



Appraisalment of Seasonal Variation in Water Caliber of Surface Water of Halali Dam with the special reference to Environmental Pollution in Vidisha District of Madhya Pradesh.

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Abstract- India is a developing country, having many problems to solve but the environmental pollution is one of the burning one. By all of, water pollution is becoming more and more dangerous day by day, only because of human stresses. Present research work deals with the study of seasonal alteration in the water quality of Halali Dam, located in Vidisha district of (with special reference to environmental pollution in the area) Bhopal, M.P. Parameters like Temperature, pH, Conductivity, TDS, Total Alkalinity, Total Hardness, Chloride, Nitrate, DO, BOD was studied during the work period.

Keywords - Environmental pollution, Human stresses, seasonal variations, Water quality and Halali Dam.

Introduction- Water and Air are the most vital wealth on the planet Earth (1-9). Water is a natural resource attainable to us. All living organisms on our planet depends on water for their growth and survival. Rivers are the most precious source of freshwater. Mother Earth is the only planet in our solar system having about 70% of water. But, owing to increase in human population, industrialization, use of pesticides and fertilizers in agriculture and other anthropogenic practices made it exceedingly polluted. Thus, it is unavoidable that the quality of drinking water should be checked at definite interval of time because, polluted water may cause serious water borne diseases (10,11). Water resources majorly in the developing nations are unfortunately facing serious problems due to different anthropogenic activities and mainly unsustainable use of water source (12).

Halali river in India is a tributary of River Betwa. Halali River was earlier famous as Thal River but, in the 18th century Dost Mohammad Khan's forces murdered a Challenger Rajput force near Jagdishpur (later rechristened as Islamnagar) on the bank of river. The river was relabeled to "Halali River" meaning "The river of Slaughter". Because it appeared red with the blood of the suffered. Another name of the Halali river is Banganga. On the river a dam is constructed famously known as Halali Dam. Halali Reservoir is a Reservoir in Madhya Pradesh, heart of India, passing over Bhopal, Raisen and Vidisha district. The dam is constructed on the Halali river and lies 40 km northwards from "The City of Lakes" Bhopal. The place is full of natural beauty and rich in biodiversity. The main fish species present in the dam include catla, rohu, mrigal, wallago, mystus and chitala also used for consumption purpose. The Halali was commissioned in 1973.

Halali Dam

Country	– India
Location	– Bhopal, Raisen and Vidisha District
Co-ordinates	– 23.49°N 77.51°E
Opening Date	– 1973
Dam Volume	– 227 million m ³
Surface Volume	– 2528 ha (full res. level) 2590 ha (dead res. level)
Normal elevation	– 458 m above MSL.

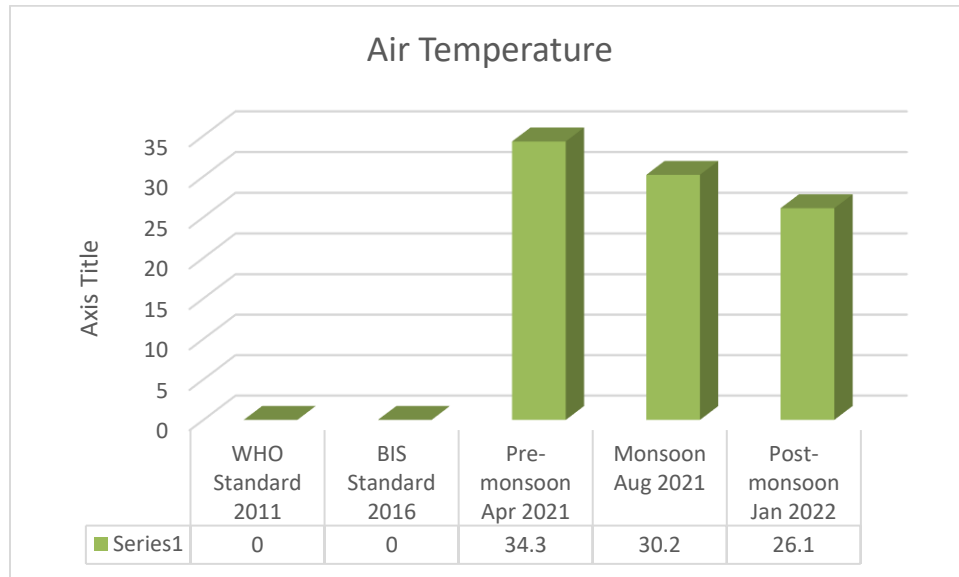
The present study is based on the assessment of seasonal variation in the water quality of surface water of Halali Dam and to see the effects of environmental pollution.

Methodology- The water samples were collected from Halali Dam seasonally - pre monsoon, monsoon and post monsoon period from February 2021- January 2022. The estimation of water parameter like water and air temperature, pH and DO was noticed to calculate the degree of pollution and other parameter like TDS, specific conductivity, total alkalinity, total hardness, chloride, nitrate and BOD were studied as per the standard guidelines and procedures (APHA, 2012).

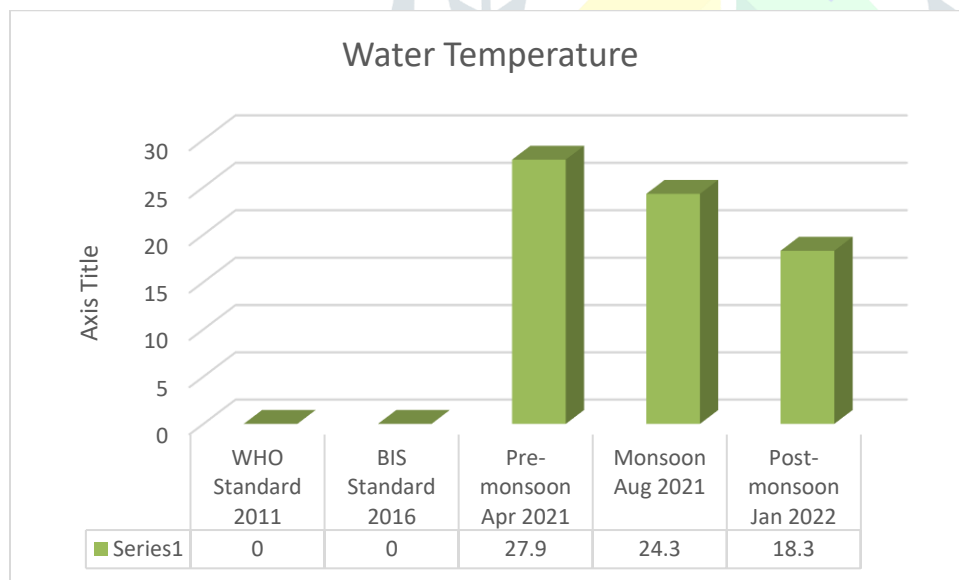
Results and Discussion: -

S.No	Parameters	Unit	WHO Standard 2011	BIS Standard 2016	Pre-monsoon Apr 2021	Monsoon Aug 2021	Post-monsoon Jan 2022
1	Air Temperature	°C	-	-	34.3	30.2	26.1
2	Water Temperature	°C	-	-	27.9	24.3	18.3
3	pH	-	6.5 - 8.5	6.5 - 8.5	8.4	8.0	7.3
4	Conductivity	µs/cm	400	1500	182	250	178
5	TDS	ppm	500	500	213	260	181
6	Total Alkalinity	mg/l	20 - 200	200 - 500	241	151	118
7	Total Hardness	mg/l	60 - 120	60 - 120	45	40	39
8	Chloride	mg/l	250	250 - 1000	49	36	30
9	Nitrate	mg/l	10	10	1.39	2.29	0.58
10	DO	mg/l	6.5 - 8	> 6.0	6.1	5.3	7.4
11	BOD	mg/l	< 5.0	< 5.0	5.1	6.2	3.1

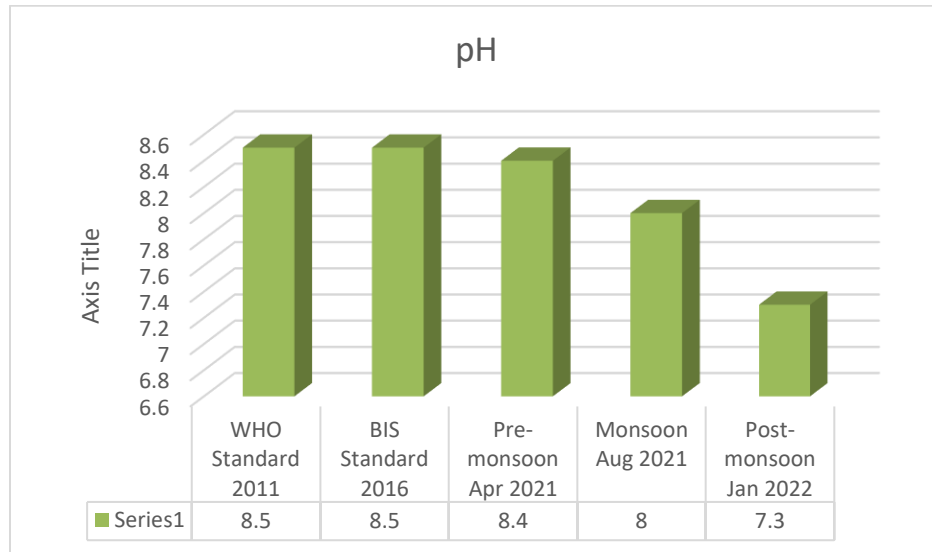
Air Temperature: - During the study the air temperature ranged from 26.1°C to 34.3°C. The maximum temperature was noticed 34.3°C in the month of April (Pre-monsoon period) and minimum 26.1°C in the month of January (Post-monsoon period) (Table 1). Similar findings were notice by Wanganeo et. al., in 2007 [13] in Sarang Pani pond Bhopal and Khan et.al., (2016) in Lower Lake of Bhopal [14].



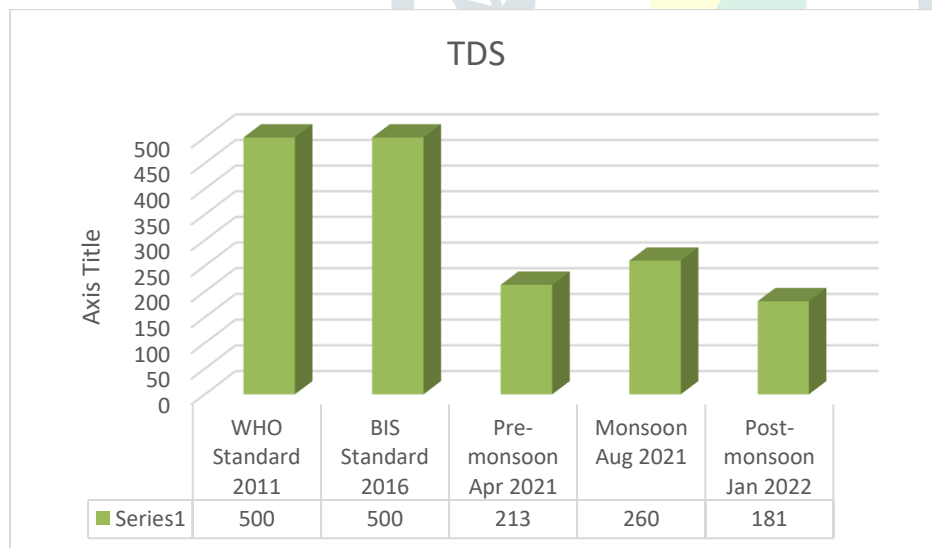
Water Temperature: - During the research work water temperature ranged from 18.3° C to 27.9° C. The maximum temperature recorded 27.9° C in the month of April (Pre-monsoon period) and minimum were noticed in the month of January (Post-monsoon period) i.e., 18.3° C (Table 1). Similar patterns were noticed in the studies of Priyatharsini and Dhanalakshmi (2016) in the Vembanoor wetland [15], Khan et.al., (2016) in the Lower Lake of Bhopal [16] and Surve et.al., (2005) in the Kandhar Dam [17].



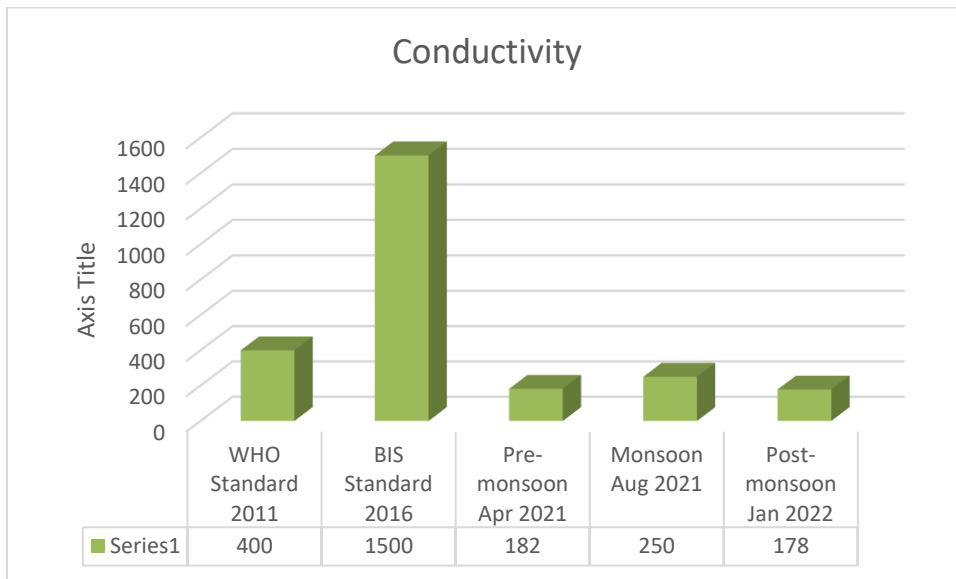
pH (Hydrogen Ion Concentration): - In the present work minimum value of pH 7.3 units was recorded in the month of January and maximum values of pH of Halali Dam was recorded 8.4 units in the month of April (Table 1). Higher values of pre-monsoon season in April may be owing to low water level and higher concentrations of nutrients in water and minimum value was noticed in post-monsoon season in January, it may be because of low temperature and less photosynthetic activities. Similar investigated by Ramakrishna (2003), while researching on Nagchoon pond i.e., maximum temperature in pre-monsoon period and minimum temperature in post-monsoon period owing to increase in bicarbonate ions in water [18].



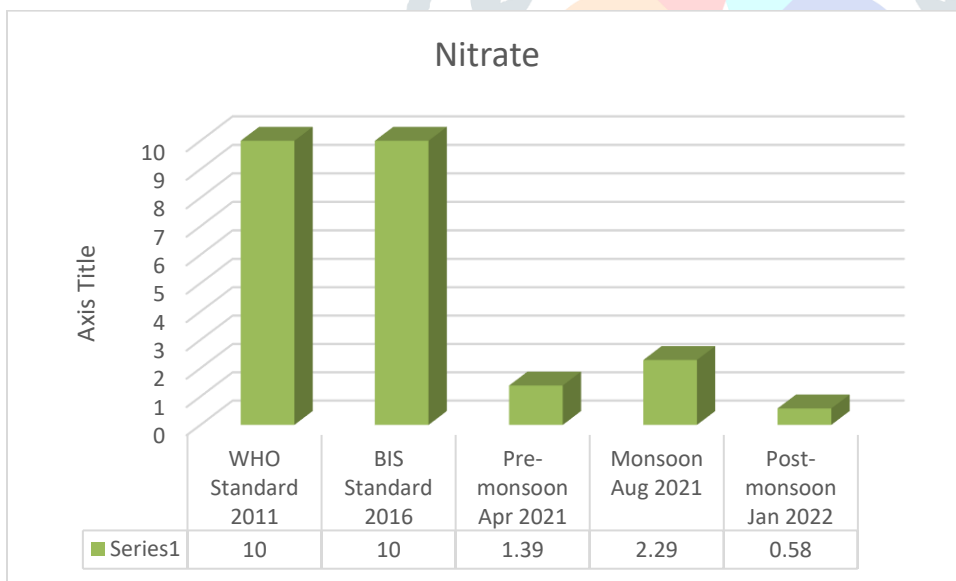
TDS (Total Dissolve Solids mg/L): - During the sampling the minimum value of TDS 181 mg/L was noticed in the month of January and maximum 260 mg/L was recorded in the month of August (Table 1). Similar findings were recorded in Teghra Reservoir by Vchchariya in 2012 [19] and works done by Korai et.al., (2008) on Keenjhar Lake [20].



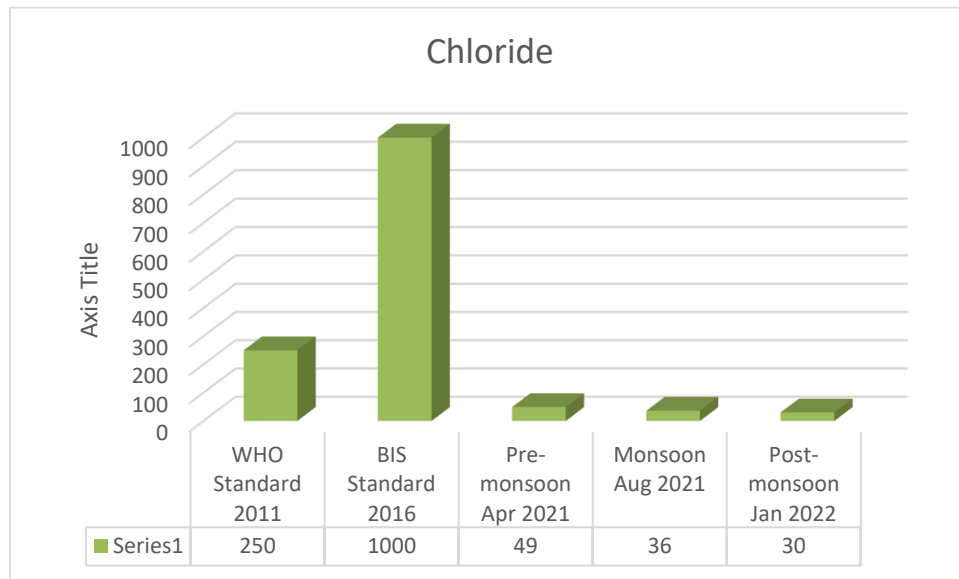
Specific Conductivity ($\mu\text{s}/\text{cm}$): - Minimum values of conductivity was 178 $\mu\text{s}/\text{cm}$ recorded in the month of January and Maximum was 250 $\mu\text{s}/\text{cm}$ in the month of August. Similar results noticed by Wanganeo et.al., in 2007 [21].



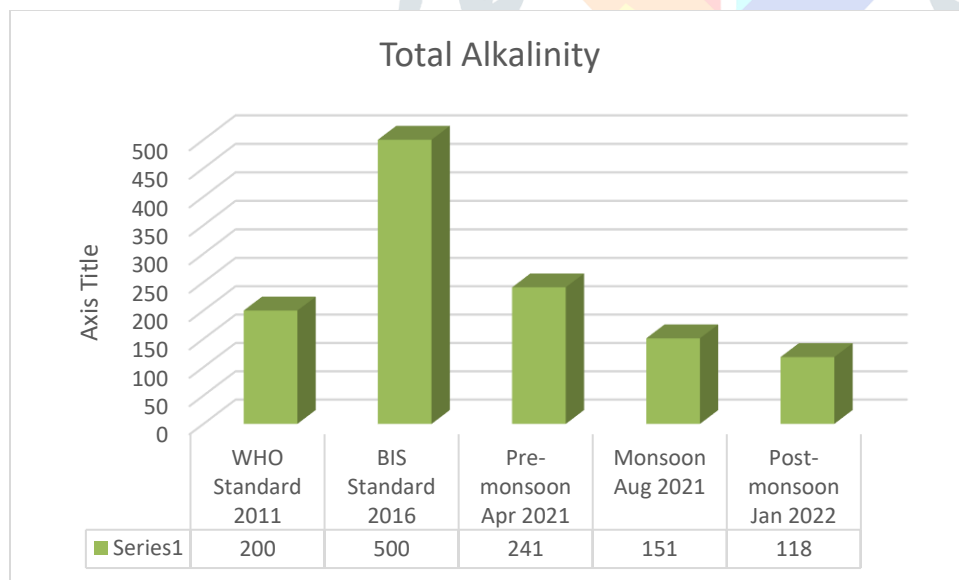
Nitrate (mg/L): - During the study period minimum values of nitrate 0.58mg/L was noticed in the post-monsoon period and maximum 2.29 mg/L in the monsoon period (Table 1). Similar observations were noticed by Uduma in 2014 [22]. The permissible limit of nitrate is 45 mg/L for drinking water by standard of BIS (2012) [23].



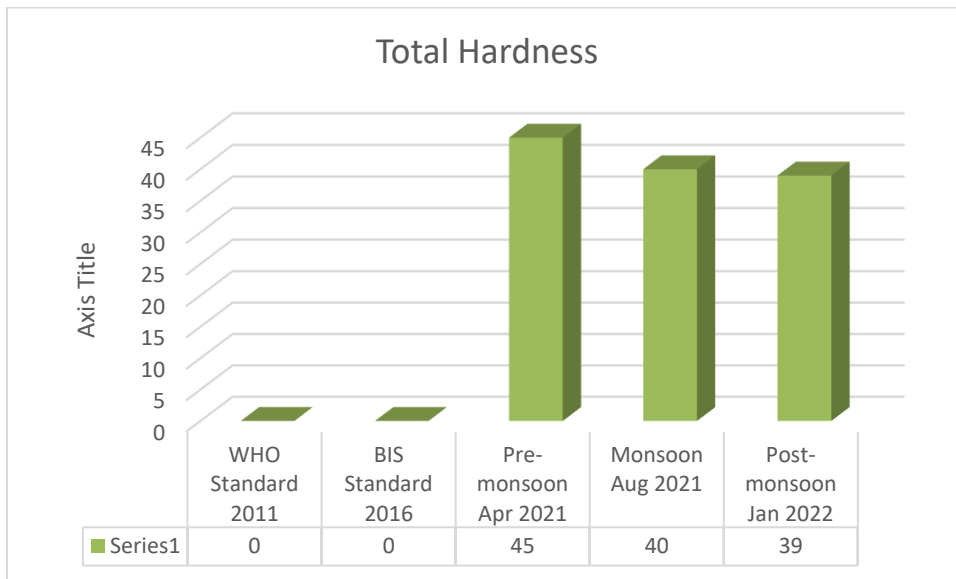
Chloride (mg/L): - Minimum values of chloride were recorded 30 mg/L during post-monsoon period and maximum value 49 mg/L were recorded in the pre-monsoon period (Table 1). The permissible limit of chloride is 250 mg/L for drinking water by standards of BIS (2012) [24].



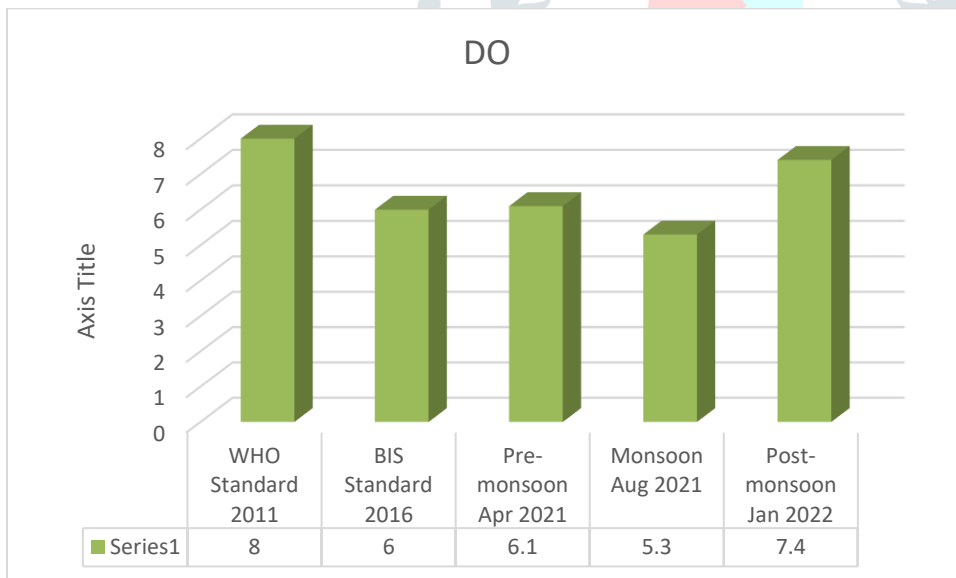
Total Alkalinity (mg/L): - During the present study values of total alkalinity varied from minimum 118 mg/L to maximum 241 mg/L in the months of January and April respectively (Table 1). Higher values of total alkalinity in pre-monsoon period have also been recorded by Singh and Soha (1987) in composite fish culture pond [25]. The permissible limit of total alkalinity is 200mg/L for drinking water by standards of BIS (2012) [26].



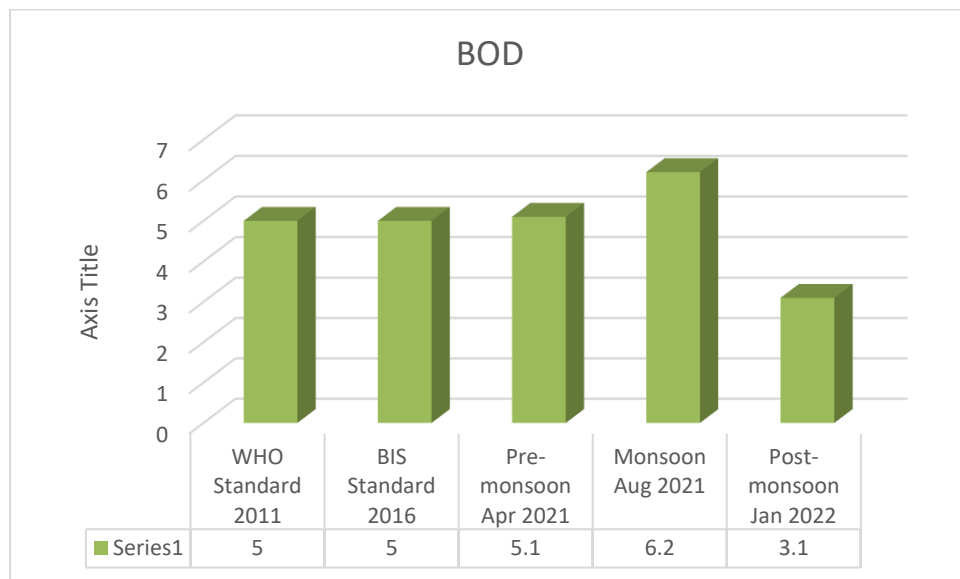
Total Hardness (mg/L): - Values of total hardness ranged from minimum 39 mg/L to maximum 45mg/L in the months of January and April respectively (Table 1). Similar findings reported by Agaadi et.al., (2005) in Papnash pond [27]. The permissible limit by BIS (2012) is 200mg/L for drinking water [28].



DO (Dissolved Oxygen mg/L): - In the present research work highest value 7.4mg/L in August and lowest value 5.3 mg/L in the month of August was recorded (Table 1). Similar observations recorded by Hussain (1967) in his study of a tropical lake [29] and by Rani et.al., (2004) in Santa city [30].



BOD (Biochemical Oxygen Demand mg/L): - The values of BOD varied between 3.1 to 6.2 mg/L, minimum and maximum in the months of January and August respectively (Table 1). Similar findings were found in the works of Siraj et.al., (2010) in Shallabugh wetland of Kashmir [31].



Conclusion: - The results obtained after the analysis of physico-chemical traits of Halali Dam all are within the permissible limits of BIS and WHO except values of total alkalinity and BOD in some months, suggests that the water of the dam easily used for pisciculture, irrigation purpose and for drinking purpose after suitable treatment.

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