was greater at ADS –II as compared with ADS –I and ADS-III (Figure 3.3). The minimum concentration of DO was observed 5.27 mg/l in December, 2006 at ADS –III and maximum was 13.79 mg/l in the month of July, 2007 at ADS-II.

3.5. Free CO_2:

Value of free CO_2 are shown graphically they ranged from 0.0 mg/l to 2.5 mg/l with an average of 0.33 mg/l at ADS-I station 0.0 mg/l to 2.7 mg/l with an average of 3.7 mg/l at ADS-II station and 0.0 mg/l to 2.4 mg/l with an average of 0.3 mg/l at ADS-III (Figure 3.3). Free CO_2 was found absent in the month of November, December, 2006, January to August, 2007 at ADS-I, ADS-II and ADS-III stations and maximum free CO_2 was 2.7 mg/l in the month of September, 2007 at ADS-II station.

Figure 3.3



***3.6. Total alkalinity*:**

Total alkalinity was observed at all stations of the dam. The seasonal fluctuations are represented graphically. The total alkalinity ranged from 36 mg/l to 376 mg/l, 35 mg/l to 345 mg/l and 30 mg/l to 400mg/l at ADS-I, ADS-II and ADS-III respectively (Figure 3.4).The average value of 100.75 mg/l, 100.33 mg/l and 137 mg/l at ADS-I, ADS-II and ADS-III stations respectively. The maximum total alkalinity was estimated 460 mg/l at ADS-II station in the month of November, 2007 and the lowest value of the total alkalinity was 30 mg/l at ADS-III in April, 2007.

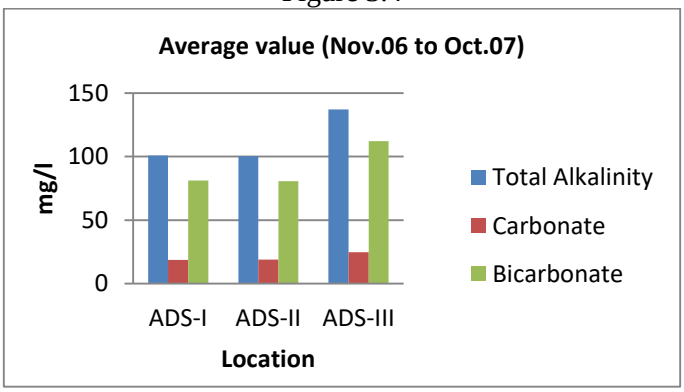
3.7. Carbonate:

The values of carbonate were ranged from 05 mg/l to 60 mg/l, 07 mg/l to 40 mg/l and 06 mg/l to 70 mg/l with an average value 18.66 mg/l, 18.83 mg/l and 24.83 mg/l at ADS-I, ADS-II and ADS-III stations respectively (Figure 3.4). The maximum value of carbonate was 70 mg/l at ADS-III in January, 2007. The minimum carbonate value was 05 mg/l at ADS-I in May, 2007. It was observed that, there is no significant difference in the average value of carbonate at all the stations (Figure 3.4).

***3.8. Bicarbonate*:**

The value of Bicarbonate were ranged from 26 mg/l to 356mg/l, 32 mg/l to 325 mg/l and 10 mg/l to 400 mg/l with an average value 81.25 mg/l, 80.66 mg/l and 112.16 mg/l at ADS-I, ADS-II and ADS-III stations respectively (Figure 3.4). The maximum value of Bicarbonate was 400 mg/l at ADS-III station in November, 2006. The minimum value of 10 mg/l at ADS-III in March, 2007. It was observed that, there is no significant difference in the average values of carbonate at all three stations.

Figure 3.4



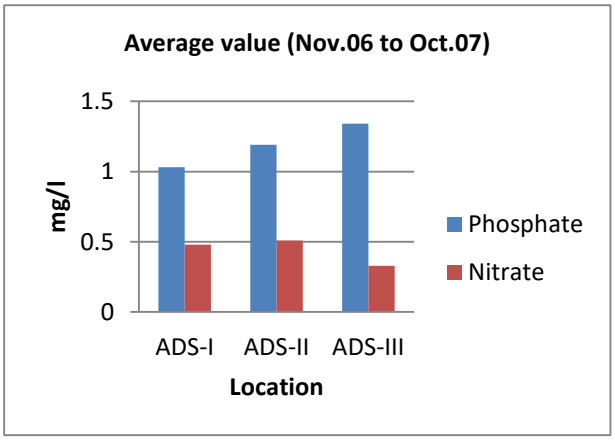
3.9. Phosphate:

The graphical representation of phosphate for three stations is given in (Figure 3.5). It is ranged from 0.4 mg/l to 1.35 mg/l, 0.4 mg/l to 2.15 mg/l and 0.25 mg/l to 2.05 mg/l at ADS-I, ADS-II and ADS-III respectively. The average values of ADS-I, ADS-II and ADS-III are 1.03 mg/l, 1.19 mg/l and 1.34 mg/l respectively (Figure 3.5). The highest value of phosphate was 2.15 mg/l at ADS-II in January 2007 and lowest value 0.25 mg/l at ADS-III in December, 2006.

***3.10. Nitrate*:**

The graphical representation of Nitrate for three stations is given in (Figure 3.5). It ranged from 0.04 mg/l to 1.8 mg/l, 0.07 mg/l to 1.9 mg/l and 0.05 mg/l to 1.9 mg/l at ADS-I, ADS-II and ADS-III respectively. The average value of ADS-I, ADS-II and ADS-III are 0.48 mg/l, 0.51 mg/l and 0.33 mg/l respectively (Figure 3.5). The highest value of Nitrate was 1.9 mg/l at ADS-II and ADS-III in May, 2007 and lowest value 0.04 mg/l at ADS-I January, 2007

Figure 3.5



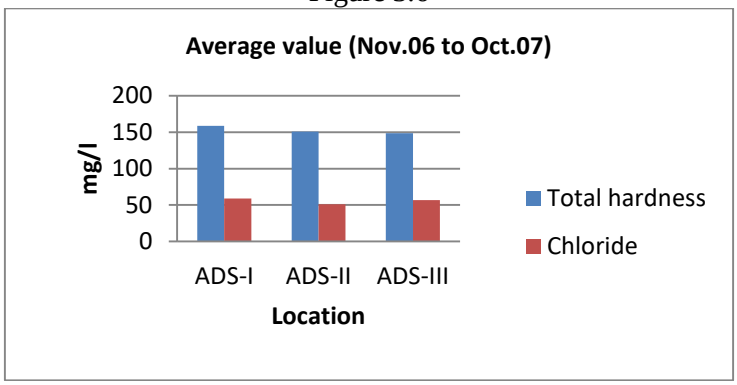
***3.11. Total Hardness*:**

The total hardness was estimated at all three stations and its seasonal fluctuations are represented graphically in (Figure 3.6). The values of hardness were ranged from 122 mg/l to 194 mg/l, 128 mg/l to 186 mg/l and 122 mg/l to 189 mg/l with average value 159 mg/l, 151 mg/l and 148.5 mg/l at ADS-I, ADS-II and ADS-III respectively (Figure 3.6). The maximum total hardness was recorded 194 mg/l at ADS-I in January 2007. The lowest value of total hardness was 122 mg/l at ADS-I and ADS-III in April 2007.

3.12. Chloride:

The values of chloride at three stations were shown in (Figure 3.6). It ranged from 36.92 mg/l to 66.74 mg/l, 26.8 mg/l to 63.6 mg/l and 35.5 mg/l to 69.58 mg/l with average value of 58.92 mg/l, 50.80 mg/l and 56.56 mg/l at ADS-I, ADS-II and ADS-III respectively (Figure 3.6). There is no significant difference in average value of three stations of the dam. The maximum value was 69.58 mg/l at ADS-III in January, 2007 and minimum value was 26.8 mg/l at ADS-II in December, 2006.

Figure 3.6



3.13. Total Solids (TS):

Total Solids were observed at all three stations and the seasonal fluctuations are shown graphically in (Figure 3.7). The values of TS range from 205 mg/l to 610 mg/l, 203 mg/l to 606 mg/l and 196 mg/l to 568 mg/l with average value 393.3 mg/l, 386.75 mg/l and 379.41 mg/l at ADS-I, ADS-II and ADS-III respectively. It is observed that the average value of TS was more at ADS-I as compared to those of ADS-II and ADS-III (Figure 3.7). The maximum value TS was 610 mg/l in July, 2007 at ADS-I. While the minimum value was 196 m/l in April, 2007 at ADS-III.

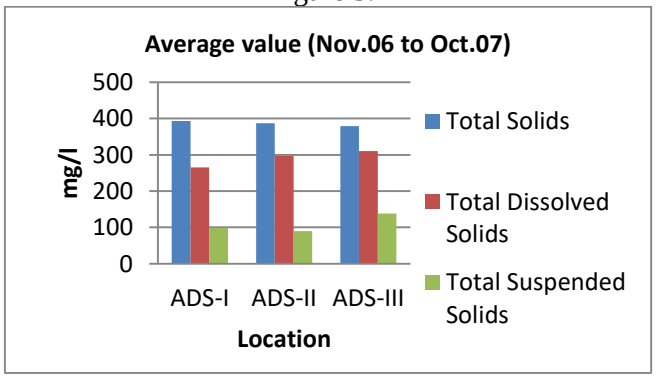
3.14. Total Dissolved Solids (TDS):

The value of TDS for three stations of Amaravati dam was representation graphically in (Figure 3.7). The TDS value ranged from 100 mg/l to 598 mg/l, 98 mg/l to 568 mg/l and 120 mg/l to 480 mg/l with average value 265.66 mg/l, 297 mg/l and 310.58 mg/l at ADS-I, ADS-II and ADS-III respectively. It is observed that the average value of TDS is more at ADS-I as compared to those of ADS-II and ADS-III (Figure 3.7). The maximum value of TDS was 598 mg/l in April, 2007 at ADS-I, while the minimum value was 98 mg/l in April, 2007 at ADS-II.

3.15. Total Suspended Solids (TSS):

The values of TSS for three stations of Amaravati dam is represented graphically in Figure 3.7. It was ranged from 40 mg/l to 178 mg/l, 30 mg/l to 161 mg/l and 19 mg/l to 274 mg/l with average value 98.5 mg/l to 89.75 mg/l and 138.33 mg/l at ADS-I, ADS-II and ADS-III respectively in figure 3.7. It is observed that the average value of TSS was more at ADS-III as compared to those of ADS-I and ADS-II. The maximum value of TSS was 274 mg/l in May 2007 at ADS-III, while the minimum value was 19 mg/l in June 2007 at ADS-III.

Figure 3.7



4. CONCLUSION:

In present study, physicochemical analysis was made for 15 parameters. The qualitative and quantitative study of these parameters reveal that , the maximum pH was observed in winter season as agreed with the view of Unii (1984), George (1967), Kumavat and Jawale (2003). Gonzalves and Joshi (1946) showing the increased rate of photosynthesis. Temperature supposedly caused rise in pH lowering of due to stagnation. Same trend remained during the summer and part of rainy season indicating that is independent of photosynthetic activity. This might be due to addition of sewage & drainage in to the river water and thus seasonal fluctuations of pH values were observed at all stations, the fluctuation might be due to the change in concentration of bicarbonate and carbonate

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