

7. Study of Physicochemical Characterization of Drinking Water Resources in Hadgaon Region Dist. Nanded Maharashtra, India

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Abstract

The Drinking Water Resources available in the Hadgaon region is specifically Isapur Dam situated on Penganga River. The aim of the present study was to analyze in physico-chemical quality of drinking water in Hadgaon region. Water is the most vital abiotic component of the river ecosystem and while studying the biodiversity of any river ecosystem, the Knowledge of the physicochemical quality of lake water becomes important. The physicochemical character of water prevailing in this river has to be studied in detail. Therefore it was thought to undertake studies on physicochemical quality of water resources available in the Hadgaon region. The study was carried out seasonally during the academic year 2013. The parameters such as water temperature, pH, total alkalinity, dissolved oxygen and carbon dioxide were estimated.

Keywords: *Drinking water resources, Biodiversity, Physicochemical character, river ecosystem.*

Introduction

The fresh water bodies of India includes a large number of rivers, ponds, dams, impoundments and lakes. The river system, have ideally the quality of water should be assessed on the basis of physic-chemical and biological parameters on order to provide the complete spectrum of information (Totawar and Tamlurkar, 2017).

The drinking water resource in Hadgaon region is specifically Isapur Dam situated on Penganga River. Isapur is situated 4 km to the west of Shembalpimpri. The height of the dam above lowest foundation is 57 m (187ft), while the length is 4,120.1 m (13,517ft). The gross storage capacity is 1.254000 km³ (0.300851 cu mi) in volume. This is one of the biggest Dam in Maharashtra. This dam is ranked at 4th position having around 3.5 km long earth wall.

The climatic factors such as rainfall, temperature, atmospheric pressure and humidity help in understanding the complex process of interaction between the climate and the biological process in water bodies (Totawar and Tamlurkar, 2017).

The aim of the present study was to analyze in physico-chemical quality of drinking water resource in Hadgaon region. Water is the most vital abiotic component of the river ecosystem and while studying the biodiversity of any river ecosystem, the Knowledge of the physicochemical quality of river water becomes important. The physicochemical character of water prevailing in this river has to be studied in detail. Therefore it was thought to undertake studies on physicochemical quality of water in drinking water resource in Hadgaon region i.e. Penganga River.

Methodology

Water samples were collected from selected four sites of drinking water resource in Hadgaon region i.e. Penganga River with the help of sterile bottles. They were labeled and transported to the laboratory and stored at 4⁰C until further analysis. The water samples were collected using standard recommended method and the samples were taken at different depths as depth of the sampling is important because the mobility of nutrients varies with the nutrient content in the different water zones. The depth of sampling was kept as recommended. For water samples also the standard recommended method were followed. Sampling was done in different seasons in the academic year 2013 from four sites. The parameter selected for analysis For water were temperature, pH, color, odour, total dissolved solids, alkalinity, total hardness, permanent hardness, BOD (biochemical oxygen demand), COD (Chemical oxygen demand), chloride, Nitrates, Nitrites, Turbidity, salinity, dissolved sulphate, and phosphate. The pH and temperature recorded on the spot by using pH paper and thermometer and rest of the parameters were analyzed in the laboratory by standard methods.(Chakrabarti and Basu, 2006) (Table 1).

Result & Discussion

Solar radiation and atmospheric temperature bring about interesting changes in aquatic ecosystem. Many workers studied the role of climatic factors in understanding the ecology of aquatic ecosystem.

Temperature plays an important role in thermal stratification which have some effect on chemical and biological activities of aquatic media like dissolved O₂, CO₂, water and air. The water temperature recorded at morning hour ranges between 18 to 30.3⁰C at all the four sampling

sites. Maximum temperature is recorded in the Summer season (Pandey and Tripathi, 1988; Pulle, 2000; Pawar, 2002).

pH is the scale of intensity of acidity and alkalinity of water and measures the concentration of hydrogen ions. Most of the biological processes and biological reactions are pH dependent. Some workers stated that waters having a pH range of 6.5 to 9.5 as recorded before day break are most suitable for River culture and those having pH values of more than 9.5 (alkaline) as unsuitable, because in the later, CO_2 is not available, hence pH is considered as an indicator of overall productivity that causes habitat diversity (Swingle, 1967). The pH recorded, ranged from 7.10 to 7.58 at all the four sampling sites (Minns, 1989).

The water that can neutralize the acid is called alkaline water. The alkalinity might be due to the high pH or it may be caused by cations of Ca^{++} , Mg^{++} , Na^+ , K^+ , NH and Fe^{+3} combined either as CO_3 or bicarbonate as hydroxides. At pH values less than 8.3 but more than 4.5 practically no CO_2 is present, but free CO_2 and CO_2 and bicarbonate may be present, (Jhingran, 1991). He also concluded that many fish ponds and rivers have the total alkalinity values equivalent to 10 to 50 ppm CaCO_3 . According to some workers in the highly productive water alkalinity reach to over 100 ppm (Alikunhi, 1967) and most productive water is that which titrates 200 to 500 ppm equivalent CaCO_3 . The total alkalinity values at *Isapur Dam situated on Penganga River* were found to be in the range of 108 mg/lit to 118 mg/lit (Schaperlaus, 1933).

Dissolved oxygen is one of the important parameter in water quality assessment. Its presence is essential to maintain the higher form of biological life in the water. The wastewater is determined largely by the oxygen balance in the system. Oxygen is formed by absorption from the atmosphere at the surface of pond and by photosynthesis of the chlorophyll bearing organisms inhabiting in water body. Thus oxygen act as an indicator of planktonic development which has a significant role in growth of fish (Jayaraju et al, 1994), the high temperature and low dissolved oxygen during summer create favourable condition for the development of blue green algae. The salinity and oxygen are inversely proportion and therefore low oxygen results in high salinity, which affect the fish production. The dissolved oxygen recorded at four sampling site of *Isapur Dam situated on Penganga River*, ranges between 5.30 to 9.10 mg/lit.

Carbon dioxide is vital in the life of plant and micro organisms. It is produced as a result of respiration of aquatic organisms. As CO_2 is highly soluble in water, it is found to be in larger amount in polluted water compared to fresh water bodies. CO_2 has a great effect on

photosynthesis which effect again on fish growth. Some workers found the free carbon dioxide high in pre-monsoon and monsoon period and low in winter. The values of CO₂ ranges from 3.41 to 6.11 mg/l at all four sampling site of Isapur Dam situated on Penganga River (Dwivedi and Pandey, 2002). MPN (Most Probable Number) Analysis of the four water samples is between 8 – 10 bacteria per 100 ml of water sample so the water is suggested to be potable for drinking purpose

Conclusion

The water of Isapur Dam situated on Penganga River one of the drinking water resource is found to be more suitable for available biodiversity. The water is productive having the maximum Alkalinity 118 mg/l also less than 8 pH, MPN (Most Probable Number) Analysis of the four water samples is between 8 – 10 bacteria per 100 ml of water sample so the water is suggested to be potable for drinking purpose. DO and CO₂ of the water is measured within the range of 5 to 10 mg/l which is the suitable condition for biodiversity but the water contains high hardness and total solids than the recommended value. Hence with Overall Analysis of the water sample collected from drinking water resource in Hadgaon region situated on Penganga River having the large area for catchment should be treated in municipal water treatment plant before using the water for drinking purpose.

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Table 1: Penganga River Water Analysis

Sr. No.	Parameters	Results			
		Site A	Site B	Site C	Site D
1	Physical Appearance	Clear	Clear	Clear	Clear
2	Odour	Chlorinated	Chlorinated	Chlorinated	Chlorinated
3	Turbidity (As NTU)	0.80	1.00	1.10	0.95
4	pH	7.20	7.15	7.40	7.10
5	Chlorides	100.20	89.00	78.00	95.00
6	Nitrate	11.30	8.40	7.50	9.56
7	Nitrites	Traces	Traces	Traces	Traces
8	Total Hardness	240.00	230.00	250.00	270.00
9	Permanent Hardness	120.00	95.00	115.00	114.00
10	Total Dissolved Solids	41.00	52.00	65.00	62.00
11	Iron	Nil	0.050	0.040	0.045
12	Fluorides	0.10	0.05	0.15	0.08
13	Alkalinity	108.00	118.00	115.00	110.00
14	Total Suspended Solids	109.00	99.00	92.00	94.00
15	BOD	12.00	10.00	13.00	11.00
16	COD	110.00	95.00	99.00	102.00
17	Total Solids	106.00	102.00	112.00	115.00
18	Dissolved Oxygen	6.34	5.30	9.10	5.75
19	Carbon Dioxide	3.41	4.41	6.11	5.12
20	MPN	10	8	9	10