

Physico-chemical Study of Panzara Dam- Maharashtra

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ABSTRACT

In this study, water quality of the Panzara down has been studied based on the physico-chemical and bacteriological parameters. The results have been compared with the norms of WHO. The results of microbial analysis has shown main concern of deteriorating water quality and need to be treated before use.

INTRODUCTION

Water is called life. The life on the earth would be impossible without water. It is gift to man by nature. It is essence for all living organisms. It is the main component of protoplasm of cell. It is used in biological activities in organisms. Water meant for human consumption should not be only safe but also wholesome. Safe water is one that cannot harm to consumer even when ingested for prolonged period of time. Drinking water must be free from chemical substances and microorganisms that might be hazardous to health of community. Water pollution has threatened the potable quality of water and reduced the quantity available in ponds, lakes, river and reservoirs due to disposal of sewage, industrial effluents, use of excess fertilizers and use of pesticides.

The total volume of hydrosphere is 1.4 billion km³. It covers 70% of earth surface. Out of that 97.3% of water is in the ocean and seas, which is unsuitable for human use. Only 2.7% is fresh water. It is estimated that only 0.00192% of total water on the earth is available for human consumption (Trivedi, 1998). Unplanned urbanization and rapid industrialization and indiscriminate use of chemicals and fertilizers and pesticides in agriculture are causing heavy pollution in aquatic ecosystem. This lead to deterioration of natural water quality and depletion of aquatic life.

Heavy metals are also present in water. These are non-biodegradable. Heavy metals are dangerous because they tent to bioaccumulate. Heavy metals can enter a water supply by industrial and consumer waste. Most of the ionic forms of metals are toxic to leaving organisms at higher concentration, while some metal ions are toxic at low concentration and very few metals ions are toxic even in trace amount such as Hg and Pb. The higher concentration of HgCl₂ decrease the protein content of the prawn *Macrobrechium rosenbergii* (Jigna Desai and S.K. Tank, 2007). Presence of heavy metal ions in natural water is subject of serious concern, when such water resources are used for drinking purpose by human and other living organisms (Mule and Patil, 2000) Prolonged use of metallic contaminated water resources for drinking purpose is

dangerous for public health, hence the analysis of physico-chemical parameters is done for water resource of Panzara Dam. The Panzara Dam is a medium size dam, constructed on the Panzara river, near village Pimpalner, Taluka Sakri, Dist. Dhule, Maharashtra. The dam is being used for irrigation and supply of drinking water to Sakri Taluka, Dhule city and also for Pisciculture on lease basis.

MATERIALS AND METHODS

Water samples were collected for the period of 12 months from May 2007 to April 2008. The samples were collected in plastic containers, which were thoroughly cleaned with nitric acid and rinsed several times with distilled water before use. Analysis was performed to determine turbidity, color, pH, total dissolved solids, alkalinity, hardness, Ca, mg, Fe, sulphate as SO_4 , chlorides as Cl, nitrates as NO_3 , sodium, conductivity, organic carbon, and microbial analysis. Analysis of various heavy metals such as Cu, Cd, Cr, Zn, and Pb was also done according to the methods of APHA (1980).

RESULTS AND DISCUSSION

Table 1 and 2 shows the various physico-chemical parameters important for deciding the quality criteria for drinking water from Panzara dam. The recorded values are also compared with quality standards as proposed by WHO (1984).

The present study shows that the permissible limits of color, odour, taste, and turbidity are mostly narrative and the water from the present water body is acceptable for the drinking and fishing purpose. The permissible limit of pH for potable water ranges within 6 to 8.5. In the present study the pH ranges between 7.51 to 8.19, which is slightly alkaline and the water body is suitable for the aquatic biota. The dissolved solids ranges between 151 to 194 mg/lit, which also very much within the permissible limit. Hardness, which is very important parameter to determine usefulness of water in different sectors is also very much below the permissible limits that, is between 20 to 81 mg/lit. Calcium (Ca) ranges between 11.1 to 28.1mg/lit, magnesium (mg) between 1.1 to 3.2 mg/lit, sulphate (SO_4) ranges between 23 to 32 mg/lit, nitrates (NO_3) ranges between 1.12 to 9.6 mg/lit and chlorides (Cl) ranges between 21.3 to 57 mg/lit which are within the permissible limits and also indicates that the water body is very much suitable for the drinking and fishing purpose. The conductivity and organic carbon is also within permissible limits Conductivity ranges between 0.205 to 0.304 and organic carbon between 0.011 to 0.024 mg/lit.

Analysis of heavy metals such as Cu, Cd, Cr, Zn, and Pb was also done. During one year period from the water of Panzara Dam. The result shows higher values in one month in case of chromium due to agricultural runoff. The concentration of Cr suitable for the human consumption is 0.05 mg/lit and for the agricultural and industrial use it is 0.2 mg/lit. In our study the concentration of Cr in the month of June was 0.37 mg/lit, which is higher than the permissible limit.

Table-1 Comparison of different Physico-chemical parameters with suggested surface water standards for source Suggested by WHO (1984)

Test	Permissible	Excessive	Range in samples mg/lit
Turbidity	2.5	10	Clear
colour	5	25	Clear
pH	7-8.5	6.5-9.5	6 to 8.5
total solids	500	1500	163-223
Dissolved solids	500	1500	151-223
Suspended solids	-----	-----	Nil-123
Total alkalinity	200	600	0.1-0.4
Partial Alkalinity	-----	-----	3- 5.6
Hardness	200	600	20-81
Ca	75	200	11.1-28.1
mg	30	150	1.1-3.2
Fe	trace	trace	Trace
SO ₄	200	400	23-32
Cl	200	1000	21.3-57
Nitrates	45	1000	1.12-9.6
Sodium	-----	-----	7.8-14
Conductivity	-----	-----	

Rainfall is the chief source of water in the Panzara Dam. During one year study the copper(Cu) content of the dam varied from 0.0089 to 0.05ppm The copper(Cu) content in the fresh water and ground water was estimated by several workers (Harish Chandra et al., 1991; Bhosle and Patil, 2001; Mule and Patil, 2000) who reported the increase level of copper content when compared to permissible limit of copper in drinking water. Prolonged exposure to CdCl₂ can cause depletion of amino acids of *Macrobrachium rosenbergii* (Jigna Desai and S.K.Tank (2008)). The lead was not detected in the water of Panzara Dam during this period. The concentration of Zn varied from 0.0014 to 0.17 ppm that is within the permissible limit. Heavy metal Cadmium (Cd) ranges from 0.0017 to 0.0143 ppm, which did not exceed the permissible limit of WHO 1984.

Table-2 Comparison of different heavy metals with Suggested Surface water standards for Source Suggested by WHO

Toxic Substances	Excessive	permissible	Range in samples, mg/lit
Copper (Cu)	1.5mg/lit	----	0.0089-0.05
Cadmium (Cd)	0.01 mg/lit	----	0.0017-0.143
Chromium(Cr)	0.05 mg/lit	0.05 mg/lit	Nil-0.39
Zinc (Zn)	1.5 mg/lit	5.9 mg/lit	0.0014-0.17
Lead (Pb)	0.1 mg/lit	-----	Nil

As far as microbial analysis is concern, in individual or small community supplies E.Coli count should be zero in any sample of 100 ml and coliform organisms should not be more than 3 per 100 ml. If coliforms exceed 3 per 100 ml, the supply should be disinfected (PCD,1978). The analysis of nonchlorinated water of Panzara Dam shows that during the study period MPN count exceed 1800 and it should be disinfected before supply.. 0.1 ppm chlorine is recommended for drinking purpose.

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