International Journal of Science and Research (IJSR)
ISSN: 2319-7064
ResearchGate Impact Factor (2018): 0.28 | SJIF (2019): 7.583

Diurnal Variation and Evaluation of Physico-Chemical Parameters of Sapana Reservior Water at District-Betul, (M.P.)

Dr. D. S. Saluja

Professor of Chemistry, Govt. M. V. M. College, Bhopal, M.P., India

Abstract: ***The present study was conducted to record the diurnal variation in physico-chemical parameters of Sapana dam water located at district-Betul (M.P.). For this study, total 11 physico-chemical parameters were analysed. The water samples, collected from three pre- selected sampling stations were analysed at 04 hour interval for a period of 24 hours from 6.00 AM. on 18th Jun.2020 to 6.00 A.M. of 19th Jun.2020. Statistical analysis was also carried out to establish a suitable correlation-coefficient among studied physico-chemical parameters. The results of present study showed that the physico-chemical parameters were fluctuated within permissible limits suggested by WHO and BIS and a positive correlation-coefficient (r) was also observed between various physico-chemical parameters. On the basis of results obtained, it is concluded that during the study period, the Sapana dam water is not much polluted and can be used for domestic and irrigation purposes after some proper treatment.***

Keywords: Diurnal Variation**,** Physico-Chemical Parameters, Statistical Analysis, Correlation-Coefficient, Sapana Dam.

1. Introduction

The most vital resource for life on the earth is water.There cannot be life without fresh water which is only 2.7 percent of total water on earth. The issues of water are becoming increasingly important to environment particularly with respect to human health and their food. Several towns, cities and communities have disappeared due to the shortage of water and climatic changes. Millions of people all over the world, particularly in the developing countries are losing their lives every year from water borne diseases. Water quality assessment has become an important exercise to evaluate the nature and extent of pollution in order to take appropriate control measures. The water of Sapana dam is used for domestic and irrigation purposes. Due to the urbanization, sewage discharge, agricultural runoff and construction of housing colonies, a major part of dam water is greatly affected. The present study was aimed to assess the quality of Sapana dam water for its domestic and irrigation purposes.

Study Area

Sapana reservoir like others in the state was constructed for irrigation purpose and it is an important source of water supply to the wide agriculture, industrial and domestic area of District-Betul (M.P.) and also being used for fish culture. The dam was constructed in the year 1956 and its longitude and latitude are $77^0$59'05" and $21^0$15'15" respectively. The total length of the dam is 1790 sqm. and the catchment area is 44.75 sqm. The gross capacity of the dam is 1690 cu.m.

2. Material and Methods

The water samples were collected from three pre- selected sampling stations in previously cleaned one litre polyethylene bottles. The water samples were analysed at 04 hour interval for a period of 24 hours from 6.00 A.M. on 18th Jun. 2020 to 6.00 A.M. of 19th Jun. 2020. The physico-chemical parameters were analysed by standard methods suggested by APHA .

3. Results and Discussion

The values of established correlation–coefficients (r) between physico-chemical parameters showed a positive correlation with all physico-chemical parameters except total alkalinity which showed a negative correlation with other parameters. The results obtained for the analysis of physico-chemical parameters and established correlation-coefficients (r) are shown in table 1, 2 and 3 respectively.

Temperature –Chemical and biochemical reactions are greatly affected by temperature. Increase in temperature of water source increases the rate of chemical reactions in water on one hand and decreases the solubility of gases on the other hand. Hence, measurable variation in temperature of the water affects the aquatic life. In the present study, the water temperature was ranged between 21.8^OC at 2.00 am to 25.8^OC at 2.00 pm. The water temperature was found maximum in day time and minimum at night. It showed positive correlation with pH.

pH - pH is defined as the negative logarithm of hydrogen ions concentration. Variation in pH values are mainly due to the hydrolysis of salts of strong bases and weak acids or vice versa and also due to the dissolved gases such as carbon dioxide, hydrogen sulphide, ammonia etc. The pH was recorded maximum as 7.8 at 2.00 pm and minimum as 7.1 at 2.00 am. It showed positive correlation with temperature and negative with total hardness and total alkalinity.

Transparency – In most water transparency is due to colloidal and extremely fine dispersion and indicates the extent of pollution in water sources. It was found maximum as 38 c.m. at 2.00 pm and minimum as 30 c.m.at 6.00 pm. It showed positive correlation with temperature and pH whereas negative with electrical conductance, total alkalinity and chloride.

Electrical Conductivity – Conductivity of water is defined as the capacity of water to conduct electrical current.

Conductivity in water is affected by temperature, mobility of ions and presence of electrolyte in the form of dissolved inorganic solids such as chlorides, nitrates, sulphates, phosphates, sodium, calcium and magnesium ions. The electrical conductivity was found maximum as 224.6 µmhos/cm at 2.00 pm and minimum as 206.1 at 2.00 am. It showed positive correlation with temperature and pH whereas, transparency, total hardness total alkalinity and chloride showed negative correlation with other parameters.

Total Hardness –Hardness in water is an important parameter as it is affects the day to day human life and also the industries to a great extent. The presence of calcium and magnesium ions in the form of bicarbonates, chlorides and sulphates produces hardness in water. It showed upward trend and it was recorded maximum as122.8 mg/l, thereafter downward trend was recorded as minimum 110.1 mg/l. It showed positive correlation with transparency.

Total Alkalinity – Alkalinity of water is described as its quantitative capacity to neutralize acids. Compounds like bicarbonates, carbonates and hydroxides in water decreases the H+ ions and increases the pH of water.The alkalinity was found maximum as 122.4 mg/l at 6.00 am and minimum as 114.2 at 2.00 pm.It showed positive correlation with total hardness.

Total Dissolved Solids –Total dissolved solids are the sum of all the chemical ions that are dissolved in the water. It is due to the dissolution of minerals, rocks, soil etc. in water.The amount of total dissolved solids was within the permissible rang of said standards in all the samples. Total dissolved solids were found maximum as 163.4 at 2.00 pm and minimum as 148.4 at 2.00 am. It showed positive correlation with temperature, pH, transparency and EC.

Chlorides –The chloride concentration serves as an indicator of pollution by sewage. People accustomed to higher chloride in water are subjected to laxative effects. In the present analysis, chloride concentration was found in the range of 22.2 to 23.8 mg/l. It was found maximum at 6.00 am and minimum at 6.00 pm. It showed positive correlation with transparency, total hardness and total alkalinity.

Nitrates –Surface water contains nitrate due to leaching of nitrate with percolating water. Surface water can also be contaminated by sewage and other wastes rich in nitrates. The nitrate content in the study varied in the range 18.1 to 19.6 mg/l and found within the prescribed limit. It showed negative correlation with total hardness, total alkalinity and chloride.

Phosphates –Phosphates may occur in surface water as a result of domestic sewage, detergents and agricultural effluents with fertilizers. Phosphate was found minimum as 0.72 mg/l at 2.00 am and maximum as 0.84 mg/l at 2.00 pm. It showed positive correlation with all the parameters except total hardness, total alkalinity and chloride.

Dissolved Oxygen –Dissolved oxygen is important parameter in water quality assessment and reflects the physical biological process prevailing in the water. The DO values indicates the degree of pollution in water bodies. In the present study, the maximum value of Do was recorded as 7.4 mg/l at 2.00 pm and minimum was as 6.4 at 2.00 am. It showed negative correlation with total hardness, total alkalinity and chloride.

Table1: Standard permissible limit of various physico-chemical parameters suggested by WHO and IS10500 : 2012

S.No.	Parameters	unit	Permissible Limit	
			WHO	IS 10500 : 2012
1	Temperature	^{O}C	-	-
2	pH		7.5 – 8.5	6.5 – 8.5
3	Transparency	cm	5.0	5 - 10
4	Electrical Conductivity(EC)	µmhos/ cm	1400	-
5	Total Hardness (TDS)	mg/l	1000	200 - 600
6	Total Alkalinity (TA)	mg/l	120	200 - 600
7	Total Dissolved Solids (TDS)	mg/l	1000	500 - 2000
8	Chlorides (CI^-)	mg/l	250	250 -1000
9	Nitrates(NO_3^-)	mg/l	5.0	45
10	Phosphates (PO_4^{3-})	mg/l	-	-
11	Dissolved Oxygen (DO)	mg/l	-	>5

4. Conclusion

The results of present study showed that during the study the physico-chemical parameters were fluctuated within permissible limit suggested by WHO and BIS and a positive correlation-coefficient (r) was also observed between various physico-chemical parameters. On the basis of results obtained, it is concluded that during the study period, the Sapana dam water is not much polluted and can be used for domestic and irrigation purposes after some proper treatment.

Table 2: Mean values of physico-chemical parameters of Sapana dam water during Jun.2020

S. No.	Parameters	Unit	Time					
			6.00 A.M.	10.00 A.M.	2.00 P.M.	6.00 P.M.	10.00 P.M.	2.00 A.M.
1	Temperature	^{O}C	22.1	23.8	25.8	25.1	24.6	21.8
2	pH	-	7.2	7.5	7.8	7.6	7.4	7.1
3	Transparency	cm	30.5	34	38	30	-	-
4	Electrical Conductivity	µmhos/cm	208.4	212.8	224.6	220.1	216.8	206.1
5	Total Hardness	mg/l	122.8	118.2	112.3	110.1	116.4	118.3
6	Total Alkalinity	mg/l	122.4	120.6	114.2	116.3	118.8	120.1
7	Total Dissolved Solids	mg/l	152.1	156.8	163.4	160.1	154.6	148.4
8	Chlorides	mg/l	23.8	23.1	22.6	22.2	22.8	23.2
9	Nitrates	mg/l	18.1	19.1	19.6	18.8	19.1	18.2
10	Phosphates	mg/l	0.74	0.78	0.84	0.78	0.8	0.72
11	Dissolved Oxygen	mg/l	6.6	6.8	7.4	7.2	7	6.4

Table 3: Correlation-coefficients between various physico-chemical parameters of Sapana dam water

Parameters	Temp.	pH	Trans.	EC	TH	TA	TDS	Cl^-	NO_3^-	PO_4^{3-}	DO
Temp.	1										
pH	0.87	1									
Trans.	0.34	0.65	1								
EC	0.94	0.78	-0.35	1							
TH	-0.92	-0.77	0.26	-0.96	1						
TA	-0.95	-0.83	-0.32	-0.86	0.92	1					
TDS	0.83	0.99	0.51	0.75	-0.76	-0.81	1				
Cl^-	-0.91	-0.73	0.44	-0.98	0.98	0.86	-0.7	1			
NO_3^-	0.86	0.89	0.98	0.74	-0.63	-0.74	0.83	-0.64	1		
PO_4^{3-}	0.85	0.91	0.86	0.7	-0.63	-0.77	0.88	-0.62	0.95	1	
DO	0.9	0.92	0.32	0.82	-0.81	-0.88	0.95	-0.78	0.84	0.92	1

References

[1] APHA, Standard methods for examination of water and waste water, (20th ed.), American Public Health Association, New York; (1995).
[2] BIS, Standards for drinking water, IS – 10500;(1983).
[3] Guideline for drinking water, World Health Organization, (2thed.);(1996)
[4] NEERI, Manual on water and waste water analysis, National Env.Engg. Research Inst; Nagpur, (1988).
[5] Trivedi, R.K; Goel, P.K; Chemical and Biological Methods for water poll. Stu., Env. Pub; Karad, India, (1986).
[6] WHO, International Std. for Drinking Water, Ist Ed; World Health Org; Geneva (1963).