



WATER QUALITY ASSESSMENT OF SATARA TUKUM LAKE OF POMBHURNA TEHSIL IN CHANDRAPUR DISTRICT OF MAHARASHTRA STATE WITH RESPECT TO PHYSICO-CHEMICAL CHARACTERISTICS

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ABSTRACT: Satara tukum is a very small village in Pombhurna tehsil of Chandrapur district located in Maharashtra state. A freshwater perennial lake is present in this village. All village people depend on this lake water for cloth washing, irrigation, farming, and for all domestic activities. Due to continuous anthropogenic activities the lake water is getting polluted day by day.

In this context in present studies 17 different physico-chemical characteristics of this lake water were analyzed for 2 years span during 2018-2019 and 2019-2020. The analyzed physical and chemical parameters include atmospheric temperature, water temperature, turbidity, conductivity, total dissolved solids, free CO₂, total alkalinity, pH, dissolved oxygen, total hardness, Calcium, chlorides, phosphate, nitrate, sulphate, Phosphate, COD and BOD were recorded. In all 17 different physico-chemical parameters were analyzed and recorded during the study on this freshwater ecosystem of perennial nature. The physico-chemical parameters show the prevailing water quality conditions of the lake water in a particular area which is presented in this research paper.

Key words: - Satara Tukum, Physico-chemical characteristics, Pombhurna tehsil, Chandrapur district, Maharashtra state.

INTRODUCTION :

India is a agricultural country totally based on water resources. The quality of water plays a vital role for mankind because it is directly linked with human health. Lake waters are mainly used for domestic, farming and cloth washing purposes. Increasing various human activities and some natural processes, degrade the water quality and is posing a great threat to all forms of life including man. The reason of water pollution in rural areas is due to extensive use of fertilizers and pesticides for agriculture purposes. We need to conserve water for future purpose and designing an appropriate framework to safeguard our natural resources

for sustainable development and biodiversity conservation.

The Physico-chemical parameters of any lake show the exact water quality conditions of the lake water in a particular lake site and a real picture emerge from it. In India a number of ponds, lakes and reservoirs are naturally present which are not being utilized fully due to lack of insufficient knowledge about them. In this context present research work is an attempt towards finding out the water quality of a perennial rural lake. The physico-chemical conditions vary according to different climatic conditions and the surrounding factors play a important role in it.

Studies on water quality were done in India by Choyal et al (2021), Bagde & Verma (1985), Meshram et al (2014), Gupta (2018), Oza and Singh (2015), Desai (2014), Tichkule and Bakre (2017), Chaudhary & Sitre (2020), Mehta et al (2016), Salve & Hiware (2006), Simpi et al (2011), Tandale and Dabhade (2014), Solanki and Saraswat (2020).

As no previous studies were reported from this region of Chandrapur district regarding water quality analysis of Satara tukum lake present research is an attempt towards bridging this gap.

MATERIALS AND METHODS :

Satara Tukum is very small village located 12 km away from pombhurna tehsil and 25 km away from district head quarter in Maharashtra state in which the perennial freshwater lake is situated. The Satara Tukum lake is about 194 mt. above mean sea level and is at 19°89'56.63' N latitude and 79°62'98.79' E longitude. The water depth of Satara Tukum lake is near about 7 feet during the monsoon season which decreases to 5 feet during the summer season.

Satara Tukum lake is perennial freshwater lake with huge water spread area in monsoon and harbor beautiful avifaunal diversity and aquatic vegetation. The study on this lake was conducted between Feb. 2018 to Jan. 2020. Water samples were collected as per standard references. Collected water samples were immediately brought to N.S.Science and Arts College, Bhadrawati District Chandrapur research laboratory every month and total 17 different physico-chemical parameters were analyzed. The physical parameters like air temperature, water temperature and pH were determined on the sampling spot itself while the other parameters like turbidity, dissolved oxygen (D.O.), Conductivity, total alkalinity, total Hardness, calcium, chlorides, sulphate, total dissolved solids, nitrate, Phosphate, COD and BOD were determined using standard literature

APHA (2005), Kodarkar (1992), Trivedi and Goel (1984) in the research laboratory.

RESULT & DISCUSSION :

The results of physico-chemical studies are presented in table No. 1 and 2. During the study period water temperature ranged between 20-29°C in both the years. The ambient atmospheric temperature of air ranged between 25 to 45°C. The PH of lake water ranged between 7.4 to 8.2. The conductivity ranged between 226-305 ms/cm. The total dissolved solids ranged between 160-245 mg./litre. The total alkalinity ranged between 105-130 mg./litre. The total hardness fluctuate between 128-161 mg./litre. Calcium ranged between 0.2 to 0.6 mg./litre. Chlorides ranged between 4.1 to 10.1 mg./litre. Phosphate ranged between 3.1 to 4.9 mg./litre. Sulphate ranged between 3.1 to 4.9 mg./litre. Nitrate ranged between 0.2 to 0.4 mg./litre. BOD ranged between 5.9 to 12.1 mg./litre and COD ranged between 19-40 mg./litre.

In present study ambient atmospheric temperature ranged between 23-45°C. The minimum was recorded in December and maximum in May months in summer season. Temperature is one of the most important parameter that influence almost all the physical, chemical and biological properties of water and thus the water quality. The lake water temperature is largely influences by local climatic conditions. Water temperature influences many abiotic and biotic components of aquatic ecosystem. It also reflects the dynamics of living organisms such as metabolic and physiological behavior of aquatic ecosystem. Maximum temperature of water in May is attributed to shallowness of lake water and high load of suspended matter (Kumar, 1992).

The dissolved oxygen of Satara tukum lake water fluctuate between 6.8 to 8.3 mg./litre. Dissolved oxygen in natural water depend upon physical, chemical and biological activities in the

water body. Dissolved oxygen content plays a vital role in supporting aquatic life and is susceptible to environmental changes. Dissolved oxygen is an important limnological parameter indicating level of water quality and organic pollution in water body (Wetzel and Likens, 2006). It was minimum in May (6.8) and maximum in December (8.3). Hiware (2006) observed that during summer water temperature was high due to low water level and clear atmosphere.

The CO₂ content of lake water ranged between 2.1 to 3.1 mg/litre in present work. Carbon dioxide is added to aquatic ecosystem as it is directly mixed from atmosphere. The increase in carbon dioxide level may be related to decay and decomposition of organic matter (Dutta Munshi, 1995).

Nitrates were the most oxidized forms of nitrogen and the end product of aerobic decomposition of organic nitrogenous matter. The evaluation of nitrogen is therefore an important parameter in understanding the nutritional status of water bodies. In our studies nitrate ranged between 0.2 to 0.4 mg/litre, maximum in rainy season and minimum in December months. Nitrate is attributed to anthropogenic activities such as run of water from agricultural fields, discharge of households and municipal sewage and other effluents contains nitrogen such observations are reported by Royer et al (2004). Simpi et al (2011) reported that values of nitrate ranged between 2.1 to 12.8 mg/litre in Hosaahalli tank of Karnataka supporting our work.

Turbidity of Satara tukum lake water ranged between 9-20 NTU. Turbidity was maximum during August month and minimum in February month. Similar result was recorded by Manjare et al (2010) supporting our work.

The sulphate content ranged between 3.1 to 4.6 mg/litre. Sulphates are found appreciably in all natural waters, particularly those with high salt

content. Besides industrial pollution and domestic sewage, biological oxidations of reduced sulphur species also add to sulphate content. Soluble in water it imparts hardness to other cations.

The pollution of water is measured by assessing the physico-chemical parameters of water (Wankhede et al, 2012). The physico-chemical analysis of water is the prime consideration to assess the quality of water for its best utilization like drinking, fisheries and industrial purposes and helpful in understanding the complex processes, interaction between the climatic and biological processes in the water. The present studies throw light on the contents of variation in different parameters of Satara tukum lake forming baseline data for future studies.

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Table: 1: Variations in Physicochemical parameters in Satara Tukum Lake during 2018-19.

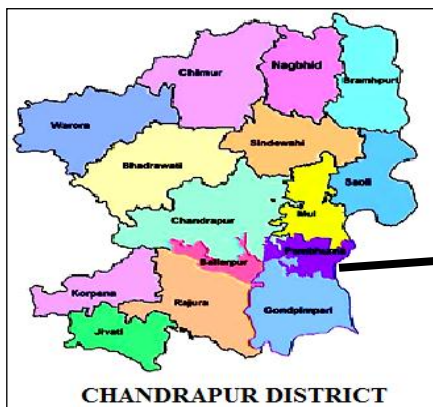
S. N.	Parameters	Feb.	Mar	Apr	May	Jun	July	Aug	Sep.	Oct.	Nov	Dec	Jan	Min	Max
1	Atm. Temp.	30	34	40	45	42	33	32	31	28	27	24	28	26	45
2	Water Tempe.	24	25	27	29	27	26	25	24	23	22	20	23	20	29
3	Turbidity	9	10	12	13	16	24	25	22	19	18	17	16	9	25
4	pH	7.9	8.1	8.0	8.20	8.2	7.9	7.7	7.8	7.8	8.0	8.1	8.11	7.7	8.20
5	Conductivity	256	289	304	305	298	250	220	225	235	248	252	256	220	305
6	Ttotal Dissolved Solids	160	185	191	198	201	230	240	208	201	199	195	165	160	210
7	Dissolved Oxygen	7.5	7.3	6.9	6.8	7.0	7.2	7.9	8.0	8.1	8.2	8.3	7.9	6.8	8.3
8	Free CO₂	2.9	2.9	3	3.1	3	2.9	2.8	2.5	2.4	2.4	2.5	2.2	2.4	3.1
9	Total Alkalinity	105	110	114	114	118	113	129	130	125	115	109	106	105	130
10	Total Hardness	128	129	144	148	148	144	132	128	126	129	120	121	120	148
11	Calcium	0.42	0.41	0.52	0.6	0.51	0.5	0.4	0.3	0.31	0.2	0.3	0.4	0.2	0.6
12	Chloride	7.8	9.8	9.8	10	10.1	10.1	10.5	9.7	9.7	9.5	9.7	9.6	7.8	10.5
13	Phosphate	4.6	4.6	4.9	5.1	4.9	4.7	4.5	4.8	4.8	4.9	4.6	4.7	4.5	5.1
14	Sulphate	3.6	3.8	4.5	4.9	4.9	4.8	4.3	3.9	3.6	3.8	3.1	3.2	3.1	4.9
15	Nitrate	0.31	0.35	0.2	0.25	0.2	0.41	0.51	0.26	0.33	0.35	0.4	0.22	0.2	0.51
16	BOD	9.8	12	12.1	12.3	12.2	12.00	11.8	11.5	11.1	10.1	9.9	9.85	9.85	12.3
17	COD	39.8	39.8	40.2	40.0	39.5	38.5	37.6	36	35.5	36	37	38.9	35.5	40.2

Table:2: Variations in Physicochemical parameters in Satara Tukum Lake during 2019-20.

S.N	Parameters	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Min	Max
1	Atm. Temp.	30	35	40	45	42	33	32	31	28	27	23	28	23	45
2	Water Temp.	24	25	27	29	27	26	25	24	23	22	20	23	20	29
3	Turbidity	9	10	12	13	15	20	21	17	14	13	12	11	9	20
4	pH	7.9	8	8.1	8.2	8.2	7.9	7.8	7.6	7.5	7.4	7.4	7.9	7.4	8.2
5	Conductivity	256	289	304	305	298	250	270	268	260	250	265	220	220	305
6	T.D. S.	160	185	191	198	201	240	245	225	205	190	170	169	160	245
7	D.O.	7.5	7.3	6.9	6.8	7.0	7.2	7.9	8.0	8.1	8.2	8.3	7.8	6.8	8.3
8	Free CO ₂	2.9	2.8	2.9	3.1	3	2.8	2.7	2.6	2.4	2.5	2.6	2.1	2.1	3.1
9	Total Alkalinity	105	110	125	130	120	113	118	116	112	110	108	106	105	130
10	Total Hardness	128	129	144	148	148	144	160	161	148	139	140	138	128	161
11	Calcium	0.45	0.48	0.5	0.6	0.5	0.55	0.3	0.3	0.2	0.41	0.3	0.4	0.2	0.6
12	Chloride	8.8	9.8	9.8	10	0.6	10.1	9.7	9.5	4.3	4.8	4.5	4.1	4.1	10.1
13	Phosph.	4.6	4.6	6.0	6.5	5	4.9	4.5	4.7	4.8	4.9	4.6	4.6	4.5	6.5
14	Sulphate	3.6	3.8	4.5	4.9	4.8	4.8	4.3	3.9	3.6	3.8	3.1	3.2	3.1	4.9
15	Nitrate	0.3	0.31	0.22	0.25	0.3	0.4	0.3	0.22	0.25	0.26	0.28	0.31	0.2	0.4
16	BOD	9.8	12	12.1	12	12.1	12	10.5	9.4	8.3	6.9	6.2	5.9	5.9	12.1
17	COD	39.6	39.8	40	40.1	40.1	40.5	38.5	35	30.1	24	20	19.5	19	40

All the values in table are in mg/litr except temperature, PH, Conductivity and turbidity.

STUDY AREA



Satara Tukum lake view