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Physico-Chemical Analysis of Makroda Reservoir of Guna District, Madhya Pradesh, India

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Abstract: *The present research study deals with assessment of water quality of Makroda reservoir located in the Bhamori tehsil of Guna district, during the study period from November 2018 to October 2019. The findings of various physico-chemical water samples such as Transparency, temperature, conductivity, TDS, pH, Dissolved Oxygen, Free CO_2, Alkalinity, Hardness, Chlorides, Phosphate and Nitrates were analyzed. According to the current findings, most of the water parameters of this water body were within the allowable range hence, under consideration this reservoir is not badly contaminated, though continuous monitoring in the future is required to protect the water quality through correct ways.*

Keywords: Physico-Chemical.

I. INTRODUCTION

Water is a valuable natural resource that sustains all life on the globe as well as our Earth. The Makroda Reservoir is located in the Northwestern portion of the Malwa area in Guna district of Madhya Pradesh's. It is built over the Negri River, a tributary of the Parvati River at latitude 24º43'30"N and longitude 77º16'00"E. The Makroda Reservoir is important water body for for irrigation and water supply in the local community. Farmers and fishermen also utilized the water for pisciculture. The fundamental information about Makroda Reservoir is needed for hydro-biological investigations, and data is collected in accordance with study criteria even while keeping archives to ensure reliable future studies. The primary objective of physico-chemical water analysis is to determine the condition of the reservoir.

1.1 Basic Salient features of Makroda Reservoir

A. HYDROLOGY	B. RESERVOIR
a. Catchment area : 174.77 km2	a. Gross storage capacity at FRL : 46.57 Mm3
b. Mean annual rainfall : 1054.46 mm	b. Live storage capacity : 40.96 Mm3
c. Maximum annual rainfall : 1687.57 mm	e. MWL : 461.16 m (Original) 462.12 m (Revised)
d. Minimum annual rainfall : 376.93 mm	g. Area of submergence at FRL : 8.47 km2
e. Maximum flood discharge : 2554 cumec (Revised) 598.41 cumec (Original)	h. Top level of Dam : 462.99 m (original) 463.99 m wall (Revised).

II. MATERIALS AND METHODS

Sample Collection: Black coloured plastic cans (polythene containers) with a capacity of 2 litres were utilized for sample collection. Water samples were collected monthly in the morning hours between 9.00 and 11.00 a.m. on the first week of each month from the three separate sampling locations (M1, M2, M3) for physico-chemical investigations from November 2018 to October 2019. The cans were properly cleansed with both tap and distilled water before being dried. The containers are carefully closed after the material was collected. During sampling, every effort has been made to avoid air bubbles. At the sites, characteristics such as air temperature, water temperature, pH, and transparency are immediately recorded and rainfall data were obtained from the M.P. Water Resources Department, while the remaining physical and chemical parameters were analyzed in the research lab using conventional scientific techniques provided by various organizations and scientists such as APHA (1998), Adoni (1985), Trivedi and Goel (1986).

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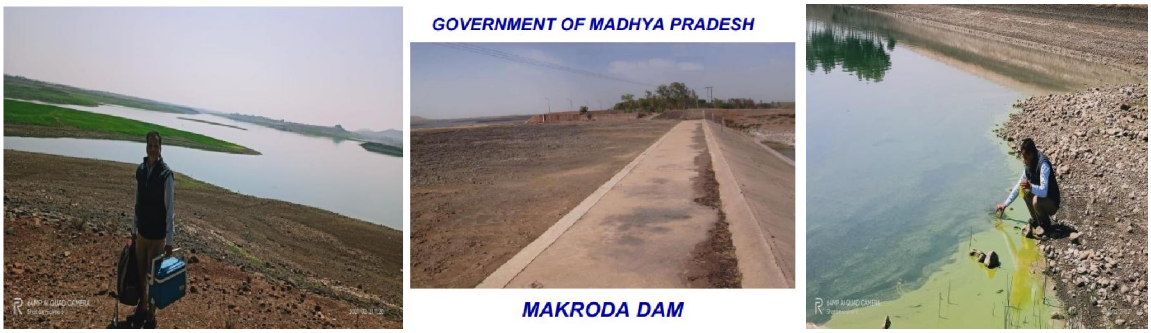

Figure: An Open View of Makroda Reservoir

IV. RESULTS AND DISCUSSION

The Makroda Reservoir results are the most significant. The physico-chemical parameters were separated into two groups for efficiency of demonstration: Transparency, temperature and conductivity are examples of physical parameters in Group I. Group II includes chemical parameters such as pH, Dissolved Oxygen, Free CO_2, Alkalinity, Hardness, Chlorides, Phosphate and Nitrates.

- **Water Temperatures:** The water temperature was measured the same way at all three locations, with very slight variances in mean values. They were approximately 18.7°C in the winter and 34.5°C in the summer, with a minimum of 18.7°C in the winter and a high of 34.5°C in the summer, with a minimum of 28°C in the monsoon. The fact that surface water temperature rises in the summer and falls in the winter implies a near parallel relationship between air and water temperature. In winter, a rise in water temperature causes natural processes to extend out, reducing the solubility of gases such as O_2 and CO_2.
- **Water Transparency:** Transparent of water enable more light to penetrate, which has far-reaching consequences for all aquatic organisms, including growth, distribution, and behavior. The water is probably transparency ranged from 153 cm to 207 cm. Overall transparency is highest at all locations between winter season and summer season. It was found to be at the very worst during the monsoon season due to sewage pollution of precipitation from the surrounding region.
- **Conductivity:** Conductivity is a numerical representation of the capacity to transport electric current, which is affected by conductivity. It is a measure of ionic composition. Makroda Reservoir near Guna, Madhya Pradesh, measured electrical conductivity in the 0.160-0.270 mS/Cm range. Makroda Reservoir's water conductivity ranged between 398 S/cm and 278 S/cm. High conductivity was measured during the summer, that might be associated with increasing chlorides and dissolved solids caused by evaporation of water, leading to higher salt concentrations.
- **TDS**: TDS levels of the water body was in the range from 110 to 210, which were within the allowable range.
- **pH**: The average pH in this research ranged from 6.87 to 7.74. The ideal pH range for drinking water is 7 to 8.5.The results suggest that the water in Makroda Reservoir is safe to drink as well as comes within the standard range. It was highest in the summer and is related with significant photosynthetic activity in the water. As per existing research, the pH range is favorable for aquatic life, irrigation, and household purposes.
- **Dissoloved Oxygen**: One of the most essential factors in water quality is dissolved oxygen, which serves as an indicator of the physical and biological activities occurring in the water. The average dissolved oxygen level in Makroda Reservoir ranged from 5.13 to 8.13 mg/lit. Throughout the research, under consideration. maximum DO values was high in winter that may be explained by the water while minimal DO is found throughout the summer due to the increased consumption of microorganisms in the degradation of organic materials.
- **Free CO_2**: The free CO2 concentrations in the present research ranged from nil to 11 mg/lit for the three aquatic environment examined. During the winter, CO2 levels were at their highest. A high CO2 level implies that larger organic pollutants, that may be due to fertilizer and inorganic fertilizer inclusion into streams. The lack of CO2 might be linked to that used in photosynthesis.

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- **Alkalinity**- The alkalinity in Makroda Reservoir varied from 54.7 mg/lit to 147.9 mg/lit. Summer has the highest alkalinity in Makroda Reservoir, followed by winter and the lowest during the monsoon season. The alkalinity concentrations are usually larger than 110 mg/lit, indicating that the water bodies are substantially contaminated as a result of household effluent as well as fertilizer waste. During the monsoon, overall alkalinity decreased, which might be attributed to the diluting effect.
- **Total Hardness**: the total hardness of the water ranged from 66.25 mg/l to 135 mg/l. Summer had the highest total hardness, followed by monsoon, while winter had the lowest. The presence of carbonates and bicarbonates may account for the highest hardness levels in the summer period.
- **Calcium Hardness**: The calcium hardness varied from 16.83 mg/lit to 39.27 mg/lit. Its values were found to be highest in the summer and lowest in the winter. Total hardness and calcium revealed a very positive association ship, indicating that total hardness is mostly caused by the presence of calcium salts.
- **Magnesium Hardness**- Magnesium concentrations were found to be lower than calcium concentrations in all water bodies studied. It also contributes significantly to overall hardness. In the current study, magnesium hardness ranged from 2.92 mg/lit to 10.72 mg/lit.
- **Chloride-** Chloride concentrations in water varied from 11.85 mg/lit to 39.5 mg/lit, indicating contamination with animal and human wastes. Chloride levels are increased throughout the summer and monsoon seasons. High chloride levels measured in the summer may be responsible to increase organic degradation of animal source or even to water evaporation due to evaporating. Excessive chlorine levels are found in the monsoon as a result of highly polluted household drainage with influx of wastewater from neighboring town.
- **Phosphate-** it was observed that phosphates ranged from 0.375 to 1.575. It was at its lowest (0.375) in August and its highest point (1.575) in April. Phosphate levels were somewhat higher during the monsoon.
- **Nitrate-** The assessment of nitrate is critical because it contributes to assessing the contamination quality of such an aquatic environment. An municipal water system acquires the excess of nitrates from untreated residential sewage,. Its concentration in water rises as a result of the addition of home sewage, agricultural runoff, and other factors. Throughout the study period, nitrate concentrations ranged from 0.292 to 0.612.

The physiochemical characteristics of a fresh water body are influenced by the meteorological, geochemical, geomorphological, and pollution conditions in the drainage basin and underlying aquifer. These results are confirmatory with earlier workers who also reported similar trends of observation by Verma (2009), Murhekar (2011), Alam (2013), Zaidi and Pal (2015) and Mishra and Yadav (2020).

Expert supervision and corrective procedures are required for long-term repair and conservation of Makroda Reservoir in Umri taluka, Guna (M.P). The following recommendations have been made in order to limit the occurrence of heavy pollution.

1. Bathing, cleaning clothing, automobiles, and household animals, among other things, should be avoided.
2. Continued agricultural and home wastewater disposal activities should be rigorously avoided.
3. Adequate water supply schemes must be created for people to avoid unrestricted water consumption.
4. 4 Before consuming the water, preliminary treatments should be undertaken.
5. For water conservation, waste water should be recycled using adequate purification processes.
6. Regular activities of arranging and cleaning dangerous aquatic plants and fauna should be promoted.
7. Communities must be informed about the benefits of conservation as well as its scarcity.
8. Legislative actions should be implemented to limit misuses in order to protect the lake's natural eco-balance.

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