The Biobrio ISSN : 2393-9508 e-ISSN: 2582-4902
An International Quarterly Journal of Life Sciences
Website: www.thebiobrio.in SJIF 2023:8.16

10 (1&2): 935-938, 2023

Study on the physico-chemical properties of water samples of Mahi Reservoir, Sonpur (Saran), Bihar, India

Prashant Kumar* & Rajan Kumar
University Department of Zoology, J.P. University, Chapra, Bihar, India

Received : 11th December, 2022 ; Accepted : 12th January, 2023

ABSTRACT

From January to December 2021, measurements of the physico-chemical characteristics of water samples taken from the east, south, west, and north sides of the Sonpur (Saran)-based Mahi Reservoir were made. Analyses were done on PCP factors as turbidity, temperature, transparency, pH, DCO_2, DO_2, nitrate, and phosphate. The findings show that the majority of the parameters from all four corners of the water bodies were adequate for both domestic and aquatic life, including fish cultivation. Unfortunately, there have been some unfavourable pollutants brought on by anthopogenic activities, such as bathing, washing, etc., which could deteriorate the pond's condition in a few years if the proper actions are not taken.

Key Words - physico-chemical properties, turbidity, transparency, pH, DCO_2, DO_2

***Corresponding author :** prashantkrzoology@gmail.com

INTRODUCTION

The first scientific step in determining the biological attributes of water that are necessary for the life of aquatic species is the study of the physico-chemical characteristics of water samples taken from any water body or source. No life can be generated in water without the right blending of physical and chemical features to make the water conducive to life, even if this combination is a component of non-biological science. The volume of water on earth is approximately 1357,506,000 km (1.35 billion km), little more than 97% of which is salty ocean water. The rain and snow that fall on the earth are very fresh, despite the fact that water that evaporates from the ocean has nearly no salt.

The goal of the current study is to describe the physiochemical characteristics of fresh water samples taken from the stagnant Mahi Reservoir, a body of water utilised for fish culture.

MATERIALS AND METHODS

Four separate corners of the standing water body (fishery pond) of Mahi Reservoir of Sonpur (Saran), namely the east, south, west, and north, were used to collect water samples for various physico-chemical analyses. Every site had samples taken once every day. The examination of the physiochemical properties of water was carried out in accordance with the guidelines provided by APHA (1998), Golterman (1969), and Trivedi and Goel (1984). While the samples for the majority of the parameters were maintained using the appropriate preservatives, some of the parameters were examined in the field. Between 8 and 11:30 in the morning, the samples were collected in two-liter polythene bottles.

A centigrade mercury thermometer was used to test the water's temperature, and a Secchi disc with a 20 cm diameter was used to measure the water's transparency. The dissolved carbon dioxide (DCO_2)

and dissolved oxygen (DO_2) were estimated using reagents such as sodium thiosulphate, sodium hydroxide, and phenolphthalein indicator. Turbidity was evaluated using a nephelometer, pH was determined using a digital pH metre. Using a calorimeter, nitrate and phosphate were estimated. Each sample (four-corner replication) underwent analysis; the findings are listed in the table 1.

RESULT AND DISCUSSION

According to the table's physico-chemical data, the water temperature varied between 17.90 and 30.90°C in sample I, 19.20 and 31.80°C in sample II, 17.80 and 34.30°C in sample III, and 19.20 and 31.80°C in sample IV. It was discovered that the water temperature was greater in the summer and lower in the winter. The prolonged daytime exposure to sunshine and greater solar penetration during the summer are what cause higher temperatures. Because to the absence of sunlight, the summer temperature (May-July) was always higher than the winter temperature (Jan-Feb). All of the samples' observed water temperatures fell below the WHO-recommended range of 30°C to 35°C.

Although water can be acidic, neutral, or basic in nature, pH is a crucial chemical property in determining the quality of the water. Other chemical processes like solubility, ionisation, and

Table 1- Physico-chemical profile of water samples of Mahi Reservoir of Sonpur (Saran) from January to December 2021.

Samples and Parameter		Mean Monthly Data											
		Jan.	Feb.	March	April	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
S-I:P.P	Turb.	1026	1136	575	775	710	804	1180	690	888	680	868	1165
	Temp.	18.00	19.10	24.90	25.30	29.70	30.90	26.70	27.30	26.80	25.70	23.30	17.90
	Trans.	43.00	43.00	42.00	44.00	60.00	17.00	6.00	7.00	23.00	13.00	28.00	47.00
C.P	pH	8.24	8.54	8.10	7.60	7.65	7.80	8.10	8.20	8.10	8.10	8.10	8.20
	DO_2	10.30	11.00	10.50	7.60	4.10	4.50	7.70	6.50	7.40	7.40	10.50	12.60
	DCO_2	2.00	1.70	1.40	1.50	2.10	2.40	2.20	2.10	2.40	2.80	2.60	2.70
	Nitr.	0.20	4.8	4.8	3.0	3.0	3.0	2.3	3.6	4.8	4.0	4.7	2.0
	Phosp.	0.10	0.20	0.20	0.30	0.40	0.20	0.10	0.10	0.10	0.10	0.10	0.10
S-II:P.P	Turb.	1206	1452	1452	1070	1460	1310	1430	1240	1220	1036	1126	145
	Temp.	19.20	19.90	26.30	25.90	30.80	31.80	30.70	29.80	26.90	29.30	22.30	21.10
	Trans.	42.00	41.00	27.00	58.00	65.00	17.00	6.00	6.50	19.00	12.00	27.00	46.00
C.P	pH	8.30	8.40	7.70	7.60	7.00	7.00	7.50	7.60	8.00	7.00	7.00	7.00
	DO_2	10.20	11.10	10.80	7.10	5.00	5.00	8.20	7.00	8.30	7.50	10.00	9.30
	DCO_2	1.70	1.80	1.00	1.40	2.00	2.20	0.50	2.00	2.00	2.30	2.60	2.50
	Nitr.	88.0	1100	1225.0	150.0	225.0	1750.0	32.0	45.0	105.0	110.0	70.0	85.0
	Phosp.	0.20	0.30	0.30	0.30	0.40	0.20	0.20	0.20	0.20	0.20	0.20	0.20
S-III:P.P	Turb.	1150	1300	1240	840	1150	1180	1300	1240	900	800	1000	1215
	Temp.	18.00	19.40	24.60	25.90	32.80	34.30	28.20	28.50	27.20	27.30	20.00	17.80
	Trans.	30.00	27.00	40.00	40.00	45.00	21.00	21.00	9.00	10.00	27.00	29.00	60.00
C.P	pH	8.35	8.40	8.30	8.30	8.25	8.15	8.15	8.20	8.20	8.20	8.25	8.30
	DO_2	10.10	11.00	11.50	8.00	5.00	6.30	7.00	9.60	9.80	8.00	8.30	10.00
	DCO_2	2.00	2.00	1.80	1.40	1.80	1.80	2.00	2.30	2.00	2.00	1.20	2.50
	Nitr.	60.0	160.0	110.0	90.0	35.0	40.0	29.0	35.0	90.0	95.0	58.0	55.0
	Phosp.	0.10	0.20	0.20	0.40	0.30	0.20	0.10	0.10	0.10	0.10	0.10	0.10
S-IV:P.P	Turb.	1206	1452	1452	1070	1460	1310	1430	1240	1220	1036	1126	145
	Temp.	19.20	19.90	26.30	25.90	30.80	31.80	30.70	29.80	26.90	29.30	22.30	21.10
	Trans.	42.00	41.00	27.00	58.00	65.00	17.00	6.00	6.50	19.00	12.00	27.00	46.00
C.P	pH	8.30	8.40	7.70	7.60	7.00	7.00	7.50	7.60	8.00	7.00	7.00	7.00
	DO_2	10.20	11.10	10.80	7.10	5.00	5.00	8.20	7.00	8.30	7.50	10.00	9.30
	DCO_2	1.70	1.80	1.00	1.40	2.00	2.20	0.50	2.00	2.00	2.30	2.60	2.50
	Nitr.	88.0	1100	1225.0	150.0	225.0	1750.0	32.0	45.0	105.0	110.0	70.0	85.0
	Phosp.	0.20	0.30	0.30	0.30	0.40	0.20	0.20	0.20	0.20	0.20	0.20	0.20

metal chelating-which are in charge of toxicity-are frequently impacted by pH. The pH values of the samples ranged from 7.60 to 8.54 ppm (S I), 7.00 to 8.40 ppm (S II), 8.15-8.40 ppm (S III), and 7.00 to 8.40 ppm (S IV), respectively. As a result, reservoir water samples can be classified as neutral or basic.

One of the crucial aspects of water that directly affects the survival and distribution of flora and animals in an ecosystem is dissolved oxygen. The range of DO_2 concentrations is 4.10 to 12.60 ppm. Summertime brings a drop in dissolved oxygen because of both an increase in temperature and microbial activity. Winter temperatures dropping and shorter periods of intense sunlight may be to blame for the high levels of dissolved oxygen and carbon dioxide. With the exception of the winter season, when DO_2 values in all four corners rose to highs of 10-12 ppm, the values of the four corners' DO_2 stayed consistent. The dense growth of algae or plants owing to photosynthesis may be the cause of the high DO_2 concentration throughout the winter. According to a scale the royal committee reported, DO_2 can be used to determine the water quality. Water with a DO_2 concentration of 7 ppm is thought to be very clear, 6 ppm is considered moderate, 5 ppm is questioned, and 4 ppm or less is considered terrible.

In the current investigation, dissolved carbon dioxide was observed to range between 0.50 and 2.80 mg/l. Site I recorded the highest free CO_2 concentration (2.80 mg/l), while Site II recorded the lowest (0.50 mg/l). One of the likely causes of the extremely high concentration of dissolved carbon dioxide in the current experiment may be respiration by zooplankton and other species.

The largest and lowest nitrate concentrations were found in sites II, with a range of 0.20-0.70 ppm. Nitrate levels were found to be below the 45 ppm WHO acceptable limit. The main anthropogenic causes of nitrate include agricultural runoff, trash dump runoff, and contamination from human or animal waste. Because the river is fed by nitrate-rich qualifiers, the concentration may rise and fall frequently with the season. Degradation of organic matter was the cause of the variation in nitrate content.

Similar to smoke in air, turbidity is the cloudiness or haziness of a liquid brought on by numerous small particles that are typically imperceptible to the unaided eye. A crucial evaluation of water quality is the measurement of turbidity. Turbidity was measured between 145 and 1452 ppm, with site II recording the highest value and site I the lowest. Phytoplankton growth may be the cause of turbidity in open water. Storm water runoff from human activities that disturb the land, such building, mining, and agriculture, can result in high silt levels entering water bodies during rainstorms.

Large volumes of turbidity are also added to adjacent waters by urbanised regions and locations with high rates of bank erosion due to storm water pollution from concrete surfaces like parking lots, highways, and bridges. Certain businesses, like mining, coal recovery, and quarrying, can produce extremely high levels of turbidity from colloidal rock particles. The risk of developing gastrointestinal disorders increases with increasing turbidity levels in drinking water. Because to the possibility of pathogens like viruses or bacteria attaching to the suspended solids, this presents a particular challenge for those with impaired immune systems.

Up to 0.40 ppm of phosphate has been discovered in traces. The phosphate value typically fluctuated but reached its highest level in the months of April and May at both sites I and II, indicating a moderate to high level of pollution in the Mahi Reservoir of Sonpur (Saran), Bihar.

CONCLUSION

The physico-chemical profile of the water samples taken from all four corners of the water body is well within the limitations of the WHO standard, according to experimental results from the current inquiry. Yet, samples of the south and west corners are where slightly anthropogenically influenced pollution frequently occurs. Unconscious human actions like bathing, washing dishes with detergent, and agricultural runoff, among others, are likely to have an impact on the water body of Mahi

Reservoir of Sonpur (Saran), Bihar. So, it may be inferred that the critical water quality indicators for drinking, irrigation, aquatic life, and surface water-turbidity, temperature, transparency, pH, DO_2, DCO_2, nitrate, and phosphate are within WHO standards.

REFERENCES

A.L.Lehninger, David L.Nelson & Michael M.Cox. 2008. Principles of Biochemistry, Worth Publisher, INC, New York..

APHA. 1998. Standard Methods for Examination of Water and Wastewater, 20th Ed., American Public Health Association, Washington, DC, New York.

Golterman, H.L. 1969. Methods for Chemical Analysis of Fresh Waters. I.B.P. Handbook No. 8. Black Well Scientific Publ., Oxford. 166 pp.

Helena Curtis, 1974. Invitation to Biology, Worth Publisher, INC, New York.

Shalini Kamal, 2012. Ph.D Thesis "Hydro-biological study of Konar Dam with special reference to diversity of plankton species abundance, Vinoba Bhave University, Hazaribagh.

Trivedi, R.K. and Goel, P.K., 1984. Chemical and biological methods for water pollution studies, Environmental Publications, Karad.