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NOTE

Preliminary Physico-Chemical Studies of Water Flow of Machna Annicut Dam, District Betul (M.P.)

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Betul, a district of Madhya Pradesh, is situated about 199 km, southeast of Bhopal. The need of water for irrigation and other purposes is met from Machna river, the lifeline of Betul city. This river also caters to the drinking water needs of Betual city. The monitoring of Machna Annicut dam water flow has been done seasonally at Vivekanand Nagar, Betul. The samples were collected from the upstream and downsteam of the flow path of the river at six points. Water temperature, turbidity and conductivity were found higher in summer season. The pH, alkalinity, nitrate, chloride, fluoride, total hardness, Ca and Mg hardness, BOD and COD were found higher in monsoon season. The study is aimed to assess the degree of pollution of Machna Annicut dam water and its quality status.

Public health critically depends upon the availability and quality of drinking water. Water is one of the major carriers of several diseases of both chemical and bacteriological origin. Due to increasing industrialization, urbanisation and other development activities, most of our water bodies such as ponds, lakes, streams and rivers have become polluted. Today many rivers receive substantial quantity of industrial effluents, sewage, domestic waste, agricultural runoffs etc. About 72% of the streamlets and rivulets contained polluted water. Hence it has become essential to ascertain the potability of water before it is used. For the achievement of the above purpose a periodic monitoring and constant vigil of water resources at strategic points must be selected for ensuring safe drinking water.

The present study aims at assessing the degree of pollution of Machna Annicut dam water and its quality status. The river Machna receives domestic sewage, dead bodies of animals and funeral ash in higher amounts than the industrial effluents.

The selection of sampling points was decided in the light of objectives of environmental monitoring programme. The collection of sample was followed as per the internationally accepted APHA and BIS proposed standard methods. The

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water samples were collected in clean jerrycans. Pre-sterilized bottles were used for the collection of DO and BOD samples. Temperature and pH of the samples were observed on the spot. The water samples were preserved for the determination of DO and BOD. The methods for analysis were followed as standard methods[1–4] suggested.

Table-1 shows the results of Machna Annicut dam water flow for all seasons of the year 1995–1996. The temperature of river water showed positive correlationship with pH, total alkalinity, turbidity, total hardness as calcium carbonate in monsoon and negative correlationship with iron. Turbidity was found ranging from 4.1 to 21.1 National Turbidity Unit. Higher value of turbidity than the permisible limits (2.5–10) in monsoon is due to the soil clay particles dissolved in the water.

TABLE-1
PHYSICO-CHEMICAL ANALYSIS OF MACHNA ANNICUT DAM WATER DURING 1995–96

Parameters	Units	Summer	Monsoon	Winter
Temperature	°C	28.30	25.80	21.30
Turbidity	NTU	4.10	21.10	4.80
Conductivity	μmhos/cm	302.00	271.00	239.00
pH	pH scale	7.90	7.60	7.70
Total alkalinity	mg/ L	159.30	188.60	134.00
Total hardness	mg/ L	98.00	184.40	120.50
Calcium hardness	mg/ L	68.20	104.20	52.00
Magnesium hardness	mg/ L	46.80	56.40	50.30
Chloride	mg/ L	48.90	62.40	30.20
Fluoride	mg/ L	0.10	0.14	0.10
Nitrate	mg/ L	1.44	2.71	1.50
DO	mg/ L	5.40	6.80	7.20
BOD	mg/ L	5.40	5.90	5.30
COD	mg/ L	40.10	38.80	31.80
Iron	mg/ L	1.00	0.90	1.03

The pH of surface water is specified for protection of fish life and to control undesirable chemical reactions such as dissolution of metal ions in acidic waters. The environmental protection agencies criteria for pH are 6.5 to 9.0 for fresh water aquatic life and 5 to 9 units for domestic water supplies. In the present study the pH was found ranging from 7.6 to 7.9 which is similar with the findings of previous workers[5–8]. Specific conductivity was found ranging from 239 to 302 μmhos/cm. Minimum values were recorded in winter season. Total alkalinity of water is due to salts of weak acids. High alkalinity of water is not fit for drinking purpose. In the present study, total alkalinity ranging from 134.0 to 188.6 mg/L has been determined.

Total hardness is caused by divalent cations. In the present study the total

hardness ranged from 98.0–184.4 mg/L which was found higher in monsoon, calcium and mangnesium hardness ranged from 52–104.2 mg/L and 46.8–56.4 mg/L respectively. Previous workers[4–7] reported total hardness ranging from 110.1–149.5 mg/L in river Ganga, Chlorides (Cl^-) were found substantially ranging from 30.9–62.4 mg/L. Fluoride limits recommended in drinking water are from 0.6–1.2 mg/L. Low fluoride level is linked with dental caries and high fluoride level may cause fluroorosis. In the present study, fluoride ranged from 0.1–0.14 mg/L. High value of nitrates due to the domestic sewage and fertilizers varied from 1.44–2.71 mg/L.[8]

The Environmental Protection Agencies criteria for DO is minimum (5.0 mg/L) for fresh water. In the present study DO ranged from 5.4–7.2 mg/L. DO value may be higher due to algal growth. It is lower due to pollution (Patel *et al.*[8]). BOD is the measurement of water pollution in terms of oxygen. It is oxygen in water that is consumed by the microorganisms feeding on the organic pollutants. Acceptable limits for BOD are 6.0–100 mg/L. In this study it ranged from 5.3–5.9 mg/L. COD was observed to be varying from 31.8–40.1 mg/L approximately which is within limits. Findings are similar with Raina *et al.*[9]. Noted COD ranged from 23.8 to 46.6 ppm in Jhelum river. Iron is present in the soluble form in soil. World Health Organization recommends the iron range 0.3 mg/L. Higher values were obtained in witnter season due to confluence of domestic sewage. The findings are similar to Raina *et al.*[9] as iron ranged form 0.1 to1.0 mg/L in Jhelum river and Sengupta *et al.*[10] recorded iron content ranging from 0.1–1.0 mg/L.

Conclusion

The chemical parameters indicate that the nutrient load is very low due to lack of industries and the river water may be used after proper treatment. Higher values of BOD, COD, turbidity and lower value of DO are due to the human activities and domestic sewage directly mixed in the river due to the lack of proper sanitary system in village areas.

REFERENCES

1. APHA Standard Methods for the Examination of Water and Waste Water: APHA, AWWA, WPCF, New York (1986).
2. Indian Standard IS-2296, Tolerance Limits for Inland Surface Water Subject to Pollution, second revision, Indian Standards Institution, New Delhi (1982).
3. R.K. Trivedi and P.K. Goel, General Chemical and Biological Methods for Water Pollution Studies, Environmental Publications, Karad (1986).
4. Manual on Water and Waste Water Analysis, NEERI, Nagpur, p. 340 (1986).
5. P.I. Chacko and S.V. Ganapati, *Indian Geol. J.*, **24**, 35 (1949).
6. Sanjay Telang, Praveen Jain and Ahmed Jawed Khan, *Orient. J. Chem.*, **12**, 97 (1996).
7. E. Jalan and G.S. Pandey, *Ind. J. Env. Pro.*, **8**, 593 (1988).
8. M.K. Patel and T.N. Tiwari, *Ind. J. Env. Pro.*, **12**, 889 (1978).
9. V. Raina, A.K. Shah and Shakti R. Ahmad, *Ind. J. Env. Hlth*, **26**, 187 (9884).
10. B. Sengupta, S. Laskar and J. Das, *Ind. J. Env. Hlth.*, **30**, 202 (1988).

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