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Study on Diurnal Variation of Some Physico-Chemical Properties of Sapana Dam Water at Betul City (M.P) during the Winter Session

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Abstract: ***The present paper deals with the diurnal variation of some physico-chemical properties of Sapana dam water, which is situated about 8 kms. East of Betul city (M.P.), has been studied during January 2019. The parameters studied include Temperature, Transparency. pH, Total Alkalinity, Free CO_2 Total Solids (TS), Total Dissolve Solids (TDS), Total Hardness (TH), Dissolve oxygen (DO), Chlorides, Nitrites, Nitrates, and Phosphates. The work was carried out at an interval of four hours during a twenty-four hours schedule commencing from 6.00 a.m. of 04th Jan-2019 to 2.00 p.m. of the next day. It was observed that the values of Temperature, Dissolve oxygen (DO) and Chlorides increases in day time and decreases in night whereas Total Alkalinity increased in night while decreased in day hours. The Free CO_2 was recorded nil at day time. Similarly, the Dissolve oxygen exhibit a positive relationship with water temperature whereas there is an inverse relationship of Nitrites and Nitrates with water temperature was found. The other parameters did not exhibit any fixed pattern of variation.***

Keywords: Diurnal Variation, Physico Chemical Properties, Winter Session, Parameters, Photo Synthesis

1. Introduction

Fresh water is the most precious material for life on earth. Variation in the hydrographic features of various fresh water bodies and coastal ecosystems of India have been studied by Ganpati et.al. (1955), George et.al. (1961), Saxena & Adoni et.al. (1973), Reddy et.al. (1979), Desouse et.al. (1981), Pai & Raddy et.al. (1981), Malhotra et.al. (1973), Khanna & Badola et.al. (1987), Rawat et.al. (1990) and panday et.al. (1996). Similarly, scattered randomly made work reports are available on diurnal variation of some physico-chemical and biological parameters of ponds, lakes, rivers and reservoirs. However, very little information is available on diurnal variation of physico-chemical parameters of fresh water resources in Betul city (M.P.). The present study highlights the importance of water temperature that regulates the hydro chemical & biological factors.

2. Materials & Methods

The present study deals with the diurnal variation of some physico-chemical properties of Sapana dam water situated at Betul city (M.P.) during jan-2019. The water samples from Sapana water dam were collected from four different sampling stations at a time in clean plastic containers and glass samplers and brought to the laboratory for quality analysis. The water samples were collected from the following sampling stations-

1) S_1 - Near Temple
2) S_2 - 300 meter east from S_1
3) S_3 - 300 meter south from S_2
4) S_4 - 500 meter away from S_3

Samples were collected at an interval of four hours during a twenty four hours schedule commencing from 6.00 am of 04th Jan-2019 to 2.00 am for the next day. Sampling were made at same hours at an interval of one week till 25thJan-2019. The average of the four stations and four days of sampling were noted separately with respect to the time of collection. The physico-chemical parameters were determined by standard methods suggested by APHA (1980), Kudesia (1980) and Trivedi & Goel (1984).

3. Observation Table

Table 1: Mean values of physico-chemical parameters of Sapana dam water during Jan- 2019

Parameters	Unit	Time					
		6.00a.m.	10.00a.m.	2.00p.m.	6.00p.m.	10.00p.m.	2.00a.m.
Temperature	^oC	11.30	12.74	16.64	15.20	12.42	10.48
Transparency	Cm	-	120.42	125.62	118.21	-	-
pH	-	8.12	8.21	8.34	8.28	8.20	8.10
Total Alkalinity	mg/l	70.64	68.92	66.74	67.22	68.31	71.20
Free CO^2	mg/l	1.42	-	-	-	1.74	2.18
Total Solids (TS)	mg/l	192.21	193.74	194.10	193.42	192.60	192.41
Total Dissolve Solids (TDS)	mg/l	170.84	172.50	173.32	173.04	172.56	171.22
Total Hardness (TH)	mg/l	112.50	113.34	114.20	113.86	113.02	112.48
Dissolve oxygen (DO)	mg/l	8.72	8.86	9.12	9.02	8.94	8.84
Chloride	mg/l	13.32	14.18	15.22	14.96	14.18	13.24
Nitrite	µg/l	1.21	1.12	0.98	1.04	1.09	1.10
Nitrate	µg/l	0.92	0.86	0.78	0.82	0.88	0.90
Phosphate	µg/l	0.18	0.24	0.30	0.34	0.42	0.28

4. Results and Discussions

The results of physico-chemical parameters of Sapana dam water are summarized in table 1 as :

1) **Temperature :**Temperature of water bodies is important because it affects bio-chemical reactions proceed by aquatic organisms. A rise in temperature of water lids to the speeding up of the chemical reactions in water, reduce the solubility of gases and amplifies the taste and odors (Shrivastava & Patil et.al. 2002). The water temperature of Sapana dam water varied between 16.64^{o}C at 2.00 pm to 10.48^{o}C at 2.00 am early morning during Jan-2019. It was found that, the water temperature was maximum in daytime while minimum in the night. Dutta et. Al. (1982), Rawatet. Al. (1990) have also reported similar trend of temperature.
2) **Transparency:** The transparency of Sapana dam water showed upward trend in the mid noon when it was maximum, thereafter downward was recorded. It was found maximum 125.62 cm at 2.00 pm and minimum 118.21 cm at 6.00 pm. The observation could not be made during night due to the lack of sunlight. The similar types of variation was observed by Dutta et. Al. (1982) and Pandey et.al. (1996).
3) **pH:** The pH remained alkaline and slightly increased during day time whereas started decreasing slightly at night. This nocturnal decrease in pH value was due to CO_2 during day time in photosynthesis and absence of photosynthesis during night. It was found maximum 8.34 at 2.00 pm and minimum as 8.10 at 2.00 am. A similar pattern has been reported by George et. at. (1961) and Pandey et. al. (1996).
4) **Total Alkalinity:** Total alkalinity values were higher during night and lower during day hours. It showed an upward trend and was found maximum at early morning as 71.20 mg/l at 2.00 am and minimum 66.74 mg/l at 2.00 pm in noon. Same trend was also noted by Grover and Rauthanet. al. (1992).
5) **Free Co_2:** Free CO_2 was found maximum as 2.18 mg/l at 2.00 am. and minimum as 1.42 mg/l at 6.00 am. The maximum value of free CO_2observed in early morning may be due to the respiratory activity of the biota and absence of photosynthesis. This similar trend was also reported by Khanna and Badola (1987).
6) **Total Solids (TS) and Total Dissolve Solids (TDS) :**The total Solids (TS) and total dissolve solids (TDS) showed upward trend in the midnoon, when they were found maximum, thereafter downward trend were recorded. The total Solids (TS) was observed maximum 194.10 mg/l at 2.00 pm and minimum 192.21 mg/l at 6.00 am. Similarly, the total dissolve solids (TDS) was found maximum 173.32 mg/l at 2.00 pm and was recorded minimum 170.84 mg/l at 6.00 am. This similar trend was also reported by Dutta et. al. (1982) and Joshi et. al. (1996).
7) **Total Hardness (TH) :** It showed upward trend in the mid noon when it was recorded maximum, thereafter downward trend was recorded as minimum in the early morning hours as also observed by Joshi et. al. (1996). The maximum value of TH was recorded as 114.20 mg/l at 2.00 pm. and minimum 112.48 mg/l at 2.00 am.
8) **Dissolve Oxygen (DO):** Dissolve oxygen (DO) is one of the most important parameters in water quality assessment and reflects the physical and biological process prevailing in the water. Oxygen can be rapidly removed from the water by discharge of oxygen demanding wastes (Shrivastava & Patil et.al. 2002). Do increase during day time may be due to the photosynthesis activity of autotrops and decrease in night due to the respiratory activity of heterotrops. In the present study, the maximum value of Do was recorded as 9.12 mg/l at 2.00 pm and minimum was 8.72 mg/l at 6.00 am and it was also directly related to the water temperature.
9) **Chloride:** Chlorides may occur in fresh water as a result of dissolution of salt deposits in the soil. It was found maximum at noontime as 15.22 mg/l at 2.00 pm and minimum at night and early morning as 13.24 mg/l at 2.00 am. Same trend was also given by Joshi et. al. (1996).
10) **Nitrite:** Nitrites is an intermediate and unstable compound formed during denitrification and nitrification process. The maximum nitrite value as 1.21 µg/l was observed at 6.00 am. Whereas minimum as 0.98 µg/l at 2.00 pm, which is inversely related to the water temperature.
11) **Nitrate:** It is also inversely related to the water temperature which was the maximum 0.92 µg/l at 6.00 am and minimum as 0.78 µg/l at 2.00 pm.
12) **Phosphate:** Phosphates was recorded maximum as 0.42 µg/l at 10.00 pm and minimum as 0.18 µg/l at 6.00 am. Similar trend was also reported by Naik and Reddy(1980).

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