ANALYSIS OF WATER QUALITY USING PHYSICO-CHEMICAL PARAMETERS OF VIJASAN LAKE IN BHADRAWATI, DIST – CHANDRAPUR, MAHARASHTRA, INDIA

Nasare P. N.

Nilkanthrao Shinde Science and Arts College, Bhadrawati, Chandrapur (M.S) India
Email: pnnasare@rediffmail.com

Abstract: This paper present to study of physico-chemical parameters of Vijasan Lake in Bhadrawat, Dist- Chandrapur, Maharashtra, India. Monthly changes in physical and chemical parameters such as Atmospheric Temperature, Water Temperature, Colour, Odour, Taste, Turbidity, Transparency, Conductivity, T.S., TDS, T.S.S., and pH, DO, BOD, COD, Alkalinity, Total hardness, Calcium, Magnesium, Chloride, Sulphate were analyzed for a periods of December 2016, January 2017, February 2017. All parameters were not within permissible limits. The result indicates that the Lake is highly polluted with different harmful contaminants.

Keywords:- Vijasan lake, Physico-chemical parameters, Monthly variation

Introduction:

Water is one of the most important component of the ecosystem. Better quality of water described by its physical, chemical and biological characteristics. But some correlation was possible among these parameters and the significant one would be useful to indicate quality of water.

Due to increased human population, industrialization, use of fertilizers in agriculture and man-made activities. The natural aquatic resources are causing heavy and varied pollution in aquatic environment leading to water quality and depletion of aquatic biota.

In the present study involves the analysis of water quality in terms of physico-chemical parameters of Vijasan lake Bhadrawati, Dist-Chandrapur, Maharashtra, India. It is located in 20° 10' 04.870" N Latitude and 79° 07' 49.94" E Longitude. The area of Vijasan Lake is 20.72 hectares. The height of Bhadrawati at sea level is 549 meter. The Vijasan Lake is basically used for shingada cultivation, and fisheries activities by Dhiwar community in India. Still now several researchers have carried out study on physico-chemical and biological characteristics of standing and running water resources (Pandey et al 1993, Trivedy & Goel (1986), Kodarkar, 1992)

Materials and Methods:

The water samples from Vijasan Lake were collected from five different sample

sites (V1 V2 V3 V4 V5) in the morning hours between 9 to 11 am in Bisleri bottles regularly for every month. The water samples were immediately brought into laboratory for the estimation of various physico-chemical parameters like. Water temperature, transparency and pH were recorded at the time of sample collection, by using thermometer and pocket digital pH meter. Transparency was measured with the help of Secchi Disc while other parameters such as other physico-chemical parameters were estimated by using standard methods as presented by APHA, AWW (1985), Trivedy and Goel (1986) & Kodarkar (1992).

Result and Discussion:

Monthly variation in physico-chemical parameter is presented in table – 1,2,3.

Physical Parameters –

1. Atmospheric temperature – In December 2016, atmospheric temperature ranges from 17-18°C, In January – 2017, it was 18-19°C and in February 2017, it was 20-21°C. Atmospheric temperature was found maximum in February – 2017 and minimum in December – 2016.

2. Water temperature – In December – 2016, water temperature ranges from 14-15°C, In January – 2017, it was 16-17°C and in February 2017, it was 19-20°C. Water temperature was found maximum in February-2017 and minimum in December – 2016.

3. Colour – Colour was observed visually and colour was found brownish in all three months due to heavy contamination.

4. Odour – The odour was disagreeable odour in water may be because of presence of decaying vegetation, inorganic constituents, organic substances discharge of waste water in water bodies.

5. Taste :- Water was found bitter during December – 2016, January – 2017 and February – 2017.

6. Turbidity – The turbidity of water fluctuates during December – 2016 and ranges from 112-112.8 NTU, in January – 2017, it was 112.2-112.32 NTU and in February – 2017, it was 112-112.8 NTU respectively the maximum values were recorded in December – 2016 and in February-2017. It might be due to human activities, decrease in the water level and presence of suspended particulate matter.

7. Transparency – Transparency values were ranged from 24-24cm in December – 2016, 24-28 cm in January-2017 and 24-27 cm in February-2017.

8. Conductivity – The conductivity values were ranged from 331-649 mho/cm in December-2016, in January-2017, it was 330-595 mho/cm, in February-2017, it was 332-650 mho/cm respectively. The maximum values were found in February – 2017.

9. Total solids (T.S.) – T. S. was ranged from 988-992 mg/l in December- 2016, 986-995 mg/ml in January -2017 and 988-995 mg/ml in February-2017 respectively.

10. Total dissolved solids (TDS) – The total dissolved solids fluctuates from during three months. In December-2016, it was found between 992-998 mg/L. In January -2017, it was 993-998 mg/L. In February-2017, it was found 992-995 mg/L.

11. Total suspended Solids (TSS) – The values of total suspended solids ranged from 2.784-6.022 mg/L in December-2016, in January-2017, it was 2.781-6.021 mg/L and in February-2017, it was 2.78-6.022 mg/L.

12. P^H:- P^H was ranged from 5.71-6 in December -2016, in January-2017, it was ranged from 5.63-6.02 and in February-2017, it was ranged from 5.7-6. The P^H was acidic and maximum P^H value was 6 and

minimum was 5.63. The factors like our temperature bring about changes in the P^H of water bio-chemical and chemical reactions are influenced by the P^H. The values were minimum in winter season.

13. Dissolved Oxygen (DO)– The values of DO ranged from 208 -3.5 mg/L in December-2016. In January -2017, it was ranged from 2.7-3.7 mg/L and in February-2017, it was ranged from 2.7-3.7 mg/L.

14. Biological oxygen Demand (BOD) :- Tin December -2016, BOD value were ranged from 3.968-4.891 mg/L. In January -2017, it was ranged from 3.75-5.112 mg/l and it was ranged from 3.97-5.11 mg/l in February -2017. Biological oxygen demand measures the amount of oxygen that microorganism consume, while decomposing organic matter. BOD is amount of dissolved oxygen requires for the biochemical decomposition of certain inorganic materials (e.g. iron, sulphates). Vijasn Lake has high organic and inorganic waste material and recorded maximum value in winter season.

15. Chemical Oxygen Demand (COD) :- The COD values ranged from 12.1 to 14.1 mg/l in December -2016, it was ranged from 13.2 – 14.1 in January -2017 and in February-2017, it was ranged from 13.1-14 mg/l. Maximum values were recorded in winter season.

16. Alkalinity :- Alkalinity is a chemical measurement of waters ability to neutralize acids. The values were ranged from 500-525 mg/l. In January -2017 and in February-2017, it was ranged from 535-995 mg/l. The values are maximum in winter season and it indicates the presence of bicarbonates, carbonates and hydroxide. The values above the normal level water taste becomes, unpleasant. High alkalinity of water affects the health.

17. Total Hardness (TH) :- Total Hardness in defined as the sum of calcium and magnesium hardness in mg/l, as CaCO₃. The values ranged from 195-215 mg/l in December-2016. In January-2017, Values were ranged from 195-219 mg/l and in February -2017, values were ranged from 195-219 mg/l. The maximum values of Total Hardness were recorded in winter season.

18. Calcium :- Calcium generally has the highest concentration and minerals constitute the primary sources of calcium ion in waters. Calcium is present in water as a consequence of equilibrium between calcium and magnesium carbonate minerals of CO₂ dissolved in water surface water containing a high level of carbon-dioxide readily dissolved calcium from its carbonate minerals. The content of calcium in drinking and surface water is not regulated. The values ranged from 210.42-221.4 mg/l in December-2016. In January 2017, values were ranged from 210.42-226.3 mg/l and in February 2017, the values were ranged from 210-226 mg/l. The maximum values were recorded in winter season.

19. Magnesium – Magnesium is also one of the important mineral for various enzymatic transformations. In December 2016, the values were ranged from 11.36-13.4 mg/l. In January 2017, the values were ranged from 11.2-13.42 mg/l and the values were ranged from 11.2-13.5 mg/l. Maximum values were recorded in winter.

20. Chloride:- The ionized form of chloride is one of the most abundant inorganic ions, natural and waste water. In December-2016, the values were ranged from 99.4-120.7 mg/l. In January 2017, the values were ranged from 99.9-115.5 mg/l. and in February 2017, it was ranged from 99.9-115.5 mg/l.

21. Sulphate :- Natural water contains sulphate ions and of these ions are also soluble in water. In December-2016, the values were ranged from 11.08-11.45 mg/l. In January –2017, the values were ranged from 11.01-12.1 mg/l and in February 2017, the values were ranged from 11-12.5 mg/l.

Conclusion:

In the study, the values of physico-chemical parameters obtained from each point were different the values obtained were compared with the ICMR standards. The values are not permissible with ICMR standards.

Acknowledgements:

The author is grateful to Dr. L. S. Ladke, Principal, Nilkanthrao Shinde Science and Arts College, Bhadrawati for providing all possible facilities during the study of

physico-chemical properties of Vijasan Lake. Author also thanks to Mr. N. Y. Shinde (Ex-MLA), Secretary, Bhadrawati Shikshan Sanstha, Bhadrawati for his support and co-operation.

Reference :

Pandey, A. K., Siddhiqui, S. Z. and Rama Rao (1993) Physico-chemical and biological characteristics of Husain sagar, an industrially polluted lake, Hyderabad. *Proc. Acad. Environ. Biol.* 2(2), 161-167.

Trivedy, R. K. and Goel, P. K. (1986) Chemical and biological methods for water pollution studies, Environmental publication, Karad, Maharashtra.

Kodarkar, M. S. (1992) – Methodology for water analysis, Physico-chemical, Biological and Microbiological Indian Association of Aquatic Biologists, Hyderabad, Publication 2, PP50.

A PHA (1985) – Standard Methods for Examination of water and waste water, 20th edition, American Public Health Association, Washington DC.

Table-1.: Physico-Chemical parameters of Vijasan Lake, Bhadrawati, site – V1 V2 V3 V4 V5 during December – 2016.

Month & Year December - 2016								
PHYSICAL PARAMETERS								
PARAMETER	Unit	V1	V2	V3	V4	V5	Mean	BIS, IS : 10500 (1983) ICMR standard
Atmospheric Temperature	(O ⁰ C)	17	17	18	17	18	17.4	-
Water Temperature	(O ⁰ C)	15	14	15	15	14	14.6	-
Colour	-	360	300	200	180	100	228	10
Odour	-	1.82	1.72	1.8	1.9	1.78	1.804	Unobjectionable
Tastes	-	1.8	1.92	1.86	1.78	1.82	1.836	-
Turbidity	(NUT)	112.32	112.8	112.32	112	112.64	112.416	10 (Max.)
Transparency	(cm)	25	24	27	25	25	25.2	-
Conductivity	(mhos/cm)	241	249	649	419	331	377.8	-
T.S.	(mg/l)	992	988	988	990	996	990.8	-
T.D.S.	(mg/l)	994	996	998	992	992	994.4	-
T.S.S.	(mg/l)	5.866	5.668	2.784	6.022	2.809	4.6296	-
CHEMICAL PARAMETERS								
PARAMETER	Unit	V1	V2	V3	V4	V5	Mean	BIS, IS : 10500 (1983) ICMR standard
PH	(mg/l)	5.75	5.96	5.64	6	5.71	5.812	6.5-8.5
DO	(mg/l)	3.4	3.2	2.8	3.2	3.5	3.22	-
BOD	(mg/l)	4.891	4.792	3.968	4.114	4.334	4.4198	-
COD	(mg/l)	13.7	13.2	12.1	14.1	13.2	13.26	-
Alkalinity	(mg/l)	495	500	545	545	525	522	-
Total Hardness	(mg/l)	190	200	210	220	218	207.6	300
Calcium	(mg/l)	210.42	216.4	221.4	218.4	220.4	179.607	75
Magnesium	(mg/l)	12.31	12.37	13.4	11.36	11.71	12.63	0.1 (Max.)
Chloride	(mg/l)	99.4	112.18	113.6	112.18	120.7	11.612	250
Sulphate	(mg/l)	11.09	11.12	11.25	11.45	12.35	11.452	150

Table -2: Physico-chemical parameters of Vijasan Lake, Bhadrawati, site – V1 V2 V3 V4 V5 during January – 2017.

Month & Year - January - 2017								
PHYSICAL PARAMETERS								
PARAMETER	Unit	V1	V2	V3	V4	V5	Mean	BIS, IS : 10500 (1983) ICMR standard
Atmospheric Temperature	(O ⁰ C)	19	18	19	19	18	18.6	-
Water Temperature	(O ⁰ C)	17	17	16	17	17	16.8	-
Colour	-	300	290	200	200	190	236	10
Odour	-	1.95	1.76	1.78	1.9	1.7	1.818	Unobjectionable
Tastes	-	1.9	1.85	1.9	1.82	1.82	1.858	-
Turbidity	(NUT)	112.21	112.25	112.45	112.2	112.32	112.286	10 (Max.)
Transparency	(cm)	26	24	28	25	26	25.8	-
Conductivity	(mhos/cm)	245	255	595	485	330	382	-
T.S.	(mg/l)	990	987	986	991	995	987.8	-
T.D.S.	(mg/l)	995	997	998	993	993	986.2	-
T.S.S.	(mg/l)	5.855	5.665	2.781	6.021	2.905	4.6456	-
CHEMICAL PARAMETERS								
PARAMETER	Unit	V1	V2	V3	V4	V5	Mean	BIS, IS : 10500 (1983) ICMR standard
PH	(mg/l)	5.71	5.95	5.63	6.02	5.69	5.8	6.5-8.5
DO	(mg/l)	2.9	3.4	2.7	3.5	3.7	3.24	-
BOD	(mg/l)	5.112	4.891	3.995	3.75	3.85	4.3196	-
COD	(mg/l)	13.5	13.2	14.1	13.2	13.5	13.5	-
Alkalinity	(mg/l)	545	545	495	535	527	529.4	-
Total Hardness	(mg/l)	195	205	211	211	215	207.4	300
Calcium	(mg/l)	210.4	219.3	226.3	218.4	220.3	218.34	75
Magnesium	(mg/l)	12.11	12.35	13.42	11.33	11.2	12.082	0.1 (Max.)
Chloride	(mg/l)	99.9	112.15	113.5	112.16	115.6	110.642	250
Sulphate	(mg/l)	11.01	11.08	11.2	11.35	12.2	11.368	150

Table -3: Physico-chemical parameters of Vijasan Lake, Bhadrawati, site – V1 V2 V3 V4 V5 during February – 2017.

Month & YearFebruary - 2016								
PHYSICAL PARMETERS								
PARAMETER	Unit	V1	V2	V3	V4	V5	Mean	BIS, IS : 10500 (1983) ICMR standard
Atmospheric Temperature	(O°C)	21	20	21	21	20	20.6	-
Water Temperature	(O°C)	20	20	20	19	20	19.8	-
Colour	-	300	300	250	180	100	226	10
Odour	-	1.82	1.95	1.9	1.78	1.76	1.842	Unobjectionable
Tastes	-	1.9	1.82	1.78	1.9	1.78	1.842	-
Turbidity	(NUT)	112	122	112	112.8	112.5	112.378	10 (Max.)
Transparency	(cm)	25	24	27	25	24	25	-
Conductivity	(mhos/cm)	249	241	650	420	332	378.4	-
T.S.	(mg/l)	991	990	988	991	995	991	-
T.D.S.	(mg/l)	995	994	992	995	994	994	-
T.S.S.	(mg/l)	5.85	5.67	2.78	6.022	2.902	4.6442	-
CHEMICAL PARAMETERS								
PARAMETER	Unit	V1	V2	V3	V4	V5	Mean	BIS, IS : 10500 (1983) ICMR standard
PH	(mg/l)	5.75	5.95	5.7	6	5.7	5.82	6.5-8.5
DO	(mg/l)	3.1	3.4	2.7	3.5	3.7	3.28	-
BOD	(mg/l)	4.99	5.11	3.97	4.199	4.335	4.5206	-
COD	(mg/l)	13.8	13.5	14.	13.1	13.5	13.58	-
Alkalinity	(mg/l)	995	545	535	545	535	631	-
Total Hardness	(mg/l)	195	205	210	219	215	208.8	300
Calcium	(mg/l)	210	216	226	218.4	220.4	218.406	75
Magnesium	(mg/l)	12.3	12.4	13.5	11.36	11.2	12.146	0.1 (Max.)
Chloride	(mg/l)	99.9	112	114	112.2	115.2	110.654	250
Sulphate	(mg/l)	11	11.5	11.1	11.3	12.5	11.48	150