

Study of physico-chemical characteristics of municipal drinking water supply of Sidhi district

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ABSTRACT

Water quality characteristics of aquatic environment arise from a magnitude of physical, chemical and biological interaction of water bodies. Rivers, lakes and sanctuaries are continuously in a dynamic state of change with respect to their geochemical characteristics. The dynamic balance in the aquatic ecosystem is upset by the activities of living organisms resulting water pollution. The present paper deals with the physico-chemical characteristics of municipal water supply of Sidhi district and confirms that Sidhi Dam water is not safe for drinking water and needs immediate installation of a filtration plant in Sidhi.

Key words: Water quality assessment, Sidhi District.

INTRODUCTION

Sidhi is a small district of Madhya Pradesh with prominent industrial complexes such as NCL (Singrauli) and NTPC (Vindhyannagar). It is situated in the eastern part of Madhya Pradesh surrounded by Baragaon (East) Madwas (South) Rewa (West) and Mirzapur and Allahabad (North). Bhadaur is the nearest railway station at a distance of 40 kms.

For a population of about 50,000 besides some river water the alternative source of water supply in the Municipal areas is Sidhi dam where sedimentation and chlorination are the only treatments available.

The present paper with the chemical analysis of the municipal drinking water supply from Sidhi dam to Sidhi town.

MATERIAL AND METHODS

Samples of municipal drinking water were collected in clean polythene bags in different seasons in the year 2004 and subjected to chemical

analysis for the measurement of different parameters such as temperature, turbidity, pH, conductivity, DO, BOD, COD and NO_3^- and Cl^- , SO_4^{2-} and F by methods prescribed by APHA (1980) and APHA *et al.*, (1987). Required amount of chlorine was applied to kill bioforms such as bacterial and algal species (Table -1).

RESULTS AND DISCUSSION

The temperature of municipal drinking water varied from 18° (winter) to 32° (summer). The turbidity was higher in monsoon period (4.60mg/l) while lower in summer 1.05mg/l pH varied from 6.2 (winter) to 8.2 (summer) and conductivity ranged from 370 mho (winter) to 1210 mho (monsoon). NO_3^- concentration was highly variable from 1.24 ppm (summer) to 6.00 (winter) Cl concentration from 200 ppm (winter) to 340 ppm (monsoon) SO_4^{2-} from 180 ppm (summer) to 250 ppm (monsoon). Fluorides recorded as 0.25 ppm (winter) to 0.50 ppm (monsoon).

Variation of DO level was noted as 1.40 ppm (summer) to 3.00 ppm BOD ranged from 1.20

ppm (winter) to 7.40 ppm (monsoon) and COD from 15.0 ppm (winter) to 80.00 ppm (summer). The range of Ca^{++} was noted as 28 ppm (winter) and 50 ppm (summer) (Table - 2).

Water is the most vital resources for all kinds of life on this planet. The quality of drinking water certainly affects the life of human population. Intake of contaminated / Polluted water in the prime sources of human diseases that has created a great problem of health. Goel *et al.*, (1980) and Kumar *et al.*, (1996) worked out the physico-chemical characteristics of water and their seasonal changes. The present paper reports the physico-chemical characteristics of municipal water supply of Sidhi distric with a view to asses the quality of drinking water. The results of chemicla analysis revealed a variation of temperature from 20°C (winter) to 32°C (summer). This variation is the commulative effect of heat gain fram solar energy and transfer by conduction/evaporation. The temperature of stored

water volume is a great signigicance in the regulation of various physico-chemical as well as biological activities (Mishra and Yadav, 1978 and Munawar, 1974) pH is an indication of type and intensity of pollution (Zafar, 1964). In the present result lower pH volume indicates the water acidic.

Turbidity is caused by the substances which do not exist in form of true solution and is directly related with scattering of light. The higher turbidity during monsoon reperesent higer rate of light scattering affecting photosynthesis.

Conductivity is a measure of the capacity of a substance/solution to conduct electrical flow and is reciprocal to resistance. The resistance of an aqueous solution is inversely proportional to ion content. This is why, pure water with specific conductivity 0.038×10^{-6} mho cm^{-1} at 18°C is poor conductor of electrical flow but due to dissolved substances such as NH_3 , CO_2 conductivity. Thus, conductivity is directly proportional to ions concentration. In the present investigation the increased conductivity of drinking water of Sidhi Dam indicates higher concentration of dissolved ions (impurities) during monsoon.

Dissolved oxygen is one of the important parameters in water assessment. It is essential to maintain biological life in aquatic ecosystem. The Oxygen balance of water is reduced due to increased metabolic activities and inorganic reducing agents such as H_2S , NH_3 , NO_2 and Fe^{++} ions. (Suresh *et al.*, 1989).

Table - 1: Chlorine required to kill bacterial and algal organisms

S. No.	Organism	Cl_2 (ppm)
1.	Protozoa	0.3 - 0.1
2.	Sulphur bacteria	0.5
3.	Diatoms	0.5 - 2.0
4.	Green	0.3 - 1.5
5.	Iron-bacteria	0.5
6.	Blue-green	0.5 - 1.1

Table - 2: Physico-chemical characteristics of municipal water supply of Sidhi District

1.	Water temperature (°C)	32	26	18
2.	Turbidity (NTU)	1.05	4.06	1.05
3.	pH	8.2	7.3	6.2
4.	Conductivity (Mhos)	850.0	1210.0	370.0
5.	DO (ppm)	1.40	1.75	3.00
6.	BOD (ppm)	5.30	7.40	1.20
7.	COD (ppm)	80.00	40.00	15.00
8.	Nitrate (ppm)	1.24	5.8	6.0
9.	Chloride (ppm)	240.0	340.0	200.0
10.	Sulphur (ppm)	100.0	250.0	240.0
11.	Floride (ppm)	0.40	0.50	0.25
12.	Calcium (ppm)	50.0	30.0	28.0

In the present study, the oxygen maxima was recorded during winter (3.00 ppm) which indicates lower amount of inorganic reducing agents. Decomposition of organic matter may be an important factor to reduce Dissolved Oxygen during summer. The dissolved inorganic minerals (S, NO₃, Ca) do influence the purity of water and make it more toxic (Moriarty, 1983).

The lower quantity of Fluorides (<0.5ppm) in drinking water of Sidhi caused dental diseases. Increased eutrophication is another important factor for water pollution. (Samantaray *et al.*, 1983). The increased BOD during monsoon confirms the

eutrophic level (Aher *et al.*, 2005).

On the basis of the physico-chemical characteristics, it may be concluded that the drinking water supply for Sidhi Dam is not fully safe and needs immediate installation of a filtration plant in Sidhi.

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REFERENCES

1. Aher N.H., Jain D.S., Kumavat, M.R. and Nandan., S.N. *Proceeding of ISCA*, Ahmadabad (2005).
2. APHA *Standard methods for examination of water* New York (1980).
3. APHA, AWWA and WPCF *Standard methods for the examination of water and waste water*, New York (1987).
4. Goeld P.K. Gopal B & Trivedi, R.K., *Intern. J. Ecol., Env Sc.* **6**: 97-116 (1980).
5. Kumar, N and Kumar, K. *Bioved.*, **7**(2): 171-174 (1996).
6. Mishra, G.P and Yadav, A.K. *Hydrobiological.*, **59**: 275-278 (1978).
7. Munawar, M. *Hydrobiologia.* **44**: 13-27 (1974).
8. Moriarty, F. *Ecotoxicology, the study of pollutants in ecosystem*. Academic Press. London, 332 (1983).
9. Suresh, C., Sukla N., Rajmikant .S and Tripathi, B.D *Geobios.* **16**: 20-27 (1989).
10. Samantara, R.S.M and Padi, S.B. *Res J. Chemistry and Environment.* **3**(4) 19-21 (1999).
11. Zafar, A.R. *Phykos* **5**: 115-216- (1964).