



AN INVESTIGATION ON THE HYDROLOGY OF THE HARSOOL DAM IN AURANGABAD, INDIA

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Abstract:

In addition to being necessary for digestion and the consumption of food, water also plays a role in the maintenance of proper muscle tone, provides cells with oxygen and nutrients, and functions as a natural air conditioning system. Seventy percent of an individual's body weight is the amount of water that they should consume on a daily basis. As a consequence of this, it is significant for regular growth. On the other hand, water may be lethal if it is polluted with hazardous or dangerous substances, if pathogenic germs are present, and if there is a lack of proper cleanliness. During the first week of July 2009 to June 2010, samples of water were collected for a physicochemical examination at the Harsool Dam in Aurangabad, India. The samples were gathered between the hours of 8:00 and 11:00 AM. The present research investigates the seasonal shifts, the connection between metrics, and the relationship between measurements. The physicochemical characteristics of the water obtained from the Harsool Dam were investigated and studied. From July 2009 till June 2010, that is. There is a connection between the physicochemical parameters and the different seasons. With this information, it is possible to determine the water quality of the dam. The correlation coefficient reveals a highly significant positive and negative relationship ($p < 0.01$), as well as a significant positive and negative relationship ($p < 0.05$). The use of correlation coefficients allows one to determine the degree to which two things are connected to one another. As a result of the findings, it was discovered that the metrics of these dams saw variations depending on the season. During the course of the present study, the fact that the measured parameter values were found to be lower than the ISI-permitted limit is evidence that the water from the dam is acceptable for use in residential settings and for drinking.

Key Words: Hydrology, Harsool Dam, Seasonal Variations, Water Quality

Introduction:

The Physicochemical properties of pond water directly impact the dominant organisms and the person who uses that water. Freshwater is perhaps the most vulnerable habitat and is more susceptible to change by human activity. This essential resource is becoming increasingly limited in many areas of the world as a result of the severe decline in water quality (Munde et al, 2021) ^[12]. Numerous physicochemical or biological elements may affect fish growth and reproduction by acting as stressors (Iwama et al, 2000) ^[6]. It is difficult to comprehend the biological phenomenon without understanding the chemistry of water. The general hydrobiological connection and ecosystem metabolism are explained by the chemistry of water (Deshmukh and Ambore, 2006) ^[4]. The eutrophication process is accelerated by phosphorus and nitrogen inputs from household garbage and fertilizers (Madhusudan et al, 2017) ^[11]. Natural factors such as dust, storms, runoff, and mineral weathering are slow processes that cause eutrophication (Kudari et al, 2006) ^[10]. Waters that move very slowly are important because they fill reservoirs that are used to store water for domestic usage, drinking, and fish farming. Declining water quality is now widely understood to be a result of eutrophication (Kim et al, 2001) ^[9]. Understanding the trophic dynamics of this body of water requires a thorough understanding of the physicochemical aspects of limnology. While each component plays a part, the overall outcome is the product of how all the elements interact (Hulyal and Kaliwal, 2008) ^[5]. Keep this in mind; this study was conducted to assess the monthly values, standard deviation, and correlation of different water parameters of Harsool Dam in Aurangabad [MS] India.

The Harsool Dam is situated seven km from Aurangabad's North Side. The dam's location is altitude and 190.32'0" North latitude and 750.14' East longitude. When the Nizam state ruled the Marathwada region, a huge tank was built to supply drinking water to the city of Aurangabad. It was constructed in 1954 along the Harsool River. The band measures approximately 3172 meters in length, 4.50 meters in breadth, and 73.64 square kilometers in catchment area. 4.50 meters wide is the peak. The tank receives ample water throughout the monsoon, but the water level drops during the post-monsoon period, especially in March and April. The water spread area is around 2511.00 hectares.

Results and Discussion:

These consist of inorganic salts such as calcium, magnesium, potassium, sodium, bicarbonates, chlorides, Sulphates and some heavy metal compounds. The organic substance in small amounts also

contributes to the total number of solids dissolved in water. TDS in drinking water comes from natural sources, wastewater, urban runoff, and industrial wastewater. "Dissolved solids" refer to minerals, salts, metals, cations, or anions dissolved in water. They include everything in the water except the pure water molecule (H₂O) and suspended solids. Suspended matter does not disappear and does not settle in water. Total dissolved solids (TDS) is a measure of the variety of minerals in water. They don't have any gas or colloids in them. Salts and other organic compounds that easily dissolve in water and frequently add a certain amount of hardness are examples of dissolved solids in naturally occurring water. The excessive total dissolved solids generally affect palatability (Jawale and Patil, 2009) ^[7]. The dissolved solid's total values reached 39 to 75 mg / l. The average values of the total solids dissolved were a maximum of 65.62 ± 9.57 mg / l in winter and a minimum of 48.37 ± 4.53 mg / l in summer, as indicated.

In the Harsool Dam, the total solids dissolved were positively correlated with the total alkalinity, although they were not negatively correlated (Table 2). (Salve and Hiware, 2006; Shinde et al, 2010; Shinde et al, 2011) ^[17, 18, 19] reported in Wanparakalpa Reservoir, Nagapur near Parali Vaijanath Dist. Beed, Maharashtra, seasonal analysis revealed that low total dissolved solids were reported in the winter season while the maximum value was in the monsoon due to the addition of solids from surface runoff. (Solanki, 2006) ^[21] reported the maximum values of TDS in July at all stations in Belial and Pandu Lakes of Bodhan, (A.P.) India. A medium with a high TDS content has a higher water density, which improves osmoregulation. (Jawale and Patil, 2009) ^[7] reported that magnesium showed a significant positive correlation with pH, electric conductivity, calcium, T.A., and sulfates. Magnesium is widely used in minerals. It is also highly chemically active; So it cannot be found in nature in its primary state. Except for magnesium hydroxide with a high pH, its salts are highly soluble. Magnesium ions are of particular importance in water pollution. They can contribute to water hardness. The amount of magnesium and calcium in the water may also be a distributive factor for crustaceans, fish, and other organisms in some inland passages. Magnesium is the eighth most common element in the earth's crust and the natural element of water.

It is vital for the proper functioning of living things and is found in minerals such as dolomite and magnetite. The human body contains about 25 grams of magnesium (60% in bones and 40% in muscles and tissues). The Magnesium values reached 1.12 to 179 mg/l. The average Magnesium values were maximum in monsoon at 45.77 ± 82.22 mg/l and minimum during winter at 2.67 ± 0.23 mg/l as recorded (Table 1). In the Harsool dam, the Magnesium was not positively and negatively correlated (Table 2). Chlorides are generally found in natural waters. The presence of chlorides in natural water can be attributed to the dissolution of salt deposits, the discharge of wastewater from the chemical industry, the exploitation of oil wells, the release of sewage and the drainage of irrigation, contamination by leachate waste and ingress of seawater into coastal areas. Each of these sources can cause local pollution of the surface and groundwater. The chloride anion is generally present in natural waters. The most prevalent anions in wastewater are chloride and chloride anions (Cl⁻). The concentration of chloride is higher in organic wastes, and its higher level in natural water is unmistakable evidence of sewage contamination. Chloride values reached 35.1 to 57.1 mg / l. In summer, the average chloride values were a maximum of 48.98 ± 5.36 mg / l and minimal during the monsoon at 40.96 ± 4.76 mg / l, as indicated. Chlorides were not positively and negatively correlated in the Harsool Dam (Table 2). (Anita et al, 2005) ^[1] the chloride content of water at two sites of the littoral zone of the Lake revealed that it recorded maximum value in May and minimum in August in Mir Alam Lake, Hyderabad. (Reddy et al, 2009) ^[16] reported that the Chloride maximum value was recorded in May while the minimum was recorded in August.

The most stable Sulphates in the water at 250 ° C and one atomic pressure are free Sulphates, SO₄²⁻, H₂SO₄, H₂-H₂S, and S₂⁻. The participation of Sulphates types in geological and biological processes and the use of Sulphates fertilizers contribute to water contamination. In urban areas, the industrial emission of SO₂ gas and its contact with the humidity formed by Sulphatesic acid is one of the primary sources of Sulphates pollution in surface waters. The discharge of industrial wastes and sewage into the water also increases concentration. From a chemical point of view, Sulphates play an essential role in forming Ca and Mg salts to give water a permanent hardness. Sulphate in fertilizers increases the concentration of sulphate in the water body and causes water pollution. Additionally, they originate from runoff water, which has significant concentrations of both mineral and organic sulphur compounds. In adults, water with roughly 1000 mg/l of magnesium sulphate serves as a purgative; however, children and beginning users may still be affected by lower doses (Joshi and Sakhare, 2003) ^[8]. Sulphate is important constituent producing water with calcium and magnesium. High amounts of sulphate impart a bitter taste to water (Bhalerao and Khan, 2000) ^[3]. Sulphates values reached 0.8 to 6.1 mg / l. The average Sulphates values were a maximum of 4.25 ± 1.36 mg / l in winter and a minimum of 1.46 ± 0.47 mg / l during monsoons, as shown (Table 1). In the Harsool dam, the Sulphates were not positively correlated, although they were negatively correlated with phosphate. (Telkhade et al, 2008) ^[22] Stated that Sulphate is a crucial element in protein metabolism and is essential for plant growth.

It was most abundant in March in Neri Nala in Durgapur, District of Chandrapur. A vital component of both plants' and animals' metabolic processes, phosphorus is a nutrient for plant growth. It regulates primary

productivity and algal growth. Phosphorus concentrations in most natural waterways range from 0.005 to 0.020 mg/L. Only trace amounts of phosphorus are needed by algae. Algal blooms can result from eutrophication, which can be brought on by too much phosphorus. Phosphate levels of 0.1 to 0.3 mg / l were achieved. The average phosphate values were a maximum of 0.25 ± 0.05 mg / l in winter and a minimum of 0.2 ± 0.07 mg / l during monsoons, as indicated (Table 1). In the Harsool Dam, phosphate was not positively correlated, although it was negatively correlated with sulfate and total alkalinity (Table 2). The maximum concentration of 0.74 mg/l phosphate was observed in the deeper zone in December 2004 and the minimum of 0.22 mg/l in the shallow zone in July 2005 at Upper Lake of Bhopal (Sisodia et al, 2007) [20]. (Rao et al, 2002) [15] in Julur tank reported maximum phosphate in monsoon. Phosphate is the key nutrient in the productivity of water in reservoirs (Piska et al, 2000) [14]. Alkaline earth metal concentration is what causes the overall hardness. The main cations that impart hardness and stop leather from developing are Ca^{++} and Mg^{++} ions. The most prevalent elements in natural surface and groundwater are Ca^{++} and Mg^{++} , which are mostly found as carbonates, bicarbonates, and carbon dioxide. These compounds serve as important sources of inorganic carbon for producers in aquatic ecosystems.

They also serve to control the buffers. Total hardness values reached 40 to 77 mg / l. The average values of total hardness were a maximum of 67.25 ± 5.31 mg / l in winter and a minimum of 50.37 ± 4.62 mg / l in summer, as indicated (Table 1). The total hardness in the Harsool dam was not correlated positively and negatively (Table 2). (Pawar and Pulle, 2005) [22] studied Maximum values were reported during the monsoon at Pethwadaj Dam in Nanded, Maharashtra, while minimum values were recorded during the winter. (Salve and Hiware, 2006) [10] reported that Winter and monsoon were both moderate in terms of total hardness, but summer was lower.

Surface water's alkalinity is primarily determined by its carbonate and hydroxide content, as well as by the presence of borates, phosphates, silicates, and other bases. Alkalinity is defined as the quantity of strong acid required to get a sample's pH down to 8.3 (free alkalinity; also known as phenolphthalein alkalinity); a pH of 4.5 indicates complete alkalinity. The sum of the hydroxides, carbonates, and bicarbonates is the total alkalinity. Water's ability to neutralize a potent acid is measured by its total alkalinity. Total alkalinity values reached 54 to 82 mg / l. The Average Total alkalinity was 77.25 ± 3.49 mg / l maximum during the monsoon and 59 ± 3.92 mg / l minimum in winter, as recorded. In the Harsool dam, the overall alkalinity was positive for sulfate, although it was negatively bound to phosphate (Table 2). In the Free State, alkalinity is typically provided by the salts of carbonates, bicarbonates, phosphates, nitrates, borates, silicates, etc. in addition to the concentration of hydroxyl ions. The total alkalinity ranged from 90 to 120 mg/l, with summertime values being a little higher (Reddy et al, 2009)[15].

Conclusions:

During the summer, monsoon, and winter seasons, the other physical-chemical traits change in a variety of ways according to the seasons. The dam water sample is environmentally and ecologically balanced, according to our physicochemical study. A huge number of parameters need to be examined more closely to model water quality. These variables were chosen because they are easy to measure quickly and continuously at water quality monitoring stations. The range of Total Dissolved Solids, Magnesium, Chlorides, Sulphates, Phosphate, Total Hardness, and Total Alkalinity are quality metrics for aquaculture and irrigation, one can infer. The physicochemical characteristics appear to be positively and negatively correlated in the current investigation. Future water quality improvements and regular monitoring of the level of contamination are required for the Harsool Dam in Aurangabad, India, to continue to offer the best conditions for fish survival and reproduction.

References:

1. Anita G, Chandrasekar SVA, Kodarkar MS. Limnological studies on Mir Alam Lake, Hyderabad; Poll. Res, 2005: (3):681-687.
2. APHA. Standard methods for the examination of water and waste waters, 21st Edn., Washington, DC. U.S.A, 2005.
3. Bhalerao AP, Khan AM. Fluorine and sulphur contents in the Lakes in the triable area of Marathwada, Maharashtra; J. Aqua. Biol, 2000:15(1&2):59-61.
4. Deshmukh JU, Ambore NE. Seasonal variations in physical aspects of pollution in Godavari River at Nanded. Maharashtra, India. J. Aqua. Biol, 2006:21(2):93-96.
5. Hulyal SB, Kaliwal BB. Water quality assessment of Almatti Reservoir of Bijapur (Karnataka State, India) with special reference to zooplanktons. Environ. Monit. Assess, 2008:139:299-306.
6. Iwama GK, Vijayan MM, Morgan JD. Stress response in Fish. Ichthyology, Recent research advances. Oxford and IBH pub. Co. Ltd, New Delhi, 2000, 453.
7. Jawale AK, Patil SA. Physico-chemical characteristics and Phytoplanktons abundance of Mangrul dam, Dist - Jalgaon, Maharashtra, J. Aqua. Biol, 2009: 24(1):7-12.
8. Joshi PK, Sakhare SV. Physico-chemical limnology of papnas: a minor wetland in Tuljapur town, Maharashtra. India; J. Aqua. Biol, 2003:18(2):87-91.

9. Kim B, Ju Hyun Park, Gilson Hwang, Man Sig Jun, Kwangsoon Choi. Eutrophication of reservoirs in SouthKorea. *Limnology*, 2001:2:223-229.
10. Kudari VA, Kadadevaru GG, Kanamadi RD. Characterization of selected lentic habitats of Dharwad, Haveri and Uttar Kannada districts of Karnataka state, India. *Environmental monitoring and assessment*, 2006:120:387-405.
11. Madhusudan Yaduvams E, Ranga Rao SV, Venkata Ramana, Byragi Reddy T. Physico-Chemical Analysis of Ground Water in the Selected Area of Visakhapatnam, AP, India,2017:6(12):1252-1258.
12. Munde AS, More PR, Shinde SE. Study of Sukhana Dam, Concerning Water Parameters Dist, Aurangabad, India. *SSR Inst. Int. J. Life Sci*, 2021:7(5):2853- 2859.
13. Pawar SK, Pulle JS. Studies on physico-chemical parameters in Pethwadaj dam, Nanded district in Maharashtra, India; *J. Aqua. Bio*, 2005:13(1and 2):57- 59.
14. Piska Ravi Shankar, Saraladevi B, Divakara Chary K. The present status of Ibrahimbagh, a minor reservoir of Hyderabad, *Fishing Chimes*, 2000:20(2):41-43.
15. Rao Kulkarni Rajender, Rita Sharma N, Mehtab Bukari. Diurnal variations of physico-chemical aspects of pollution in Khushavati River at Quepem, Goa; *J. Aqua. Biol*, 2002:17(1):27-28.
16. Reddy Vasumathi K, Laxmi Prasad K, Swamy M, Ravinder Reddy T. Physico-chemical parameters of Pakhal Lake of Warangal district andhra Pradesh, India; *J. Aqua. Biol*, 2009:24(1):77-80.
17. Salve BS Hiware CJ. Studies on water quality of Wanparakalpa Reservoir, Nagapur, near Parli Vajjnath, dist. Beed, Marathwada region. *J. Aqua. Biol*, 2006:21(2):113-117.
18. Shinde SE, Pathan TS, Raut KS, More PR, Sonawane DL. Seasonal variations in physico-chemical characteristics of Harsool-Savangi Dam, district Aurangabad, India. *The Ecoscan*, 2010:4(1):37-44.
19. Shinde SE, Pathan TS, Raut KS, Sonawane DL. Studies on the Physico-chemical Parameters and Correlation Coefficient of Harsool-savangi Dam, District Aurangabad, India. *Middle-East Journal of Scientific Research*, 2011:8(3):544-554.
20. Sisodia Sapna, Sudha Singh C, Padmakar Mogali, Nandan J, Yadava RN. Seasonal variations and species diversity of macro zoobenthic communities, 2007, 211- 214.
21. Solanki VR. Ecological studies on Bellal and Pandu Lakes of Bodhan, (A.P.) India. Ph.D. Thesis submitted, Osmania University, Hyderabad, 2006, 1-200.
22. Telkhade PM, Dahegaonkar NR, Zade SB, Lonkar AN. Quantitative analysis of Phytoplanktons and zooplanktons of Masala Lake, Masala; Dist. Chandrapur, Maharashtra; *Envirn. Cosr. Jou*, 2008: 9(1-2): 37-40.