

Water Quality Assessment of Tulashi Tank from Kolhapur District, Maharashtra, India

K. B. Koli*, and D. V. Muley**

* Department of Biology, The New College, Kolhapur (M.S.) 416 012, India

** Department of Zoology, Shivaji University, Kolhapur (M.S.) 416 004, India

Abstract:

Water of Tulashi tank is utilized for pisciculture, irrigation and domestic purposes. It is an urgent need to assess the water quality. The Physico-chemical parameters of Tulashi tank were studied during January to December, 2008. The results discovered that there was a significant seasonal variation in some physico-chemical parameters. Water temperature ranges from 22.16 to 28.64°C, turbidity 0.68 to 2.95 NTU. Transparency 32.45 to 44.56 cm. The pH 7.10 to 8.85, DO 6.48 to 8.52 mg/l, CO₂ 1.89 to 5.98 mg/l, Alkalinity 126.42 to 162.42 mg/l, Total Hardness 82.46 to 156.26 mg/l. Phosphate 0.19 to 1.94 mg/l, Nitrates 2.17 to 12.45 mg/l and Chlorides 37.26 to 43.48 mg/l. Above values are within the acceptable limits of BIS standard for drinking water therefore the water is potable and suitable for pisciculture.

Key Words: Physico-chemical parameters; Tulashi tank; Kolhapur district

I. INTRODUCTION:

Water is very important life supporting material. Every living organism needs water, without which neither the life nor any development is possible. Thus it is very much essential for a healthy growth. But it may become harmful for life, if one uses water polluted with harmful or with toxic substances and poor sanitation. [1] Water quality parameters provide the basis for judging the suitability of water for its designated uses and to improve existing conditions. For optimum development and management for the beneficial uses, current information is needed which is provided by water quality programmes. We depend on water for domestic needs, irrigation, sanitation and disposal of wastes. The quality and quantity of surface water bodies like lakes and tanks depend upon the climate, catchments, geography of the area and the inputs and outputs both natural and manmade [2]. The water quality of lakes can be degraded due to microbiological and chemicals contaminants. Normally water in nature is never pure in chemical sense. In water natural impurities are in very low amounts. Lakes, dams, rivers are important source of fresh water.

The quality of water is described by its physical, chemical and microbial characteristics. But, if some correlations were possible among these parameters, then significant ones would be fairly useful to indicate the quality of water. The study of physico-chemical properties of an aquatic ecosystem is important, because fluctuation in the water quality has an influence on the biotic communities. This information is important to be communicated to the general public and the Government in order to develop policies for the conservation of the precious fresh water resources [3]. The aims of this study were designed to monitor seasonal variation in water quality parameter of Tulashi tank so as to assess its status and suitability through the potability and aquaculture point of view and to compare observed levels of studied parameters with the corresponding WHO and BIS guidelines values for drinking-water quality and pisciculture.

II. MATERIALS AND METHODS:

Study area:

Tulashi tank was artificial earthen (with masonry spillway) type of dam. It is situated about 48 km from Kolhapur city, towards the south-west side and constructed in 1966 – 1969. It is situated at Latitude 16° 31'15 " East and longitude 74° 01' 00 " North. Its average length is 1522 meter and average height is 48.68 m. The Catchment area of the project is 34.92 Sq. Km and Water storage capacity is 91.92 M.cum.

Physico-chemical parameters:

Study of physico-chemical parameters were carried out during the period of January, 2008 to December, 2009. By considering the morphometry and human activities sampling sites were selected at different places along the tanks, From all the four stations of tank, water samples were collected from the periphery at about 1 to 1.5 meters depth fortnightly. The water samples were collected in plastic cans of 2-3 lit capacity and brought to the laboratory to study various parameters.

Temperature and pH were recorded at the time of sample collection using portable kit. The determination of dissolved oxygen, free carbon dioxide, hardness, chlorides, total alkalinity, inorganic phosphate and nitrate were analyzed in the laboratory as per the standard procedure and metrology described by [4, 5].

III. RESULTS AND DISCUSSION:

The results of the present study were shown in table 1.

Table 1: Annual physico-chemical status of Tulashi tank (Jan 2008 to Dec 2008).

Sr . No	Physicochemical parameters	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1	Temperature (°c)	22.16	22.48	24.56	26.48	28.64	27.45	26.47	25.12	25.47	24.18	23.56	22.58
2	Turbidity (NTU)	2.25	2.90	2.95	1.20	1.45	1.65	1.74	1.56	1.90	0.85	0.68	1.56
3	Transparency(cm)	40.10	32.45	35.46	32.48	30.40	42.56	39.42	38.85	35.42	44.56	45.26	46.18
4	p ^H	7.10	7.65	7.45	7.80	8.10	8.28	8.13	8.12	7.90	8.08	8.10	8.26
5	D.O (mg/l)	7.35	6.48	6.88	8.14	8.52	8.46	8.42	8.26	8.10	8.49	8.10	8.13
6	Free co ₂ (mg/l)	2.52	2.98	2.13	2.78	1.89	1.56	2.47	4.23	4.59	5.58	5.98	6.12
7	Alkalinity (mg/l)	132.45	126.42	132.46	128.46	142.45	131.47	152.47	158.45	148.46	162.42	158.46	152.47
8	Hardness (mg/l)	83.42	82.46	96.43	107.12	156.26	145.72	110.49	102.45	98.24	95.47	91.46	87.48
9	Phosphate mg/l)	0.35	0.31	1.2	1.06	0.82	0.19	0.89	0.67	1.46	1.85	1.92	1.94
10	Nitrate (mg/l)	2.17	2.45	2.22	2.43	2.46	2.17	2.45	6.48	12.45	11.56	6.42	4.23
11	Choloride (mg/l)	38.12	39.23	37.26	38.10	42.26	41.15	43.48	42.45	41.27	40.48	42.26	39.45

Surface water temperature was fluctuated between $22.28 \pm 0.32^{\circ}\text{C}$ to $28.96 \pm 0.65^{\circ}\text{C}$ at Tulashi tank. The minimum temperature was recorded in the month of January (22.16°C) and maximum in May (28.64°C). The seasonal pattern in temperature fluctuation was recorded as low in winter season, while high in summer season. [6] have recorded minimum water temperature during winter and maximum during summer (May, June) of Banjara Lake.

Turbidity is an important limiting factor in the productivity of freshwater ecosystems. It was recorded within the range from 0.68 to 2.95 NTU. The minimum turbidity was observed in the month November of maximum in March. [7] observed that maximum transparency value was in December and minimum in August at freshwater tropical wetland of santhal Pargana (Bihar).

Transparency is the property of water by which it allows light to pass. Light is an essential factor in freshwater environments for survival of hydrophytes and acts source of oxygen as a byproduct of photosynthesis. Transparency was varied from 32.45 cm to 44.56 cm. Lower transparency values were observed in February and higher in October. This pattern in transparency was also observed by [8] in Bhilangana River from Tehri Dam reservoir of Uttaranchal.

The pH of the water samples was alkaline throughout study period. pH was recorded within the range from 7.10 to 8.28. Minimum pH was observed in the month of March and maximum in the month of June. [9] also reported that pH was fluctuated between 8.18 to 8.21 in Karaman stream of Antalya, Turkey. pH range within 6.0 to 8.5 range is good for culturing tropical fish species and, it is the recommended levels for drinking water [10]. Federal Environmental protection Agency (FEPA) recommended pH 6.5-8.0 for drinking and 6.0-9.0 for aquatic life. The cheap rate of photosynthetic activities reduces the assimilation of carbon dioxide and bicarbonates which are eventually responsible for increase in pH, the low oxygen values coincided with high temperature during the summer month. The factors like temperature bring about changes in the pH of water. The higher pH values observed suggests that carbon dioxide, carbonate- bicarbonate equilibrium is affected more due to change in physico- chemical condition [11, 12]. Change in pH is due to discharge of agricultural wastes, human anthropogenic activities and surface runoff.

The dissolved oxygen was recorded within the range from 6.48 to 8.52 mg/l Minimum dissolved oxygen was recorded in the month of February and maximum in the month of May. The amount of dissolved oxygen in water was not constant but fluctuates, depending on temperature, depth, wind and amount of biological activities such as degradation [13]. [14] have reported that in summer, dissolved oxygen concentration decreased due to high temperature. The dry season showed a significantly higher oxygen content than the wet at Kangimi reservoir, Kaduna state Nigeria.

The free carbon dioxide content in the water samples of Tulashi tank was within the range from 1.89 to 5.98 mg/l. High content of free carbon dioxide was recorded in the month of November and minimum in May [15] also recorded the similar results regarding free CO₂ content from freshwater bodies.

Alkalinity in the water samples of Tulashi tank varied from 126.42 to 162.42 mg/l. Minimum alkalinity was recorded in February and maximum in October. Similar observations have been made by [16] on Rivers Nile in Egypt.

The hardness was fluctuated from 82.46 to 156.26 mg/l. The minimum hardness was recorded in the month of February and maximum in May. The similar results were obtained by [17] from the study of ponds from Phosphate content was fluctuated between 0.19 to 1.94 mg/l. It was observed as minimum in June and maximum in December. The phosphate content in any water body was quite opposite in relation to dissolved oxygen and phytoplankton population. Many earlier workers have also reported similar findings [18].

Nitrate content in the water was recorded within the range from 2.17 to 12.45 mg/l. Minimum nitrate content was observed in the month of January and maximum in September.

The chloride content in water samples was recorded from 37.26 to 43.48 mg/l. Minimum chloride content was recorded in the month of March and maximum in July. [19] also found similar behavior of chlorides in their studies on Sagar Lake with summer maxima and winter minima.

Almost all parameters during the present study meet the water quality norms as per BIS New Delhi. Now it is clear that, the tank is not polluted by human anthropogenic activities and agricultural runoff from surrounding areas. Hence, it is appropriate for human consumption. Moreover, tank is used for irrigation, fishery and domestic purposes. As water is not contaminated, it is potable.

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