International Journal of Education, Modern Management, Applied Science & Social Science (IJEMMASSS)
ISSN :2581-9925(Online), Impact Factor: 7.555, Volume 07, No. 04(II), October - December, 2025, pp. 154-158

Physico-Chemical and Correlation Studies of Parvati Dam of Dholpur District Rajasthan

Pappu Lal Meena*

Assistant Professor Department of Chemistry, M.S.J. Govt. College, Bharatpur, Rajasthan, India.

*Corresponding Author: plmeena85@gmail.com

Citation: Meena, P. (2025). Physico-Chemical and Correlation Studies of Parvati Dam of Dholpur District Rajasthan. International Journal of Education, Modern Management, Applied Science & Social Science, 07(04(II)), 154–158.

ABSTRACT

This study examines the physico-chemical characteristics of water from Parvati Dam. The monthly fluctuations in water temperature, chlorinity, pH, total hardness, alkalinity, biochemical oxygen demand (BOD), dissolved oxygen (DO), nitrate, phosphate, and other parameters were assessed from January 2024 to December 2024. Water samples were obtained from designated stations. The monthly analysis during the evaluation period indicates consistency across the whole study duration. The water had alkaline properties. The correlation coefficient was computed for several parameter pairings to discover highly connected and interrelated water parameters.

***Keywords**: Dam Water, Physico-Chemical Analysis, Parvati Dam, Correlation Coefficient.*

Introduction

Water quality encompasses all physical, chemical, and biological elements that affect the advantageous utilization of water. Physico-chemical analysis is essential for evaluating water quality for optimal utilization in irrigation, drinking, fishery, and industrial applications, aiding in the comprehension of complex processes. Interactions between climatic conditions and biological processes in aquatic environments. The dam is situated near the village of Angai in the Saramthura region of Dholpur, at an eastern longitude of 77.45˚ and a northern latitude of 26.63˚. The Parvati Dam is situated in an eastern longitude. The Parvati Dam is the paramount dam in the Dholpur District of Rajasthan. Adjacent to a crucial water supply. The Parvati Dam also known as Angai Dam in Dolpur Rajasthan, is significant for irrigation (irrigationthousands of hectare). Water management (flood control and storage for the Parvati River. It is a tourist spot/picnic destination. Especially during monsoon season offering natural beauty and peace. Drinking water is supplied to about 80 villages of Dholpur district from Parvati Dam. About 2000 hectare of agricultural land in Baseri, Bari and Sainpau is irrigated from Parvati dam. Parvathi Dam is a wonderful source of water inthe Dang area.

Material and Methods

The current investigation was carried out at Parvati Dam from selected stations. The trial lasted one year, from January to December 2024. To investigate the comprehensive physicochemical properties of water. Water samples were collected from selected places during the first week of each month. Two-liter water samples were collected from 20 cm below the surface using wide-mouthed, screw-capped, airtight, opaque polyethylene containers. Distinct samples of dissolved oxygen (DO) and biochemical oxygen demand (BOD) were collected in 250 ml DO bottles, with oxygen stabilization performed on-site using alkali azide reagent at the time of sampling. A traditional centigrade thermometer was used to measure water temperature, and a digital pH meter was used on-site to determine pH. All remaining physicochemical parameters were tested immediately upon return to the laboratory using the

titrimetric method. The physicochemical parameters are evaluated using the standard protocols for water analysis developed by APHA (2005), Welch (1958), and Golterman et al. (1978). To promote sustainability, both the quality and quantity of water resources must be monitored, and preventive and mitigation actions applied. Fluoride concentrations are high in the fractured hard rock zone with pegmatite veins. This dam's principal duty is to supply water to the Sarmathura region and surrounding villages for potable consumption and agricultural uses in Baseri, Bari, and Sainpau cities and villages.

Study Area

The dam selected in the present investigation and the area around it is known for agriculture of wheat, mustard and sugarcane etc. The dam is located about 18 to 22 km Parvati river flow from Karauli to join the Gambhir river near Dholpur. Influenced by the Chambal basin, crucial for local water Parvati (Angai) dam irrigate large area (24667 hectare) and serve as a picnic spot, crucial for local irrigation.

Result and Discussion

- **Temperature**

The water temperature varied from 18˚C to 31.5˚C, with monthly evaluations indicating a peak of 31.5˚C during summer and a minimum of 18˚C in winter.The correlation analysis indicates that temperature is negatively connected with dissolved oxygen (D.O.) (-0.163) and transparency (-0.245). This measure exhibits a positive connection with pH (0.478), BOD (0.732), chloride (0.249), phosphate (0.635), nitrate (0.328), alkalinity (0.189), sulphate (0.038), and total hardness (0.538).

pH: pH is regarded as a crucial chemical parameter in any aquatic environment, as most aquatic species are acclimated to a specific pH range and cannot tolerate sudden fluctuations. The pH value fluctuated between 7.6 and 7.8. The highest pH was seen in May and June, while the lowest pH occurred in August. The correlation studies indicate that pH is negatively linked with dissolved oxygen (D.O.) (-0.710) and alkalinity (-0.02). This metric exhibited a positive connection with BOD (0.189), temperature (0.539), chloride (0.785), phosphate (0.0172), nitrate (0.276), sulphate (0.239), total hardness (0.639), and transparency (0.282).

- **Dissolve Oxygen**

Dissolve oxygen DO refer to the amount of oxygen dissolved in water. In dam DO levels can vary depending on factors like:

  - **Temperature**

  Cold water can hold more oxygen than warm water.

  - **Depth**

  DO level often decrease with increase depth.

  - **Photosynthesis**

  Aquatic plant produces oxygen during the day, increase DO level.

- **Pollution**

Organic contaminants can diminish dissolved oxygen levels as microorganisms utilize oxygen. The peak value was documented in August, while the lowest value was noted in May. A negative association between dissolved oxygen and temperature was identified in the current investigation. The correlation analysis indicates that dissolved oxygen (DO) is negatively connected with temperature (-0.164), pH (-0.729), biochemical oxygen demand (BOD) (-0.612), chloride (-0.716), nitrate (-0.0038), and alkalinity (-0.223). sulfate (-0.178), overall hardness (-0.134), and transparency (-0.763). Exhibit a favorable connection with phosphate (0.430).

- **Biological Oxygen Demand**

BOD is a key indicator of water quality in dam water. It measures the amount of oxygen required by microorganisms to breakdown organic matter.

- **BOD Level**
  - **Low BOD:** less than 5 mg/l indicate good water quality suitable for aquatic life.
  - **Moderate BOD**: 5 to 15 mg/l indicate some organic pollution, may affect aquatic life.
  - **High BOD:** Concentrations exceeding 15 mg/l signify substantial pollution and pose a threat to aquatic organisms. The biological oxygen requirement value varied between 0.6

and 1.1 mg/l. Monthly analysis indicates that BOD values are higher in summer than in winter and monsoon. The correlation analysis indicates that BOD has a negative connection with DO (-0.162), alkalinity (-0.025), and sulfate (-0.0436). This measure exhibits a positive connection with sulphate (0.0436), temperature (0.734), pH (0.813), chloride (0.581), phosphate (0.226), nitrate (0.0431), overall hardness (0.0275), and transparency (0.259).

- **Alkalinity**

Alkalinity is a measure of dam water capacity to resist pH changes, mainly due to bicarbonate HCO_3^- and carbonate CO_3^{-2} ions.

- Alkalinity ranges: typically 20-200 mg/l as $CaCO_3$ in fresh water dams.
- Sources: Natural weathering of rocks, agricultural runoff, and atmospheric CO_2.
- Importance: Support aquatic life, buffer pH changes, and affect water treatment processes.
- High alkalinity: May result in scaling, impact irrigation, and modify aquatic ecosystems. A high alkalinity number indicates the eutrophic condition of the water body. The total alkalinity value ranges from 125 to 150 mg/L. The monthly assessment indicates a peak value in July and a minimum value in October. The correlation analysis indicates that alkalinity is negatively connected with pH (-0.004), dissolved oxygen (DO) (-0.124), biochemical oxygen demand (BOD) (-0.025), and transparency (-0.278). This measure exhibits a positive connection with temperature (0.145), chloride (0.073), phosphate (0.221), nitrate (0.708), sulfate (0.523), and total hardness (0.628).

- **Total Hardness**

Total hardness refers to the concentration of calcium Ca^{+2} ion and magnesium Mg^{+2} ion in dam water. It is usually expressed as mg/l of $CaCO_3$**.**

- **Classification**
  - Soft water: Have less than 60 mg/l per litre total hardness.
  - Moderately hard: 60-120 mg/l.
  - Hard water: 120-180 mg/l.
  - Very hard water: greater than 180 mg/l.
  - Sources: Natural weathering of rocks, agricultural runoff and industrial activities.

The overall hardness ranged from 118 to 142 mg/l. Total hardness was elevated during the monsoon and diminished in the winter season. The correlation analyses indicate that total hardness has a negative association with dissolved oxygen (-0.135) and transparency (-0.428), while demonstrating a positive correlation with temperature (0.506), pH (0.468), biochemical oxygen demand (BOD) (0.273), chloride (0.469), phosphate (0.288), nitrate (0.798), alkalinity (0.628), and sulfate (0.529).

Table 1: showing monthly fluctuation in physico-chemical parameters of Parvati Dam at sampling station: Kurigawan.

Parameter	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Temperature	20	23	26	27	31	30	28	26	28	26	22	18
Transparency	71	65	72	70	72	63	18	14	61	73	71	73
pH	7.6	7.6	7.5	7.7	7.8	7.8	7.7	7.6	7.5	7.6	7.7	7.5
Dissolve oxygen	7.4	7.4	7.1	7.2	6.4	6.5	7.8	10.4	7.7	7.5	7.4	7.5
BOD	0.6	0.7	0.8	0.9	1.1	1.2	0.7	0.6	0.9	0.8	0.7	0.6
Chloride mg/l	30	33	35	36	37	39	29	19	21	24	30	29
Phosphate mg/l	0.712	0.722	0.748	0.821	0.813	0.822	0.895	0.892	0.810	0.891	0.712	0.729
Nitrate mg/l	0.849	0.924	0.945	0.946	0.976	0.984	1.34	0.911	0.825	0.846	0.896	0.887
Alkalinity mg/l	131	132	139	134	138	127	149	125	138	126	131	135
Sulphate mg/l	2.75	2.64	2.94	2.73	2.63	2.98	3.82	2.42	2.24	2.63	3.03	2.76
Total hardness mg/l	125	127	131	133	136	131	135	142	123	128	125	131

- **Phosphate**

Phosphate is a chemical compound containing phosphorus and oxygen, often found in water bodies due to agriculture runoff, industrial waste and sewage.

Sources: Fertilisers, detergents, industrial processes human waste.

- **Effects:** Eutrophication, characterized by algal proliferation, adversely affects aquatic ecosystems through water pollution. Phosphate is a crucial nutrient required for the growth of aquatic organisms. In the current investigation, phosphate concentrations fluctuated from 0.711 to 0.895 mg/l. The maximum value was recorded in July, while the smallest value was noted in January. The correlation analysis indicates that phosphate exhibits a negative association with chloride (-0.327) and transparency (-0.629). This metric exhibits a positive connection with temperature (0.665), pH (0.017), dissolved oxygen (DO) (0.0146), biochemical oxygen demand (BOD) (0.229), nitrate (0.439), alkalinity, sulfate (0.228), and overall hardness (0.299).

- **Nitrate**

Nitrate is a fundamental element of all organisms and plays a crucial role in metabolic processes, development, reproduction, and the transmission of heritable traits. In the current investigation, the nitrate concentration varied from 0.846 to 1.39 mg/l. The peak concentration of nitrate occurs during the monsoon, whereas the lowest concentration is observed in winter. The correlation analysis indicates that nitrate has a negative connection with dissolved oxygen (-0.415) and transparency (-0.602). This measure exhibits a positive connection with temperature (0.356), pH (0.199), BOD (0.042), chloride (0.219), alkalinity (0.075), sulphate (0.389), and total hardness (0.795).

- **Chloride**

The chloride concentrations range from 18 to 40 mg/l. The peak value was observed in summer, while the lowest value occurred during the monsoon. The correlation analysis indicates that chloride has a negative association with dissolved oxygen (-0.792) and phosphate (-0.319). This metric exhibits a positive connection with temperature (0.234), pH (0.806), BOD (0.543), nitrate (0.215), alkalinity (0.0734), sulphate (0.385), overall hardness (0.435), and transparency (0.466).

- **Sulphate**

Sulphate concentrations range from 2.2 to 3.84 mg/l. The peak value was seen in July, while the lowest was noted in September.The correlation analyses indicate that sulphate exhibits a negative connection with dissolved oxygen (DO) (-0.176), biochemical oxygen demand (BOD) (-0.539), and transparency (-0.0438). Sulphate exhibits a positive association with temperature (0.045), pH (0.249), chloride (0.385), phosphate (0.229), nitrate (0.534), and overall hardness (0.525).

- **Transparency**

Indicate a material's capacity to transmit light with little scattering or absorption. The transparency value ranged from 14 cm to 73 cm. The correlation analysis indicates that transparency is negatively connected with temperature (-0.249), dissolved oxygen (DO) (-0.762), phosphates (-0.692), nitrates (0.601), alkalinity (0.276), sulfate (-0.312), and overall hardness (-0.429). This measure exhibits a positive connection with pH (0.284), BOD (0.295), and chloride (0.455).

Table 2: Represent the correlation between the various physico-chemical parameters of Parvati dam at Kurigawan Village, Saramthura town Dholpur.

Sr.no.	Parameters	Temp.	pH	DO	BOD	Chloride	Phosphate	Nitrate	Alkalinity	Sulphate	Total hardness	Transparency
01	Temp.	1										
02	pH	0.534	1									
03	DO	-0.165	-0.712	1								
04	BOD	0.735	0.816	-0.610	1							
05	Chloride	0.251	0.806	-0.0795	0.582	1						
06	Phosphate	0.663	0.016	0.415	0.228	-0.326	1					
07	Nitrate	0.356	0.275	-0.004	0.045	0.218	0.490	1				
08	Alkalinity	0.139	-0.004	-0.123	-0.027	0.075	0.222	0.705	1			

09	Sulphate	0.042	0.248	-0.175	-0.047	0.384	0.229	0.853	0.552	1		
10	Total hardness	0.506	0.465	-0.135	0.274	0.465	0.299	0.759	0.625	0.527	1	
11	Transparency	-0.249	0.284	-0.761	0.295	0.456	-0.691	-0.601	-0.275	-0.313	-0.425	1

Conclusion

The current study determined that the water from Parvati Dam is not contaminated, since all values remain below acceptable limits; nevertheless, alkalinity is marginally elevated in March, July, September, and December. The current analysis concludes that Parvati Dam water is suitable for drinking, agriculture, and fish production purposes. It requires treatment to minimize pollution, particularly alkalinity. The present study assists the government in preserving the Parvati Dam water at optimal quality and purity levels.

References

1. Kumar and B.J.Alappat, Int, J. Environment and pollution. 1915, 454 (2003)
2. Golterman, H.L., R.S.CLYMO and M.A.M. OHNS-TAJ
3. Pathak and Mudgal, K.K. (2005) limnology and biodiversity of fish fauna in virla reservoir M.P. (India). Enviro. Cons. Journal, 6(1): 41-45
4. Pandey, B.N., S.K. Mishra, S. Yadav and P.D. Sharma (1998). An assessment of water quality of Purina in relation to its impact on public health.
5. Gunjan Bhalla, Arvind Kumar and Ajay Bansal, Asian journal of water, environment and pollution., 8(1),41 (2011).
6. ToubaK., Shivaraju H.P., Sajan C.P. and Byrappa K., impact assessment of effluent discharge on underground water quality around Gemini distillery, nanjangud, Mysore district, Int. J. Appl. Environ. Sci., 5(4), 617-626 (2010).
7. Aderogba, K. and Afelumo, T., A Study of groundwater potential for sustainable development in Igbo-Ora, Oyo State, *Journal of Engineering,* 02(10). pp 9790/3021, **2012.**
8. Agarwal, A. and Rajwar, G., Physico-chemical and microbiological study of tehri dam reservoir, Garhwal Himalaya, India. *Journal of American Science* 6, pp 65-71, **2010.**
9. Aggarwal, R. and Arora, S., A study of water quality of Kaushalya River in the submountaneous Shivalik Region*. International Journal of Scientific & Technology Research,*1(8), pp 52-68, **2012.**
10. Aguilera-González, E.N., Martinez, A. and Pérez, Rubi., Heavy metal pollution in drinking water-a global risk for human health: A review. *African journal of environmental science and technology,* 7(**7**), pp 567-584, **2013.**
11. Ahmad, M., Islam, S., Rahman, M., Haque, M., Islam, M., Heavy metals in water, sediment and some fishes of Buriganga River, Bangladesh. *International Journal of Environmental Research*, 4(2), pp 321-332, **2010.**
12. Akinbile, C. O. and Yusoff, M. S., Environmental impact of leachate pollution on groundwater supplies in Akure, Nigeria. *International Journal of Environmental Science and Development,* 2(1), pp 81-89, **2011.**
13. Akkaraboyina, Mahesh and Raju, B.S.N., Assessment of water quality index of river Godavari at Rajahmundry. *UniversalJournal of Environmental Research and Technology,* (2), pp 161-167, **2012.**
14. Singh, K.P., Amrita, Malik, Dinesh, Mohan and Sinha, Sarita., Multivariate statistical techniques for the evaluation of spatial and temporal variations in water quality of Gomti River (India). A case studies. *Water Research*, **38(18),** pp 3980-3992, **2004.**
15. Singh, M.K., Jha, D., and Jadoun J., Assessment of physico-chemical status of groundwater samples of Dholpur dist., Rajasthan, India. *International Journal of Chemistry,* **4(4),** pp 96-104, **2012.**
16. Singh, R.K., Singh, K.N., Physico-chemical and biological analysis of Gomati River water affected by urban wastes. *Mar. Sci. Res. India,* **4(2),** pp 233-236, **2007.**
17. Singh, Rajendra and Mathur, Praveen. Investigation of variations in different physico-chemical characteristics in a fresh water reservoir of Ajmer city, Rajasthan. *Indian Journal of Environmental Sciences*, **(9)**, pp 57-61, **2005.**
18. Singh, V.P., Mondal, N.C., Singh, V.S. and Saxena, V.K., Determining the interaction between groundwater and saline water through groundwater major ions chemistry. *Journal of Hydrology*. 25;388(1-2):100-11.**2010.**

❑❑❑