International Journal of Advanced Science and Research
ISSN: 2455-4227; Impact Factor: RJIF 5.12
Received: 02-06-2019; Accepted: 04-07-2019
www.allsciencejournal.com
Volume 4; Issue 5; September 2019; Page No. 05-07

A study on physico-chemical parameters of Halali Dam in Vidisha district (MP) Bhopal

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Abstract
Present study deals with Physico-chemical parameters of Halali reservoirs situated in Vidisha District of Bhopal (M.P.) India. Monthly variations in physical and chemical parameters such as Air Temperature (26°C to 34.4° C), Water Temperature (18.5 to 27.8 °C), pH (7.2 to 8.5), Dissolved Oxygen (6.0-7.2 mg/L), TDS (151 to 267 mg/l). Total Hardness (66 to 80mg/L), Chlorides (14 to 65 mg/L), Phosphate (0.00 to 0.04 mg/L) Nitrate (0.74 to 3.10mg/L) etc, were investigated. All physicochemical parameters were observed within the standard limits of WHO and BIS (2012).

Keywords: Physico-chemical parameter, Halali reservoirs, WHO, BIS

1. Introduction
Rivers are the most important sources of fresh water. All the livings organisms on the earth need water for their survival. Earth is the only planet having about 70 presents of water. But due to increase in human population, Industrialization, use of fertilizers in the agricultures and manmade activity made it highly polluted (Mohan *et al.*, 2012). To assess the water quality physicochemical analysis is the prime deliberation for its best utilizations like drinking, Irrigation, fisheries, Industrial purposes and is also helpful in understanding the complex processes. The objective of the present study was to assess the quality of water by means of physicochemical parameters.

Study area
The Halali reservoir is situated in the Vidisha district of Madhya Pradesh, India. This reservoir was built on the Halali River, and lies 40 km away from the state capital Bhopal. It coordinates 23.49°N 77.51 °E.

Methdology
The river water samples were collected from the Halali Dam. The analysis of parameters like water temperature, air temperature, pH, DO was observed to assess the degree of pollution. Other parameters like TDS, specific Conductivity, total alaklinity, total hardness, chlorides, nitrate and biological oxygen demand were analyzed as per the standard guidelines and procedures (APHA, 2012).

Results and Discussions
Air Temperature
During the presents study the Air Temperature Varied from 26°C to 34.4° C. The maximum air temperature was recorded 36°C in the month of June and minimum air temperature was recorded in the month of January (Table 1). Similar observations were reported by Wanganeo *et. al.*, (2007) [1] in Sarangpani pond Bhopal and Khan *et. al.*, (2016) [2] in lower lake.

Water Temperature
During the presents study the Water Temperature Varied from 18.5 to 27.8 °C. The maximum air temperature was recorded 27.8° in the month of june and minimum air temperature was recorded in the month of Januaray (Table 1). Similar water temperature pattern was observed by Priyatharsini and Dhanalakshmi (2016) [3] in the Vembanoor wetland; Khan *et. al*., (2016) [2] in the lower lake and Surve *et al.*, (2005) [4] in the Kandhar Dam.

pH (Hydrogen ions concentrations)
In the present study at Halali Dam minimum value (7.2 units) of pH was recorded in Dec ember and maximum value of pH (8.5 units) was recorded in the month of May (Table 1). Higher average value of summer seasons in may be due to low water level and higher concentrations of nutrients in water and minimum average value of pH in winter it may be due to low temperature and less photosynthesis. Ramakrishna (2003) [5] while working on Nagchoon pond also reported maximum in summer and minimum in winter due to increase in bicarbonate ions in water. Similar results were observed by Hutchinson (1957) [6]; Agarwal and Rajwar 2010 in Tehri Dam. The permissible limit of pH (6.5 to 8.5 units) for drinking purposes has been documented by BIS (2012).

TDS (Total Dissolved Solids mg/l)
The minimum (151mg/l) and maximum (267mg/l) value of TDS were recorded in the months of January and June respectively (Table 1). Similar observations were observed in Tighra reservoir by Uchchariya (2012) [8] in Tighra reservoir and Minor Keenjhar lake by Korai *et. al.*, (2008) [9].

Specific Coductvity (µS/cm)
The specific conductivity showed a minimum value of 180µS/cm and a maximum value of 353µS/cm in the months of February and June respectively which is below the standard level (1400 µS/cm) as per WHO (Table 1).. Similar results observed by Wanganeo *et. al.*, (2011) [1] and Raina *et. al.*, (1981).

Nitarte (mg/l)
In the prestn study of work minimum (0.48mg/l) and maximum (2.31mg/l) values of nitrate were recorded in the

months of November and June respectively (Table 1). Similar observations was reported by Uduma (2014) [10] worked in sachet water in kanometropolis. The permissible limit of total alkalinity is 45 mg/l for drinking purposes ranged by BIS (2012) [16].

Chloride (mg/l)

In the period of investigations the minimum (26 mg/l) and maximum (52 mg/l) values of chloride were found in the months of January and June respectively (Table 1). Siddamallaya and Pratima (2008) also reported similar pattern of chloride values in fresh water body. The permissible limit of total alkalinity is 250 mg/l for drinking purposes ranged by BIS (2012) [16].

Total Alkalinity (mg/l)

The total alkalinity value ranged between 120 mg/l to 242 mg/l minimum (120mg/l) and maximum (242mg/l) values of total alkalinity were recorded in the months of January and May respectively(Table 1). Higher level of alkalinity in summer has also been reported Singh and Saha (1987) [12] in composite fish culture pond. The permissible limit of total alkalinity is 200 mg/l for drinking purposes ranged by BIS (2012) [16].

Total Hardness (mg/l)

During the presents study the Total Hardness Varied from the lowest (114 mg/l) and highest (162 mg/l) were recorded in the months of December and May respecively (Table 1). Similar observations by Agaadi et. al., (2005) in Papnash pond. The permissible limit of total alkalinity is 200 mg/l for drinking purposes ranged by BIS (2012). [16]

Dissolved Oxygen(mg/l)

In the investigation highest value (7.3mg/l) of DO was recorded in the month of January and minimum value of 5 mg/l was recorded in the month of June (Table 1). Similar observations by Hussainy (1967) [13] in Limnology and primary production of a tropical lake, and Rani *et. al*., (2004) [15] in Santa City.

Biological Oxygen Demand(mg/l)

The BOD value was ranged between 3.2 mg/l to 6.4 mg/l. The minimum value of BOD recorded was 3.2 mg/l in the month of January and maximum value (6.4 mg/l) of BOD was found in the month of June (Table 1). A similar observation of BOD was made by **Siraj *et. al.*, (2010)** in Shallabugh wetland of Kashmir.

Table 1: Showing the present physicochemical observations in relation to WHO and BIS standards

Parameters	Present study	WHO standards -2011	BIS standards -2016
Air temp. (°C)	26°C -34.4°	---	---
Water temp. (°C)	18.5 - 27.8	---	---
pH (units)	7.2 - 8.5	7.0-8.5	6.0-8.5
Conductivity (µS/cm)	173-245	750	750
TDS (ppm)	151 -267	500-1000	500-2000
Total alkalinity (mg/l)	120-242	---	200-500
Total hardness (mg/l)	114-162	100-500	200-600
Chlorides (mg/l)	26-52	250	250-1000
Nitrate(mg/l)	0.48-2.31		
DO (mg/l)	5-7.3	---	---
BOD(mg/l)	3.2-6.4		

Conclusions

A study of physicochemical parameters of Halali Dam (Madhya Pradesh) was carried out by taking physicochemical parameters which according to BSI and WHO fall under the permissible limits, suggests that it is used for pisciculture, irrigation purpose and also for drinking purpose after treatment.

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