

Seasonal Variations in Physico - Chemical Parameters of Erandol Reservoir, Kolhapur: Implications for Water Quality Management

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Abstract: This study analyzes key physicochemical parameters of the Erandol Reservoir in Kolhapur, Maharashtra, over a year June 2022 to May 2023. The research aims to provide insights into the reservoirs water quality for various uses such as drinking, agriculture, and industrial purposes. Parameters like water temperature, pH, dissolved oxygen, total dissolved solids, transparency, alkalinity, chloride levels, and hardness were monitored. Seasonal variations were observed, with implications for pollution control and aquatic biodiversity management.

Keywords: Limnology, Erandol Reservoir, Water Quality, Physico - Chemical Parameters, Seasonal Variations.

1. Introduction

Erandol reservoir is earthen dam Constructed on small stream near Yerandol. Which is about 6 km west from Ajara, Dist Kolhapur (Latidunal $16^{\circ} - 3' - 21''$ North, Longitudinal $74^{\circ} - 10' - 44''$ East). Many hydro biological studies were carried out on the reservoirs in India. (Kulshrestha et. al.1992, Thomas and Aziz 2000). Similarly number of studies has been conducted on limnology from different regions of Maharashtra (Shasutri and Pendse 2001, Sakhare and Joshi 2002). Some studies also carried out from reservoirs of Ajara tahsil (Sachinkumar R. Patil and S. S. Patil 2017) however no such work was carried out on Erandol reservoir in Ajara tahsil of Kolhapur Dist. of Maharashtra. Water from this reservoir is being used by peoples of Ajara tahsil for drinking, irrigation, industrial and domestic purposes. Being lentic water system it is essential to study seasonal variation in properties of water. Therefore the present work was undertaken to study the physicochemical limnology of Erandol Reservoir.

2. Study Area

The study area selected for the analysis of water was Erandol Minor Irrigation Dam Ajara, kolhapur district. Which is about 6 km west from Ajara, Dist Kolhapur (Latitudinal $16^{\circ} - 3' - 21''$ North, Longitudinal $74^{\circ} - 10' - 44''$ East).

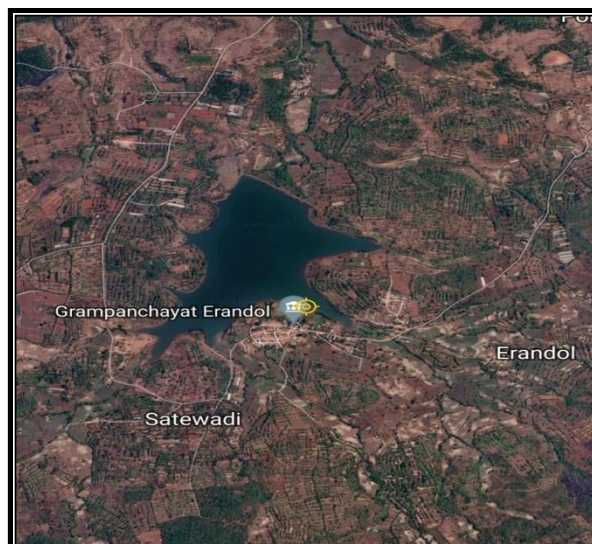


Figure 1: Map of Erandol Dam (Source: Google earth)

Table 1: Salient Features of Erandol Dam Ajara (Source: Minor Irrigation Division, Kolhapur)

	Attribute	Value
1	Name of Dam	Erandol (Kolhapur) Dam
2	River	Local Nallah
3	Nearest City	Ajra Mahal
4	District	Kolhapur
5	State	Maharashtra
6	Basin	Krishna
7	Status	Completed
8	Purpose of Dam	Irrigation
9	Year of Completion (YYYY)	2007
10	Operating & Maintenance Agency	WRD, GOM
11	Dam as per Parliamentary Constituency	Kolhapur
12	Type of Dam	Earthen
13	Total Volume Content of Dam (MCFT)	148.51
14	Total Area Under Irrigation (Hectors)	282

3. Material and Methods

To analyze the water, two sampling stations (Sampling Stations A and B) were selected. Sampling station A was

Wall Side and sampling station B was Erandol Village side. Water is collected once in a month on 1st day at about 10.00 am. The temperature is measured by digital thermometer on the spot.

Other parameters like PH, DO, Total dissolved solids, Transparency, Free carbon dioxide, Total alkalinity, hardness and Chlorides etc. were analyzed in the laboratory according to the methods suggested by APHA. The water samples (at a depth of one meter) were collected with the

help of sampler in one - liter plastic containers and brought to the laboratory.

4. Observation

The data of various physicochemical parameters at two sampling stations after monthly observation (sampling stations A and B) indicating their minimum and maximum ranges and average values during study period June 2022 to May.2023 have been mentioned in table.

Table 2: Physicochemical parameters

Sr. No.	Parameters	Sampling Station A			Sampling Station B		
		Minimum	Maximum	Average	Minimum	Maximum	Average
1.	water temperature ⁰ c	16	33	24.5	18	34	26
2.	PH	7.0	7.5	7.25	6.5	8.5	7.5
3.	DO mg / Lit.	6.00	15.00	10.5	5.00	12.00	8.5
4.	Total dissolved solids mg / Lit	50	200	125	50	250	150
5.	Transparency cm	80	150	115	90	170	130
6.	Total alkalinity mg / Lit	26	110	68	30	120	75
7.	Chlorides mg / Lit.	3.0	30	16.5	4.0	40	22
8.	Total hardness mg / Lit.	25	200	112.5	50	200	125
9.	Free carbon dioxide mg/Lit.	1.8	14.0	7.9	2.0	15.0	8.5

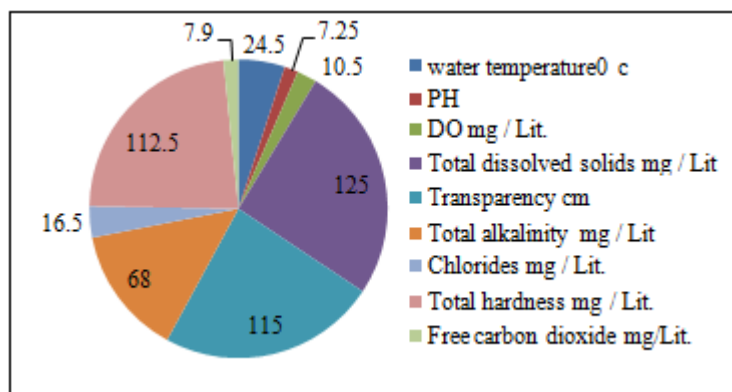


Chart 1: Sampling Station A

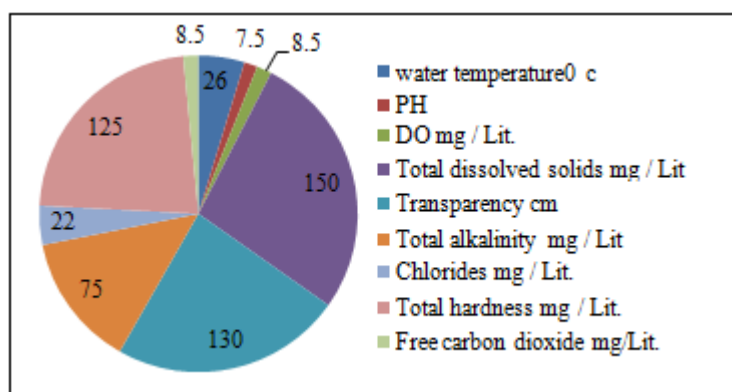


Chart 2: Sampling Station B

5. Result and Discussions

1) Water Temperature

It is one of the important physical factors. It affects primary productivity and metabolic activities of the planktons. According to S. M. Banarjee (1967) temperature between 15⁰c to 35⁰c is ideal and suitable for growth of planktons and fishes. It is variable according to the seasons. It is found to be high during summer which was 34⁰c April and May, and low during winter months which was 16⁰c in December and

January. This range is suitable for growth and reproduction of aquatic life.

2) PH

It is an important indicator which indicates acidic or alkaline nature of water. According to Kaul and Handoo PH increases due to increased metabolic activities of autotrophs. They utilize the CO₂ and liberate O₂ thus reducing H⁺ ion concentration. According to J. S. Chandrashekar (2003) Ideal PH in ecosystem is within the range of 5.5 to 8.5.

Water from Erendol reservoir is found to be neutral as PH varies from 6.5 to 8.5.

3) DO (Dissolved oxygen):

Oxygen is the important factor that supports the aquatic life. It plays an important role in the metabolic activity of organisms in aquatic ecosystems. In aquatic ecosystem Phytoplankton produce oxygen while different microorganisms and animals utilize the dissolved oxygen. Dissolved oxygen was decreased during the months of summer i. e. 5 mg/Lit and the higher values of Dissolved oxygen were observed during winter season i. e. 15 mg/Lit. The lower values of DO recorded during summer season may be due to higher ambient temperature ultimately increases the water temperature and consequently the level of dissolved oxygen deplete. Kataria *et al.* DO in reservoir ranges from 5.00 to 15.00 mg / Lit. This indicates there sufficient growth of phytoplankton.

4) Hardness

The hardness of water is mainly due to the presence of calcium and magnesium. The present investigation revealed that the level of total hardness was decreased during the months of monsoon season. Total hardness values decreased in the months of monsoon was due to dilution of water by rain. Sachinkumar R. Patil and S. S. Patil 2017. However, the elevation of hardness noted during the months of summer. Increase in total hardness during the months of summer season may be due to evaporation rate and decreased water level. Maximum values were found during summer and lowest value was found during winter months. During present investigation the maximum total hardness (200) was found in the month of May, It minimum (25) recorded in January.

5) Total Dissolved Solids

The TDS in freshwater ecosystem is mainly influenced by activity of plankton, organic material, location, geographical region of the water body, drainage, rainfall, inflowing water and human and animal activities. Kirubavathy *et al.* (2005). TDS values in excess amount at the freshwater ecosystem negatively influence the ecological balance and damage the aquatic fauna. Total dissolved solids (TDS) irrespective of the seasons ranged from 50 to 250 mg / Lit. The Maximum value of 250 mg / Lit observed in April and minimum of 50 was detected in August. The observed values of TDS indicate that it was high in summer followed by winter and monsoon. The sampling station 'B' i. e. village side shows high TDS value. This is only because of adding sewage, washing clothes and animals, bathing and other human activities.

6) Transparency

The transparency is one of the important physical parameter that influence on photosynthesis of plankton and metabolic rate of other aquatic animals. The penetration of light in the water or the visibility in the water is called as transparency. It is quite significant for productivity of the reservoir. Transparency is inversely proportional to turbidity created by suspended matter. The transparency of 80 cm recorded in July and maximum 170 cm was recorded during February. The less transparency might be due to the slit brought in to the reservoir during rainy season. Such type of observations

were also noted by various limnologists like Dutta *et al.*, Bade *et al.*, Kumar, Sawant *et al.* and Abujam *et al.*

7) Total Alkalinity

Total alkalinity is the measure of the capacity of water to neutralize a strong acid. The alkalinity in the water is greatly imparted by the salts of carbonates bicarbonates, phosphates, nitrates, borates, silicates etc. The minimum value of total alkalinity (26 mg/l) was noticed in August while the maximum value (120 mg/l) was in December. During the study period maximum value was observed in winter followed by summer and monsoon. The sampling station 'B' i. e. village side shows high alkalinity value. This is only because of washing clothes and bathing which adds detergents in water.

8) Chlorides

Chloride controls the salinity of water and osmotic stress on biotic communities (Banerjee, 1967). The excess chloride in drinking water may induce heart failure and hypertension. The minimum and maximum values of chlorides were 3.0 to 30 mg/ Lit. in month of February and April respectively. Raghvendra and WHO desirable limit of chloride concentration in drinking water is 250 mg/l According to these criteria the chloride values falls under acceptable limit.

9) Free Carbon Dioxide

Free CO₂ is essential for autotrophs to prepare their own food. In process of photosynthesis, autotrophs liberate O₂ that is utilized by other aquatic organisms. In the present investigation it was revealed that lower free CO₂ values were recorded in the months of summer i. e. 1.15 mg/l. Similar trend of lower values during summer season was given by Phukon *et al.*, Patralekh *et al.* and Narayan *et al.* In winter it is recorded highest i. e. 15 mg/l. The lower value of free CO₂ during summer season might be due to intense sunlight and increased transparency which ultimately enhances the rate of photosynthesis. Hence, the free carbon dioxide is utilized by autotrophs during these seasons.

6. Conclusion

The study concludes that the Erandol Reservoir in Kolhapur maintains water quality within permissible limits for various applications, including drinking, agriculture, and domestic use. The seasonal variation in physico - chemical parameters suggests a stable ecosystem supporting diverse aquatic life, emphasizing the need for ongoing monitoring and management for sustainable use.

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