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A Study On Some Chemical Parameters Of Sonala Dam, Washim District, (Ms)

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ABSTRACT:

This study investigates the chemical parameters of water in Sonala Dam, located in Washim district, Maharashtra, India, over a four-month period from November 2024 to February 2025. Four sampling sites within the dam were analyzed for various water quality parameters, including dissolved oxygen (DO), carbonate, bicarbonate, chloride, salinity, total hardness, and carbon dioxide. The results indicated that the water quality in Sonala Dam is suitable for irrigation and fish farming, with dissolved oxygen levels reflecting active photosynthetic processes and supporting aquatic life. Seasonal variations were observed in chemical parameters, with slight fluctuations in carbonate, bicarbonate, chloride, and salinity. The absence of carbon dioxide across all sites further supports a healthy aquatic environment. The study concludes that the water in Sonala Dam can safely be used for both domestic purposes and irrigation, highlighting the need for ongoing monitoring to ensure water quality and support the local ecosystem.

Keywords: Chemical parameters, Sonala dam, Washim district.

INTRODUCTION:

Limnology is the study of the physical, chemical, and biological characteristics of inland waters, including lakes and other freshwater bodies. Inland waters are vital resources, providing us with drinking water, recreation, wildlife viewing, fishing, land protection, and much more. The term "limnology" is derived from the Greek word "limn" which means marsh or lake. However, limnology covers much more than just lakes- it encompasses all inland water systems such as rivers, streams, ponds, groundwater, and wetlands. While these systems are mostly freshwater, limnology also includes inland saltwater and brackish waters (slightly salty).

Limnology combines various scientific disciplines, including physics, chemistry, and biology. Although water is the central focus, these water systems are interconnected and support plant and animal life, which in turn impacts and interacts with climate patterns. A major branch of limnology is **freshwater ecology**, which specifically examines ecological systems and processes in freshwater environments, including any waters with a salinity of less than 3 parts per million (ppm).

Limnology is the consider of chemistry, biology, geography, and physical of water that are found inside land masses, in spite of the fact that most limnologists specialize in fresh waters, the think about of saline lakes, just like the great Salt Lake, moreover falls beneath the reach of limnology. One of the more imperative objectives of limnology is giving rules for water administration and water contamination control, limnologists too applicated ways to ensure the natural life that lives in lake and streams themselves, A few limnologists are working on development of lake wetlands, which seem serve as territories for a assortment of animal and plant species and help in increase water contamination.

Parameters:

Water quality is assessed using various physical and chemical parameters, which help in controlling water pollution. The physical parameters include pH, color, temperature, turbidity, total dissolved solids, and electrical conductivity. The chemical parameters include dissolved oxygen, carbonate, bicarbonate, biochemical oxygen demand (BOD), chemical oxygen demand (COD), chloride, and total hardness. These parameters are used to evaluate the water quality in different water bodies. Water serves five major functions: hydropower, domestic use, irrigation, industrial use, and commercial use (Shukla, Bhadresha, Jain, and Modi, 2013).

Chemical Parameters

Dissolved Oxygen (DO):

Dissolved oxygen is a critical parameter in water quality, significantly affecting the survival and distribution of aquatic flora and fauna in an ecosystem. It serves as one of the primary indicators of water health, reflecting the oxygen content in bodies of water such as lakes, rivers, or streams. During the summer months, dissolved oxygen plays a crucial role in supporting aquatic life, particularly in warmer lakes and reservoirs. If oxygen is absent from the water, aquatic organisms cannot survive. The dissolved oxygen content is an important factor in determining the quality of natural water systems. Winkler's method is commonly used to measure dissolved oxygen. The concentration of dissolved oxygen tends to be higher during the summer months due to increased water temperature.

Biological Oxygen Demand (BOD):

Biological Oxygen Demand (BOD) is a chemical parameter that measures the amount of oxygen required by living organisms to oxidize biodegradable organic matter in water under aerobic conditions. This parameter directly indicates the amount of oxygen needed for the biodegradation of organic matter, while it indirectly measures the quantity of biodegradable organic matter present in the water. A high BOD value is often a sign of water pollution, indicating a higher level of organic material that requires oxygen for decomposition.

Chemical Oxygen Demand (COD):

Chemical Oxygen Demand (COD) measures the amount of oxygen required to oxidize organic matter in water using strong chemical oxidizing agents, such as potassium dichromate ($K_2Cr_2O_7$). The COD value is generally higher than the BOD value for the same water sample, as the chemical method used to determine COD can oxidize both biodegradable and non-biodegradable organic matter.

REVIEW OF LITERATURE:

Shukla, bhadresha, Jain, and Modi (2013), studied of physicochemical analysis of water from various source, it carried out human safe to be consumed potable water or used with low risk of immediate or to enough long-term harm. **Patil, sawant and Deshmukh (2012)**, investigated the physicochemical parameters for testing of water A review, it carried out the use different physiochemical parameters water value was good as compared to value of real water sample. **Mahajan and pokale (2017)**, reported the physicochemical analysis of mobabala lake near Bhadrawati, District - Chandrapur (MS), India. it observed that may be terminate the physicochemical parameters of three sites of mohobala lake water varied appreciably and they indicate change in relative to the seasonal changes. **Dominic, chacko, tom (2016)**, studied the analysis of water quality of samples collected from Thevara region, Kerala, India. it resulted that the various physicochemical parameters use for testing in water quality they observed the water very good quality for drinking and human uses. **Gorde and Jadhav (2013)**, studied the assessment of water quality parameters: A review, it shows that the water quality parameters certain lower in dry season than rainy season. **Solanke and Dabhade (2016)**, studied the physico- chemical analysis of upper morna reservoir, medshi district- washim, Maharashtra. It carried out the water of dam can be used of irrigation, domestic and also for culturing fishes. **Mankar (2018)**, studied on limnological and correlation studies of sonala dam, sonala district- washim, (M.S), it carried out the water can be safely used for domestic, irrigation and pisciculture. **Bali (2016)**, studied on chemical parameters of different freshwater bodies in Washim town of Maharashtra. It results that can be observed the monsoon and winter season show different fluctuation and the water are suitable for the

development on planktonic organism and fishing growth and they Also used for irrigation and fish culture. **Mankar and bobdey (2015)**, studied the assessment of water quality of sonala dam, dist. Washim, Maharashtra and it carried out the physicochemical parameters of water are using reproduction are safely. **Vasanthkumar, khatoon and manjappa (2012)**, analyzed the physico chemical characteristics of Queen Lake in Arasikere Karnataka, India and they reveals that the water quality of water bodies has to be maintained for the sake of human health. **Pawaiya, sharma and khushwah (2014)**, analyzed the physicochemical parameters in Harsi Reservoir Dabra, Gwalior district, Madhya Pradesh indicating that all the physical and chemical parameters in the Harsi, Reservoir water were within the desirable range. **Mahananda, Mohanty and Beers (2010)**, determined the physicochemical parameters of surface and ground water of Bargarh district, Orissa, India and they found that parameters which were taken for the study are below the pollution level for ground water which satisfy the requirement for the use for various purposes like domestic, agriculture, industrial etc. But in the case of surface waters, the water quality of small community pond is above the permissible limits. **Pawar and vaidya (2012)**, studied on the physicochemical characteristics and level of sewage pollution in Krishna river at wai, dist- satara revealing the drastic changes in the physic chemical characteristics of river water within a span of 2 km down the stream when it passes the rough city area, the parameters like pH, conductivity, TSS, TDS, TS, DO, BOD shows sudden increase at the exit point of the river as compared to the entry point. **Dubey, Tiwari and Ujjania (2013)**, studied the physicochemical properties of the sahapura lake, Bhopal, India and they concluded that all the physico chemical parameters of sahapura lake are beyond the prescribed limits of WHO and BIS indicating for increasing in pollution of sahapura lake, which need control of industrial waste and human activity in the water body.

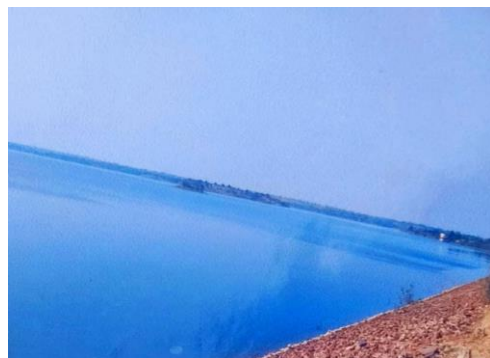
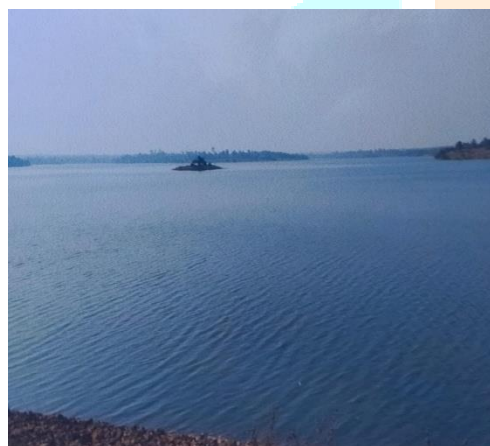
MATERIAL AND METHODS:

Sonala Dam:

Sonala is a village located near Malegaon Taluka in the Washim district of Maharashtra, India, within the Vidarbha region. It is part of the Amravati Division and is situated approximately 30 km north of the district headquarters, Washim. The village is bordered by Malegaon Taluka to the west, Barshitakli Taluka to the north, Washim Taluka to the south, and Manora Taluka to the east. The primary purpose of the Sonala Dam is irrigation, and it was constructed by the Government of Maharashtra in 1981. The dam is an earthfill structure built on the Aran River, near Mangrulpir, in Washim district. The height of the dam above the lowest foundation is 19.6 meters (64 feet), and its length is 1,114 meters (3,655 feet). The dam has a total volume of 698 million cubic meters (167 million cubic miles) and a gross storage capacity of 20,270,000 cubic meters (4.863 million cubic miles).

Sampling stations:

Four distinct sampling sites within the Sonala Dam, located in Sonala village in the Washim district, were selected for the study.

**SITE 1****SITE 2****SITE 3****SITE 4****RESULT AND DISCUSSION:**

In the present study chemical parameters in four different sites of Sonala Dam of Washim city, Maharashtra were analysed for a period of four months (November 2024-February 2025).

Analytical report of Water Quality characteristics is presented in Table Below

Parameters	Site A	Site B	Site C	Site D
DO (mg/L)	3.65 ± 0.129099445	4.9 ± 0.141421356	4.65 ± 0.129099445	4.975 ± 0.170782513
Carbon Dioxide (mg/L)	Absent	Absent	Absent	Absent
Carbonate (mg/L)	18 ± 2.82842715	12 ± 1.632993162	17 ± 1.154700538	13.5 ± 2.516611478
Bicarbonate (mg/L)	96 ± 1.632993162	95.5 ± 1.91485421	93 ± 2.581988897	88.5 ± 2.516611478
Chloride (mg/L)	79.7625 ± 6.788158194	85.08 ± 10.02677416	95.8525 ± 9.061086671	104.5575 ± 12.09288048

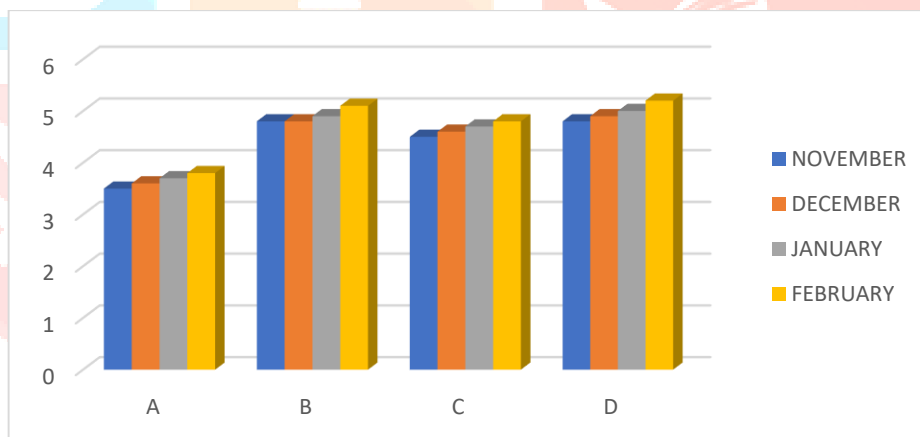
Salinity (mg/L)	145.95± 12.20286852	153.55± 18.05482392	125.4925± 82.33629875	141.4925± 94.87316861
Total Hardness (mg/L)	350.5± 7.724420151	348.5± 3.415650255	272± 3.415650255	290± 7.118052168

Analytical report of Water Quality Characteristics

DISSOLVED OXYGEN:

Dissolved oxygen (DO) concentrations of 3.0 mg/L or lower are considered stressful for oceanic vertebrates and most aquatic life. DO is a critical parameter for the survival of fish and other marine organisms. During the study period, the highest recorded DO value in Sonala Dam was 5.2 mg/L at site (D) in February, while the lowest was 3.5 mg/L at site (A) in November. Similar studies were conducted by Mankar U.P. and A.D. Bobdey (2015). Seasonal variations in dissolved oxygen levels across the four different sites of Sonala Dam are shown in Table II and Graph Plate I.

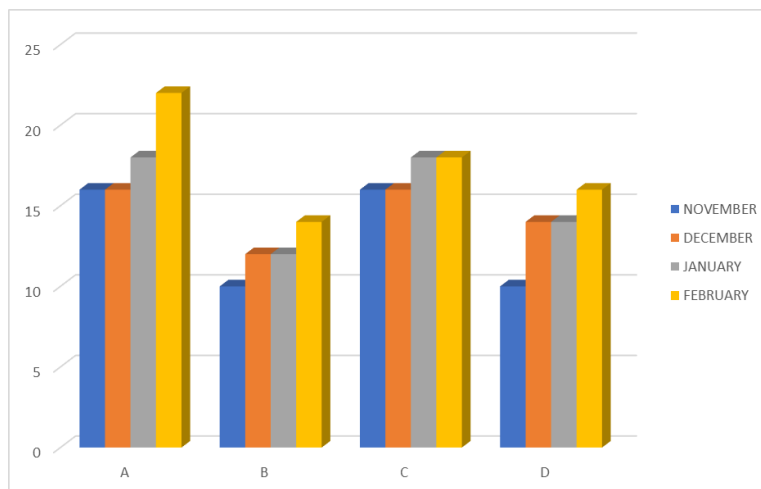
DISSOLVED OXYGEN	A	B	C	D
NOVEMBER	3.5	4.8	4.5	4.8
DECEMBER	3.6	4.8	4.6	4.9
JANUARY	3.7	4.9	4.7	5
FEBRUARY	3.8	5.1	4.8	5.2
MEAN	3.65	4.9	4.65	4.975
Std.deviation	0.129099445	0.141421356	0.129099445	0.170782513

Table II: Comparative analysis of DO from four Different Sampling Sites**Graph Plate I: seasonal changes in the DO of Four sites in Sonala Dam****Total Alkalinity:**

During the study period, the highest carbonate value recorded in Sonala Dam was 18 mg/L at Site A in February. The lowest value was 10 mg/L, observed at Sites B and D in November. The carbonate levels at all four sites in Sonala Dam showed slight fluctuations throughout the study. A similar study was conducted by A.M. Bali (2016). The comparative values of carbonates are presented in Table III and Graph Plate II.

Carbonate	A	B	C	D
November	16	10	16	10
December	16	12	16	14
January	18	12	18	14
February	22	14	18	16
Mean	18	12	17	13.5
Std.Deviation	2.828427125	1.632993162	1.154700538	2.516611478

Table III Comparative analysis of Carbonate from four different sampling site



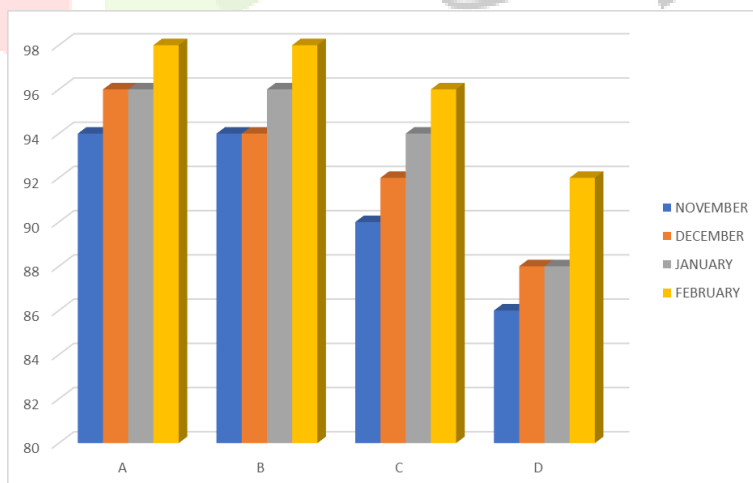
Graph Plate II Seasonal Changes in the Carbonate of Four different sites in Sonala Dam

Bicarbonates:

In sonala dam During the study period the minimum value was recorded as 86mg/L of site D in month of November and the maximum value of bicarbonates was recorded as 98mg/L of site A in month of February. All the four site in sonala dam show the slight fluctuation in the bicarbonate during the present study and similar study were carried out by A.M.Bali (2016). The comparative changes in the bicarbonate are shown in table no. IV and graph plate III

Bicarbonates	A	B	C	D
November	94	94	90	86
December	96	94	92	88
January	96	96	94	88
February	98	98	96	92
Mean	96	95.5	93	88.5
Std.deviation	1.632993162	1.914854216	2.581988897	2.516611478

Table IV Comparative analysis of Bicarbonate from Four Different Sites



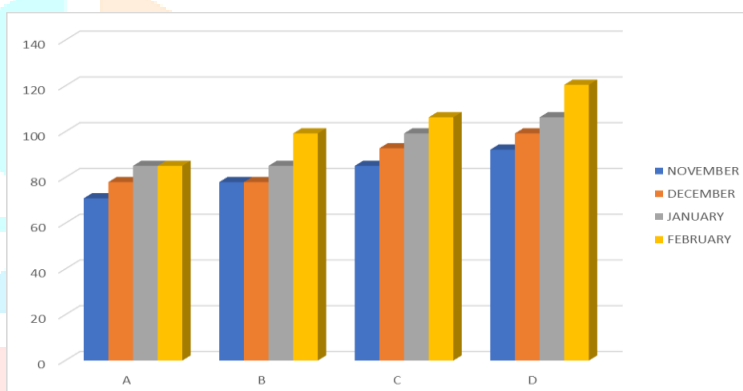
Graph Plate III Seasonal Changes in the Bicarbonates of Four different Sites in the Sonala Dam

Chloride:

The chloride is display in both fresh and salt water, and are essential components of life.. During the study period maximum value of chloride in Sonala dam was recorded as 120.5mg/L of site D in month of February and minimum value of sonala dam recorded as 70.9 mg/L of site A in month of November. All four sites in sonala dam show the slight fluctuation in the chloride during the present study and the similar studies were carried out by Dr. Ujawala P. Mankar (2012-13) The comparative changes of chloride are shown in table no. V and graph plate no.IV

Chloride	A	B	C	D
November	70.9	77.99	85.08	92.17
December	77.99	77.99	92.77	99.26
January	85.08	85.08	99.26	106.3
February	85.08	99.26	106.3	120.5
Mean	79.7625	85.08	95.8525	104.5575
Std.Deviation	6.788158194	10.02677416	9.061086671	12.09288048

TableV: Comparative analysis of Chloride From four Different Sampling sites



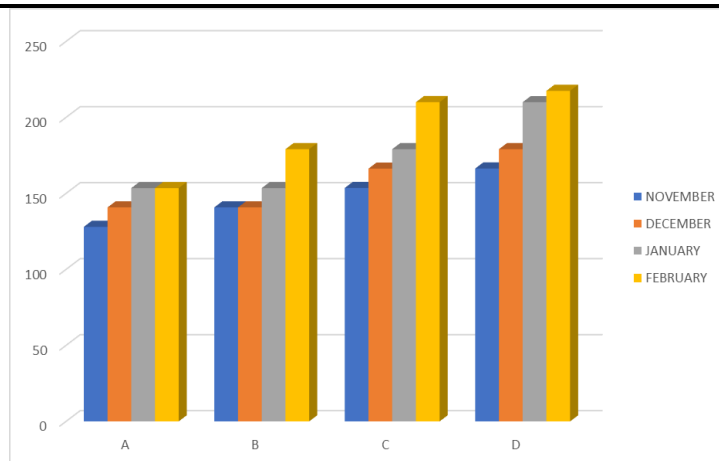
Graph Plate IV: Seasonal Changes in the Chlorides of four different sites in Sonala Dam.

Salinity

During the study period minimum value of salinity in sonala dam was recorded as 128 mg/L of site A in month of November and the maximum value of sonala dam recorded as 217.5 mg/L of site D in month of February. All the four site in sonala dam show the slight fluctuation in the salinity during the present study and similar study were carried out by A.M.Bali (2016). The comparative changes in the salinity are shown in table no.VI and graph plate no. V.

Salinity	A	B	C	D
November	128	140.8	153.59	166.39
December	140.8	140.8	166.3	179.1
January	153.5	153.5	179.1	210.04
February	153.5	179.1	210.04	217.5
Mean	143.95	153.55	125.4925	141.4925
Std.deviation	12.20286852	18.05482392	82.33629875	94.86316861

Table IV: Comparative analysis of Salinity from Four different Sampling Sites



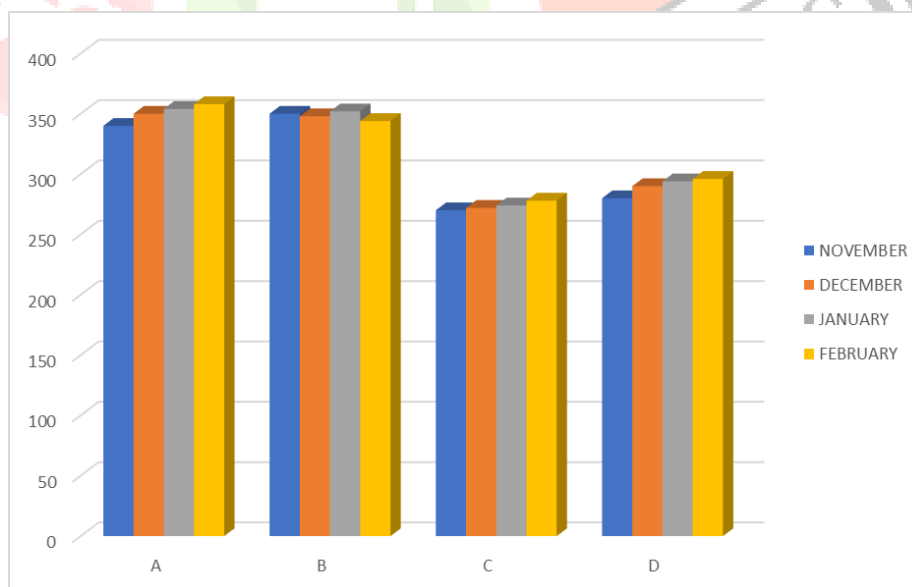
Graph Plate V: seasonal analysis in the salinity of the four different sites in Sonala Dam

Total Hardness: -

Hardness in water is primarily caused by the presence of multivalent metal ions, which originate from minerals that break down within the water. During the study period, the highest total hardness value in Sonala Dam was recorded at 358 mg/L at Site A in February, while the lowest value was 270 mg/L at Site C in November. A similar study was conducted by A.M. Bali (2016). The comparative values of total hardness are presented in Table VII, and the graph in Plate VI illustrates these findings.

Total hardness	A	B	C	D
November	340	350	270	280
December	350	348	272	290
January	354	352	274	294
February	358	344	278	296
Mean	350.5	348.5	272	290
Std.deviation	7.724420151	3.415650255	3.415650255	7.118052168

Table VII: Comparative analysis of total Hardness from four Different sites



Graph Plate VI: seasonal analysis in the Total Hardness of the four different sites in Sonala Dam

Carbon Dioxide (CO₂)

Free CO₂ in water is inferred from numerous sources such as climate, breath by the life forms, bacteria decay of natural matter etc. Rain too assimilates little sum of gas and convey it to the water on which it falls. In sonala dam the carbon dioxide absent in four site in month of September, December January, February. The similar studies were carried out by A.M.Bali(2016). The comparative changes of carbon dioxide are shown in table no. VIII

Carbon Dioxide	A	B	C	D
November	Absent	Absent	Absent	Absent
December	Absent	Absent	Absent	Absent
January	Absent	Absent	Absent	Absent
February	Absent	Absent	Absent	Absent

Table VIII Comparative analysis of Carbon dioxide from four Different sampling sites

CONCLUSION:

The monsoon and winter seasons show significant variations in different chemical parameters. The observed chemical composition of the water bodies is reported to be suitable for supporting planktonic organisms and fish. The water in the present dam is suitable for both irrigation and fish farming. The dissolved oxygen level indicates ongoing photosynthetic activity in the water, while nutrients such as sulfate, phosphates, and chloride create a favorable environment for the biota within the dam. However, further studies are necessary to confirm the precise status of the water quality. The dam water itself appears capable of maintaining a balance of natural pollutants to some extent. Based on observations from all four sides, it was concluded that the water sources can be safely used for both domestic purposes and irrigation. Aquatic life in the ecosystem depends, both directly and indirectly, on water quality. To enhance water quality, continuous monitoring of pollution levels is essential, along with maintaining favorable conditions necessary for fish survival, growth, and reproduction.

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