

Diurnal Determination of Physico-Chemical Parameters of Koshmi Reservoir Water at District-Betul, (M. P.)

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Abstract: *In this present study an attempt has been carried out to determine the diurnal variation in various studied physico-chemical parameters of Koshmi Reservoir water located at district-Betul (M. P.). For this study, total 11 physico-chemical parameters were studied. The water samples, collected from four pre-selected sampling stations were analyzed at 04 hour interval for a period of 24 hours from 6.00 A. M. of 13th Nov. 2021 to 2.00 A. M. of 14th Nov. 2021. Statistical analysis was also carried out to establish a suitable correlation-coefficient among various studied physico-chemical parameters. The results of this study showed that the physico-chemical parameters were showed variation within permissible limits suggested by WHO and BIS. On the basis of results obtained, it is concluded that during the study period, the Koshmi Reservoir water is not much polluted and can be used for domestic and irrigation purpose after some proper treatment.*

Keywords: Physico-Chemical Parameters, Diurnal Variation, Statistical Analysis, Correlation-Coefficient, Koshmi Reservoir

1. Introduction

For the human and industrial growth, water is considered to be the main requirement. Increase in population and industrialization the demand of fresh water increase in the last decades. This demand fulfilled by the water sources as rivers, dams, well and ponds which provide the water for human life, agriculture and irrigation purposes. Due to the waste discharged from the industrial and human activities, the quality of ground water has deteriorated, which affects human as well as aquatic life. Now-a-days, water quality assessment has become an important exercise to evaluate the nature and extent of pollution in order to take appropriate control measures.

Study Area

Koshmi 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 1977 and its longitude and latitude are 77°50' and 21°55' respectively. The total area of the dam is 1.02 Sq. Km; height is 13.89 meter from sea level, length of the dam is 690 sq. m. and the total catchment area is 9.45sq. km. The total gross capacity of the dam is 3227 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 analyzed at 04 hour interval for a period of 24 hours from 6.00 A. M. of 13th Nov. 2021 to 2.00 A. M. of 14th Nov. 2021. The physico-chemical parameters were analyzed by standard methods suggested by APHA (1992).

3. Result and Discussion

The values of established correlation-coefficients (r) between studied 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, 3 and 4 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 19.3 at 2.00 am to 21.6 at 2.00 pm. It showed positive correlation with all studied parameters except total hardness, total alkalinity and dissolve oxygen.

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 7.5 at 2.00 pm and minimum as 7.2 at 2.00 am. It showed negative correlation with total hardness, total alkalinity and dissolve oxygen.

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 38.2 c. m. at 2.00 pm and minimum as 10.0 cm. at 2.00 am. It showed positive correlation with temperature and pH whereas negative with total hardness, total alkalinity and dissolve oxygen.

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 224.4 mg/l at 2.00 pm and minimum as 196.1 at 2.00 am. It showed positive correlation with all studied parameters except total hardness, total alkalinity and dissolve oxygen.

Total Hardness: Hardness in water is an important parameter as it 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 downward trend and it was recorded minimum as 118.1 mg/l, thereafter upward trend was recorded as maximum 124.6 mg/l. It showed positive correlation with total alkalinity and dissolve oxygen.

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 121.4 mg/l at 6.00 am and minimum as 116.2 at 2.00 pm. It showed positive correlation with dissolve oxygen.

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 range of said standards in all the samples. Total

dissolved solids were found maximum as 164.2 at 2.00 pm and minimum as 152.5 at 2.00 am. It showed negative correlation with dissolve oxygen.

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 24.1 to 24.9 mg/l. It was found maximum at 2.00 pm and minimum at 2.00 am. It showed positive correlation with all studied parameters except dissolve oxygen.

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 18.9 mg/l. It showed negative correlation with dissolve oxygen.

Phosphates: Phosphates may occur in surface water as a result of domestic sewage, detergents and agricultural effluents with fertilizers. Phosphates were found maximum as 0.74 mg/l at 2.00 pm and minimum as 0.71 mg/l at 2.00 am It showed negative correlation with dissolve oxygen.

Dissolved Oxygen: Dissolved oxygen is important parameter in water quality assessment and reflects the physical biological process prevailing in the water. The DO values indicate the degree of pollution in water bodies. In the present study, the maximum value of Do was recorded as 7.8 mg/l at 2.00 am and minimum was as 7.2 at 2.00 pm. It showed positive correlation with total hardness and total alkalinity.

Table 1: 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	°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 (Cl ⁻)	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

Table 2: Mean values of physico-chemical parameters of Koshmi dam water during 13thNov.2021 to 14thNov.2021

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	°C	19.4	20.1	21.6	21.2	20.4	19.3
2	pH	-	7.3	7.4	7.5	7.4	7.3	7.2
3	Transparency	cm	28	36	38.2	29	10.2	10.0
4	Electrical Conductivity	µmhos/cm	196.5	218.3	224.4	223.6	199.8	196.1
5	Total Hardness	mg/l	124.6	121.2	118.3	118.1	119.4	122.3
6	Total Alkalinity	mg/l	121.4	119.6	116.2	118.3	119.8	121.1
7	Total Dissolved Solids	mg/l	154.2	158.4	164.2	163.1	156.7	152.5
8	Chlorides	mg/l	24.1	24.5	24.9	24.4	24.2	24.1
9	Nitrates	mg/l	18.3	18.5	18.9	18.6	18.1	18
10	Phosphates	mg/l	0.71	0.73	0.74	0.73	0.72	0.71
11	Dissolved Oxygen	mg/l	7.8	7.6	7.2	7.3	7.4	7.8

Table 3: Correlation-coefficients between various physico-chemical parameters of Koshmi dam water during study period

Parameters	Temp.	pH	Trans.	EC	TH	TA	TDS	Cl ⁻	NO ₃ ⁻	PO ₄ ³⁻	DO
Temp.	1.00										
pH	0.88	1.00									
Trans.	0.66	0.91	1.00								
EC	0.80	0.93	0.96	1.00							
TH	-0.95	-0.71	-0.44	-0.65	1.00						
TA	-0.95	-0.92	-0.74	-0.82	0.82	1.00					
TDS	0.97	0.94	0.81	0.93	-0.88	-0.94	1.00				
Cl ⁻	0.78	0.94	0.86	0.83	-0.56	-0.92	0.83	1.00			
NO ₃ ⁻	0.86	0.97	0.93	0.96	-0.68	-0.93	0.94	0.95	1.00		
PO ₄ ³⁻	0.88	1.00	0.91	0.93	-0.71	-0.92	0.94	0.94	0.97	1.00	
DO	-0.98	-0.80	-0.52	-0.68	0.98	0.89	-0.90	-0.69	-0.75	-0.80	1.00

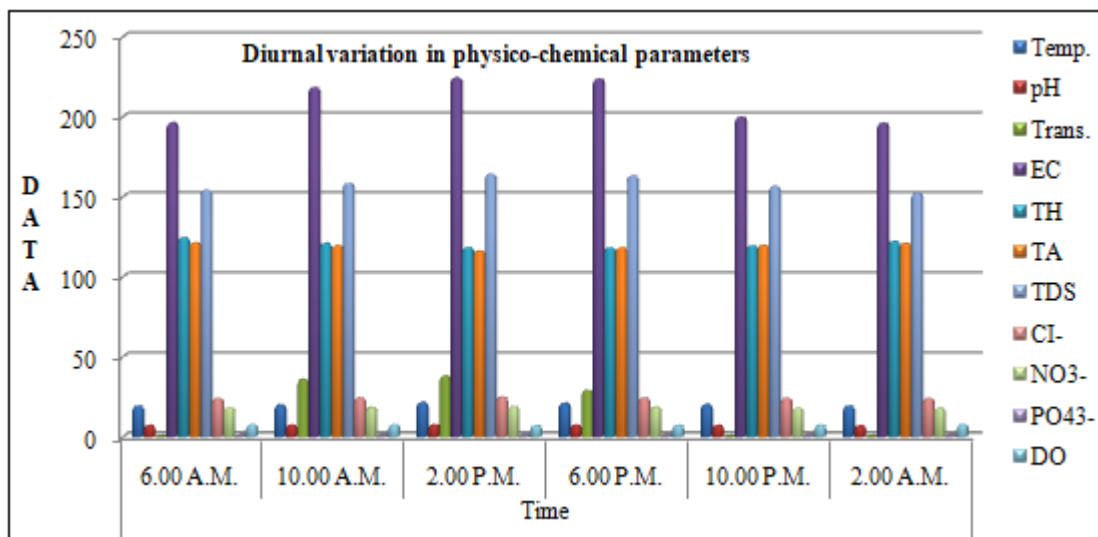


Table 4: Graph showing diurnal variation in various studied physico-chemical parameters of Koshmi dam water

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 Koshmi dam water is not much polluted and can be used for domestic and irrigation purpose after some proper treatment.

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