



STUDY OF PHYSICOCHEMICAL PARAMETERS OF UTTARMAND RESERVOIR IN PATAN TAHSIL, DISTRICT SATARA (M. S.) INDIA

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Abstract: Water quality profile based on physicochemical parameters is short and easy approach to assess present status of any water body. Reservoirs have social and economic importance for humans, as they bring industrial, agricultural and urban development, contributing with hydroelectricity and supplying water for human consumption and irrigation. Uttarmand is a medium irrigation project constructed across the river Uttarmand, a tributary of Krishna river in Patan Tahsil of Satara district in Maharashtra. Various anthropogenic activities adversely affect physicochemical parameters of the water. Thus, water quality assessment from selected sampling stations of the reservoir was carried out from January, 2019 to December, 2019. The water quality parameters analyzed includes temperature, pH, turbidity, total dissolve solid (TDS), total hardness, alkalinity, chlorides, free CO₂, dissolved oxygen, BOD, phosphate and nitrate. Variation in physicochemical parameter was observed which gives baseline information in water quality monitoring strategies.

Index Terms – Uttarmand Reservoir, physicochemical parameters, anthropogenic activities, water quality monitoring.

Introduction:

Water is one of the most precious resources on earth without which there would be no life on Earth. Nowadays, water pollution is a major global problem. It is an acute problem almost in all major rivers and dams in India. Water pollution is increasing and becoming severe day-by-day and posing a great risk to human health and other living organisms. (Jameel A., 2002). Assessment of water resource quality of any region is an important aspect of developmental activities of the region, because rivers, lakes and manmade reservoirs are used for water supply to domestic, industrial, agricultural and fish culture (Jackher and Rawat, 2003).. The physicochemical properties will also help in the identification of sources of pollution, for conducting further investigations on the eco-biological impacts and also for initiating necessary steps for remedial actions in case of polluted water bodies (Ekwenye and Oji, 2008). Uttarmand is a medium irrigation project constructed across the river Uttarmand, a tributary of Krishna river in Patan Tahsil of Satara district in Maharashtra. Various anthropogenic activities adversely affect physicochemical parameters of the water. So the present study is undertaken to analyze various physicochemical parameters of water to interpret water quality of the reservoir.

Materials and methods:

Water samples were collected monthly from three different sites of Uttarmand Reservoir. Water samples were collected in polyethylene bottles having two-liter capacity, labeled properly and analyzed in laboratory for their physico-chemical parameters. Monitoring was done during January 2019 to December 2019. Parameters like water temperature and pH were recorded at the time of sample collection while other parameters like turbidity, total dissolve solid (TDS), total hardness,

alkalinity, chlorides, dissolved oxygen (DO) and chemical oxygen demand (COD) were estimated in the laboratory. These water quality parameters were studied by using standard methods.

Result and Discussion:

The data of various physicochemical parameters at three different sampling sites after monthly observation indicating their minimum and maximum ranges during Jan. 2019 to Dec. 2019.

Table: physicochemical profile of Uttarmand reservoir

Sr. No.	Physicochemical Parameter	Range
1.	Temperature ($^{\circ}\text{C}$)	23.8-35
2.	pH	7.53-8.86
3.	Turbidity (NTU)	0.1-1.8
4.	D/O (mg/lit)	5.46-8.40
5.	BOD	4-8
6.	Alkalinity (mg/lit)	92-135
7.	Free CO_2 (mg/lit)	0.15-0.25
8.	TDS (mg/lit)	262.5-394.33
9.	Hardness (mg/lit)	95.00-118.20
10.	Chlorides (mg/lit)	2.50-13.0
11.	Phosphate (mg/lit)	0.10-0.23
12.	Nitrate (mg/lit)	0.01-0.03

Water temperature is of enormous significance as it regulates various abiotic characters and also activities of an aquatic ecosystem (Kataria *et al.*; 1995). The minimum water temperature recorded as 23.8°C in month January and maximum water temperature 35°C was found in month May. The variation in water temperature at different time were probably due to surface hitting during the day and cooling during night the variation in water temperature may be due to different timing of collection and influence of season.

pH is an important parameter that determines the suitability of water for various purposes. pH of water is important for the biotic communities because most of the plant and animal species can survive in a narrow range of pH from slightly acidic to slightly alkaline condition. During the study period minimum pH recorded as 7.53 in month August and maximum pH 8.86 was found in month May.

Turbidity is a measure of the cloudiness or clarity of water. Turbidity values were fluctuated between 0.1-1.8 NTU.

Dissolved oxygen is one of the most important parameter in assessing the quality of water, which is essential to maintain biotic forms in water. In present investigation amount of dissolved oxygen varies between 5.46 mg/lit to 8.40 mg/lit. Harney *et al.*; (2013). Pawar and Pulle, (2005) reported maximum dissolved oxygen in months of January and minimum in summer in Pethwadaj dam, Nanded district, Maharashtra.

Biochemical oxygen demand is nothing but the amount of oxygen utilized by microorganisms to stabilize the organic matter. BOD determines the strength of sewage, effluents and other polluted waters and provides data on the pollution load in all natural waters. BOD values ranges between 4 mg/L to 8 mg/L.

Alkalinity of the water is the capacity to neutralize strong acids that gives primarily a function of carbonate, bicarbonate and hydroxide content and formed due to the dissolution of carbon dioxide in water. Total Alkalinity ranged from 92 mg/lit. in the month September to 135 mg/lit in the month May. The amount of Total Alkalinity in reservoir is varied from season to season.

The monthly variations of free CO_2 showed minimum value 0.15 mg/lit in the month April and maximum value 0.25 mg/lit recorded in the month September. The fluctuations in free CO_2 values correspond directly with standing crop of phytoplankton. As the number of phytoplankton increase through winter and summer months the free carbon dioxide disappears because of greater utilization of free CO_2 for photosynthetic activity.

Total Dissolved Solids values of Uttarmand Reservoir varied from 262.5 mg/lit in the month November to 394.33 mg/lit. in the month May.

Calcium, magnesium, carbonates, bicarbonates, sulphates, chlorides, nitrates, organic matter together associate and forms hardness of water. The total hardness of reservoir water ranged between 95.00 mg/lit in the month December to 118.20 mg/lit in the month May.

Higher concentration of chloride in the water may be due to discharge of domestic sewage and also excess of chlorine in water, it serves as an indicator of water pollution. The values of Chloride varied from 2.50 mg/lit. in the month November to 13.0 mg/lit. in the month May.

Phosphates are essential for the growth of organism and a nutrient that limits primary productivity of the water body. Phosphate is the key nutrient also causing eutrophication leading to extensive algal growth (Yadav Priyanka, 2013). In the present investigation phosphate ranges from a minimum 0.10 mg/L to 0.23 mg/L.

Nitrate is the oxidized form of nitrogen and end product of aerobic decomposition of organic nitrogenous matter. The presence of nitrate in fresh water bodies depends mostly upon the activity of nitrifying bacteria, domestic and agricultural source. In the present investigation, nitrate content varied between 0.01 mg/L to 0.03 mg/L throughout the study period.

Conclusion:

In present investigation the observed values of various physicochemical parameters were found within the permissible limit as described by WHO and the reservoir water satisfy the requirement for the use in various purposes.

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