IJNRD.ORG ISSN : 2456-4184
INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT (IJNRD) | IJNRD.ORG
An International Open Access, Peer-reviewed, Refereed Journal

Study of some Physicochemical Parameters of Jawla Reservoir of Beed District, Maharashtra (India).

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ABSTRACT:

The current study examined some of the physicochemical characteristics of the water from the Jawala reservoir over a period from February 2014 to January 2015. The main goal was to assess the overall quality of the water, taking into account its critical role in a number of uses, including fish farming, drinking water supply, irrigation and other home and agricultural requirements. Water temperature, pH levels, total dissolved solids (TDS), dissolved oxygen (DO), carbon dioxide (CO2), total alkalinity, chloride, total hardness, and nitrates were the main indicators of water quality that were addressed in the study.

Key words: - *Jawla reservoir, physicochemical parameters.*

INTRODUCTION:

The Jawla reservoir is essential for meeting a variety of water demands, including those of industry, agriculture, and fish farming. The reservoir was built in 1995 on 441 hectares of land in Kaij Taluka, Dist. Beed, primarily for agricultural purposes. Over time, the reservoir has changed. Apart from its primary use, the water of Jawla Reservoir is currently an essential supply of drinking water for the neighbouring settlements. The effects of industrialization, urbanization, and the careless use of pesticides have put the Jawla Reservoir's water quality under strain, despite its importance. These operations runoff contaminates the reservoir and reduces its appropriateness for different uses, contributing to water pollution. A thorough evaluation of the water quality is necessary to solve these issues and offer crucial information. Based on physicochemical parameters, the assessment is carried out, providing a comprehensive picture of the water's current condition. This evaluation helps maintain the reservoir's original agricultural use while also guaranteeing that the water supplied for human use satisfies regulatory requirements. Authorities can put the required measures in place to prevent pollution and protect the reservoir's multifarious value for the surrounding populations by monitoring and maintaining the water quality through such assessments.

MATERIALS AND METHODS:

Two locations are identified as A and B for the study of physicochemical study. The sampling procedure was consistently executed within the time frame of 6:00 am to 10:00 am throughout the entire study period, spanning from February 2014 to January 2015. In-situ measurements were conducted in the field to ascertain the water temperature, utilizing a calibrated thermometer. Additionally, the pH of the water samples was determined using a standard pH meter. For the analysis of other water quality parameters, established methods recommended by authoritative sources such as the American Public Health Association (APHA) in 1998, Trivedy & Goel in 1985, and Kodarkar in 2006 were followed rigorously. The meticulous adherence to these standardized methodologies ensures the reliability and comparability of the collected data, contributing to the robustness of the study's findings. This comprehensive approach to sample collection and analysis aims to provide a thorough understanding of the water quality dynamics at the designated locations over the specified temporal scope.

RESULTS & DISCUSSION:

The data presented in Table No. 1 highlights the significance of water temperature as a crucial physical parameter influencing the seasonal distribution of organisms. Throughout the study area, the water temperature exhibited a range from 21.1 to 31°C at spot A, escalating to 31.8°C at spot B. Notably, a seasonal analysis revealed that the highest temperatures were recorded during the summer, moderately high values in the rainy season, and the lowest temperatures in winter. Narayana et al. (2005) previously reported water temperature variations ranging from 24.75 to 30.25°C in the Aujanapra reservoir, a trend that aligns with the findings of the current study. This consistency in results underscores the stability and reliability of the observed temperature patterns. In addition to temperature, pH emerged as another crucial factor influencing the aquatic ecosystems flora and fauna. The pH levels at spot B ranged from 7.1 to 8.7, while at spot A, they varied between 7.3 and 8.6. The present study identified an alkaline pH trend, consistent with observations made by Khan et al. (2005). This alkaline pH environment is known to significantly impact the growth and development of aquatic organisms. Furthermore, the study noted a peak in the Metabolic Activity (MA) during the summer season, attributed to elevated photosynthetic activity. This suggests a direct correlation between seasonal variations in temperature and the metabolic processes of the aquatic organisms. The high MA in summer further emphasizes the importance of understanding the interplay between environmental factors and biological activities in aquatic ecosystems. Total Dissolved Solids (TDS) represent the cumulative amount of particles that are dissolved in water, encompassing both suspended and unsuspended solids that may or may not pass through a filter. In the context of our present study, the TDS values range from 105 to 280 mg/l at spot A and 110 to 290 mg/l at spot B. Notably, the lowest values were observed during the months of December and January in the winter season, while the highest values were recorded in July and September during the rainy season. This aligns with similar observations made by Lokhande et al. (2004) during their investigation of the Dhanegaon reservoir.

Dissolved Oxygen (DO) serves as a crucial parameter in assessing water quality, providing insights into the physical and biochemical processes occurring within the water body. The recorded dissolved oxygen values range from 7.5 to 13.5 mg/l at spot A and 7.2 to 12.1 mg/l at spot B. The highest DO values were observed in the early summer months, suggesting a correlation with heightened photosynthetic activity among aquatic plants. This data indicates the dynamic nature of water quality, influenced by seasonal variations and environmental factors. The lower TDS values during the winter season could be attributed to reduced runoff and lower particle concentrations. Conversely, higher TDS values during the rainy season may be indicative of increased sedimentation and runoff. The observed fluctuations in dissolved oxygen levels highlight the impact of seasonal changes on the aquatic ecosystem, with elevated values during summer months likely linked to enhanced photosynthetic activity. Understanding these variations is essential for comprehensive water quality management and ecosystem preservation. Similar findings were reported by Devidas and Kamath et al. (2006) as well as Lokhande et al. (2009). Free carbon dioxide (CO_2) exhibits high solubility in water. CO_2, a by-product of respiration, also serves as a carbon source for photosynthesis. The concentration of free carbon dioxide valves ranges from 1.7 to 4.2 mg/l at spot A and 1.6 to 4.3 mg/l at spot B. Radhika et al. (2004) observed similar results in Vellaani lake. In the present investigation, the highest recorded CO_2 values in the winter season are attributed to incomplete utilization of CO_2 due to reduced photosynthetic activity in the reservoir.

Total alkalinity indicates the presence of carbonates and bicarbonates in water. Alkalinity is directly proportional to the productivity of the lake. Alkalinity values range from 100 to 170 mg/l at Spot A and 110 to 160 mg/l at spot B. Higher alkalinity values were noted in the rainy season, consistent with findings by Dasgupta and Purohit (2003) and Mishra et al. (1989). Chlorides are typically present in low concentrations in natural waters, and if the chloride content exceeds 205 mg/l, it is considered saltwater. In Jawala reservoir, chloride content ranges from 24.11 to 41.80 mg/l at spot A and 24.13 to 42.10 mg/l at spot B. The low chloride content in the water of Jawla reservoir indicates its potability and suitability for irrigation purposes. Chloride levels are lower in the winter season and higher in the summer season due to increased temperature and water evaporation. Similar observations were made by Chowdhary and Zammen (2006) and Devidas Kamath et al. (2006).

In the current investigation, the total hardness within the Jawala reservoir was found to vary significantly, ranging from 51 to 125 mg/l at spot A and 75 to 120 mg/l at spot B. Notably, the study revealed a distinctive pattern in hardness levels throughout the seasons, with minimum values recorded during the summer season and maximum values during the winter season. This seasonal fluctuation in hardness levels is a crucial aspect of the reservoir's water quality dynamics. This consistency in the behavior of calcium and magnesium components underscores the interplay of various factors influencing water hardness. Additionally, Pendse et al (2000) reported lower values of hardness during the summer season, further corroborating the seasonal variability observed in the current study. The collective evidence from these studies strengthens the understanding of the temporal variations in water hardness, providing valuable insights for water resource management and environmental monitoring in the region. In the current investigation, nitrate emerges as the predominant form of combined inorganic and organic nitrogen within lakes and streams. Notably, at spot A, the nitrate concentration fluctuates between 0.030 and 0.067 mg/l, while at spot B, it varies from 0.031 to 0.061 mg/l. A discernible seasonal pattern is observed, with minimum values recorded during the rainy season and maximum values in the summer season. Comparing these findings to established standards for drinking water for adults, which are typically set at a threshold of 10 mg/l (Raghvendra, 1992), it is evident that the nitrate levels in the Jawla reservoir water remain well below this limit. This lower concentration suggests that the water from the Jawla reservoir is suitable for drinking purposes. This aligns with similar observations made by Pawar and Khobragade in 2009. It is essential to highlight that the study's results imply that the nitrate content in the Jawla reservoir water falls within acceptable limits for human consumption, as per the standards set by Raghvendra (1992). This could potentially be attributed to effective management practices or natural processes regulating nitrate levels in the reservoir. The seasonal variability observed in nitrate concentrations adds complexity to the study, indicating the need for continued monitoring to understand the dynamic patterns of nitrogen compounds in aquatic environments.

CONCLUSION

The results of the previously mentioned study show that almost all evaluated parameters are within the suggested bounds established by the Bureau of Indian Standards (BIS) and the World Health Organization (WHO). Even before it has undergone the required treatments, the water from the Jawla reservoir is considered safe to drink. It is also proven to be appropriate for use in aquaculture and irrigation projects. This is explained by the favourable physicochemical parameters that are found in ranges that support fish, zooplankton, and phytoplankton development and well-being. Specifically, the reservoir water exhibits characteristics that are favourable to the culture of fish and other aquatic creatures, which qualifies it for use in fish culture procedures. The study's identified physicochemical characteristics foster an environment that is favourable to the growth and survival of phytoplankton and zooplankton, which are vital elements of the aquatic food chain. The total evaluation concludes that the water from the Jawla reservoir is suitable for irrigation and fish culture techniques in addition to being safe to drink. Because of this, it complies with the guidelines provided by the WHO and BIS, highlighting its applicability for a range of uses in the fields of public water supply, aquaculture, and agriculture. From the above study it can be concluded that almost all the parameters are within the prescribed limit of WHO & BIS standards. The Jawla reservoir water is suitable for drinking purpose before proper treatment it also used for irrigation and aquaculture activities because the physicochemical parameters are favourable range for the growth of fishes of zooplankton, phytoplankton. Over all the Jawala reservoir water is suitable for drinking, irrigation & fish culture practices.

Parameters	Water Temp. (^0C)		pH		TDS (mg/l)		DO (mg/l)		CO_2 (mg/l)		TA (mg/l)		CL. (mg/l)		TH (mg/l)		Nitrates (mg/l)	
Spots / Months	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
February	24.6	22	8.7	8.5	184	136	11.7	11.3	2.1	2.2	117	121	27	28.72	110	105	0.060	0.045
March	26.9	25.1	8.6	8.7	220	215	10.9	10.4	2.2	2.3	110	115	40.12	40.10	90	110	0.063	0.060
April	30.1	30.7	8.3	8.5	215	192	9.7	9.9	2.5	2.5	114	112	41.80	42.10	82	75	0.055	0.061
May	31	31.8	8.7	8.3	190	250	9.7	9.2	1.7	1.6	155	160	29.04	30.10	51	58	0.055	0.054
June	25.1	25.2	7.4	7.5	240	210	8.5	8.3	2.1	2.3	170	157	29.01	32.28	100	111	0.045	0.035
July	21.7	21.5	7.1	7	270	290	8	8.3	2.5	2.4	168	160	33.02	30.87	105	115	0.030	0.031
August	22.6	23	7.4	7.3	240	245	7.5	7.2	2.1	2.2	151	148	31.15	31.80	125	120	0.039	0.042
September	23.5	22.6	8.1	8	280	270	7.5	7.7	2.1	2	115	110	31.10	31.56	125	120	0.030	0.035
October	23	24.1	7.7	7.5	215	245	8.5	8.6	2.2	2.1	135	140	35.00	35.10	110	108	0.043	0.044
November	21.1	21.5	8	7.9	170	165	9.8	9.8	3.2	4.1	112	110	32.15	32.10	115	110	0.044	0.041
December	21.7	21.9	8.1	8	105	115	11.3	11.2	4.2	4.3	100	110	30.18	30.70	115	117	0.044	0.043
January	20.5	20.8	7.8	7.7	115	110	13.5	12.1	4.2	4.1	120	135	24.11	24.13	125	120	0.051	0.047

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