

WATER QUALITY ANALYSIS OF THE TIGHRA RESERVOIR, GWALIOR, MADHYA PRADESH

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ABSTRACT

The Tighra reservoir situated about 20 km west of Gwalior city, near Tighra village is primarily used to fulfill the water supply of Gwalior city. The water is also used to culture fishes by the fisheries department and for irrigation purpose. Physico-chemical studies were under taken to study the water quality of the reservoir. In this study water temperature ranges from 18.4 0C to 35.75 0C, transparency from 152.75 cm to 211.5 cm, pH from 6.95 to 7.72., conductivity from 272.5 μ S/cm to 408.5 μ S/cm dissolved oxygen ranged between 5.425 and 8.125 mg/lit , free carbon dioxide from 4.15 mg/lit and 7.82 mg/lit., total alkalinity from 53.75 mg/lit to 145.5 mg/lit and chlorides from 11.85 mg/lit and 39.5 mg/lit. The present study showed that the water of Tighra is quite safe for drinking purposes. The study also indicates that the water is quite suitable for fish culture.

KEYWORDS : Tighra reservoir, Physico-chemical studies, Water quality

Gwalior, an ancient city known for the great musician Tansen, is situated in the north region of Madhya Pradesh. The city is gifted with a number of historical places and tourist places. The Tighra reservoir, the life line of Gwalior, was primarily constructed to fulfill the water supply of the city. Tighra reservoir is the major source of drinking water to Gwalior city. Besides, the water of Tighra reservoir is also used for irrigation and pisciculture.

The Tighra reservoir is situated about 20 km west of Gwalior city, near Tighra village which is in close proximity of SADA Magnet city. It lies on 26°13' N latitude and 78° 30' E longitude at an altitude of 218. 58 m. The reservoir is surrounded by hills from three sides. The construction of the reservoir was started in the year 1910 across a seasonal rain fed Sank river primarily to fulfill the water supply of the city. The reservoir is irregular in shape having shallow embayment at its periphery. The maximum depth of the reservoir is 130.80 m (4600 mcft). The reservoir has a live storage capacity of 124.23 m (4390 mcft). Physico-chemical analysis of the reservoir was carried out for one complete year from November 2010 to October 2011 to study the water quality of the reservoir.

MATERIALS AND METHODS

For physico-chemical studies, the reservoir was divided into four zones. In each zone one sampling station was selected, as marked in the Figure 1 as S1, S2, S3 and S4. The sampling stations were so selected as to cover the maximum area of the reservoir. The monthly samples of

subsurface water were collected during first week of each month in the early hours of the day. pH and temperature were estimated on the spot, while other parameters were estimated in the laboratory, employing the methods described by APHA (1989) and Trivedy and Goel (1986).

OBSERVATIONS AND DISCUSSION

Physico-chemical characteristics of the water are given in table 1.

Temperature

Temperature is an important factor in water bodies. It affects chemical and biological reactions in water. A rise in water temperature accelerates chemical reactions, reduces the solubility of gases, alters the taste and odor and elevates the metabolic activities of organism. In Tighra reservoir, water temperature varied from 18.4°C to 35.75°C. Minimum temperature was recorded in January. Maximum water temperature was recorded during the months of April, May and June. Increase in water temperature, during summer, was due to decrease in water level and exposure of the water to maximum solar radiations. Similar observations were also made by Kadam et. al. (2007) and Jagtap et. al.(2011).

Transparency

Transparency of water depends on the total solids, total dissolved solids and total suspended particles of the water. Transparent waters allow more light penetration which has far reaching effects on all aquatic organisms including their development, distribution and behavior.

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Sreenivasan (1968) reported that waters with low transparency were not suitable for fish growth. Tighra reservoir showed good transparency of water i.e. varied

from 152.75 cm to 211.5 cm which was suitable for fish. Transparency of the water varied from 152.75 cm to 211.5 cm. Sharma (2005) found maximum transparency of the

Table 1 : Physico-Chemical Characteristics of the Water of Tighra Reservoir

| Parameter | Unit | Range | |
|---------------------|--------|---------|---------|
| | | Minimum | Maximum |
| Temperature | °C | 18.4 | 35.75 |
| Transparency | cm | 152.75 | 211.5 |
| Conductivity | μS/cm | 272.5 | 408.5 |
| pH | mg/lit | 6.95 | 7.72 |
| Dissolved oxygen | mg/lit | 5.425 | 8.125 |
| Free carbon dioxide | mg/lit | 4.15 | 7.82 |
| Total alkalinity | mg/lit | 53.75 | 145.5 |
| Chloride | mg/lit | 11.85 | 39.5 |

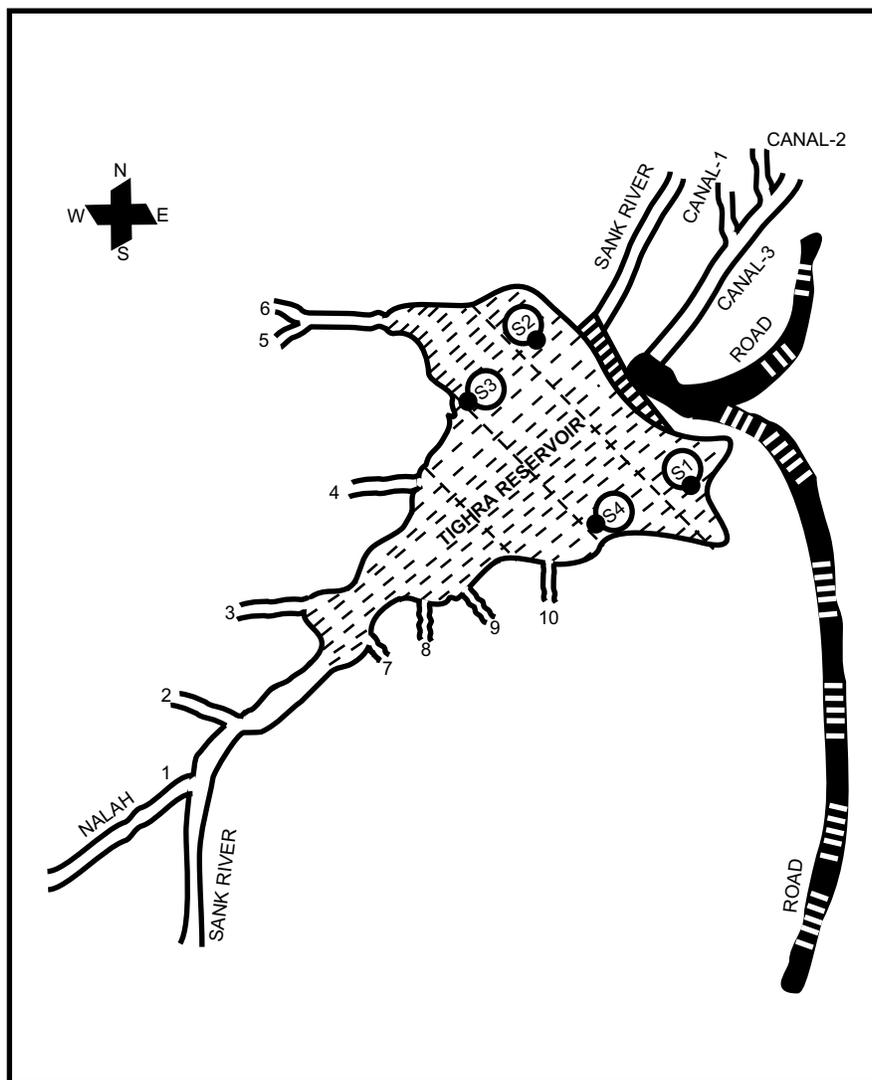


Figure 1 : Hydrographic Map of Tighra Reservoir, Gwalior, Madhya Pradesh

water of Makroda reservoir, Guna during winter and it was minimum during rainy season.

Conductivity

Conductivity is the numerical expression of ability to carry electric current which in turn depends on the ionic strength. It is an indicator of ionic composition. Amb (2015) in her studies on Ramghat Dam, Madhya Pradesh, recorded electrical conductivity in the range of 0.160-0.270 mS/Cm. The water conductivity of Tighra reservoir ranged between 272.5 μ S/cm and 408.5 μ S/cm. High conductivity was recorded during summer, which might be due to increased chlorides and dissolved solids, due to evaporation of water, resulting in increased concentration of salts.

pH

The variation in pH is an important parameter in water bodies since most of the aquatic organisms are adapted to a narrow range of pH and do not withstand abrupt changes. In the present study, the average pH ranged from 6.85 to 7.72 throughout the study period. The desirable pH of drinking water is 7 to 8.5 (WHO, 1984). The results show that the water of Tighra reservoir is suitable for drinking purpose and is under the standard range. The pH between 6 and 9 is most suitable for fish culture and pH more than 9 is unsuitable (Ellis, 1937 and Swingle, 1967). pH values also indicate that the water of Tighra is also suitable for fish culture.

Dissolved Oxygen

Dissolved oxygen is one of the most important parameters in water quality and is an index of physical and biological processes going in the water. In Tighra reservoir, average dissolved oxygen varied from 5.425 to 8.125 mg/lit. Raghwansi (2005) recorded dissolved oxygen in the range of 12.8 to 18.6 mg/lit at lower lake Bhopal.

Free CO₂

Respiratory activities of aquatic organisms and process of decomposition are important sources of CO₂ in water bodies. Free CO₂ is added to aquatic ecosystem by directly being mixed from atmosphere. Free CO₂ was recorded in the range of 4.15 mg/lit to 7.57 mg/lit in Tighra reservoir. Free CO₂ was found more during monsoon period and minimum during winter.

Alkalinity

Alkalinity is the capacity to neutralize a strong acid. It is a measure of the ability of the water to absorb H⁺ without significant change in pH. In natural waters, most of the alkalinity is caused due to CO₂. The average alkalinity ranged between 53.76 mg/lit and 145.5 mg/lit in Tighra reservoir. In Tighra reservoir maximum alkalinity was recorded during summer, followed by winter and minimum during monsoon season.

Chloride

Chloride is an indicator of contamination of water with animal and human wastes. In the present study, chloride concentration ranged between 11.3 mg/lit and 40.7 mg/lit. Low chloride contents indicate that the water is not polluted and is safe for drinking purpose.

CONCLUSION

On the basis of the present study of physico-chemical parameters it can be concluded that the water of Tighra Reservoir is safe for drinking purposes. In addition, the study indicates that the water is quite suitable for fish culture and by adopting new and better management and scientific approach the production of the fish can be augmented.

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