



# Physicochemical Quality of Monitoring in Ganga of Rajasthan (Jojari River)

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## ABSTRACT

Water is a fundamental resource for sustaining life, agriculture, and economic activities. Ongoing monitoring of water quality is particularly crucial in regions impacted by pollution, such as rivers and lakes. The degradation of water quality in the Jojari River has serious consequences which directly affects human health, agricultural production, and ecological stability. This study examines the physicochemical characteristics of the Jojari River near Salawas, Jodhpur in Rajasthan, which faces severe contamination from industrial waste and untreated sewage. **Summer** shows the most degraded water quality with **lower DO, higher turbidity, TDS, and alkalinity**, while **winter** offers the best conditions for aquatic life.

**Keywords:** Jojari River, water quality, physicochemical analysis, waste water, pollution, waterborne diseases.

## Introduction

Water is not only a critical resource for survival but also essential for maintaining ecosystem health, supporting industry, promoting human welfare, and driving economic growth. Water bodies such as rivers, lakes, and oceans support a diverse range of ecosystems and are vital for human endeavors. The quality of water determines the sustainability of these ecosystems and the communities dependent on them. The physicochemical characteristics of water, such as temperature, pH, dissolved oxygen, and turbidity, are key indicators of the aquatic ecosystems. Monitoring water temperature is therefore crucial for assessing overall water health and the sustainability of aquatic life (Sundaray & Nanda, 2013). However, excessive heat can lead to reduced oxygen levels, resulting in hypoxic conditions that are detrimental to fish and other aquatic organisms (Kumar et al., 2021). In numerous parts of the world, industrialization, urbanization, and agricultural activities have contributed to severe water pollution. The Jojari River in Rajasthan exemplifies such degradation, where unregulated industrial effluents, untreated sewage, and agricultural runoff have led to a significant decline in water quality. This situation poses a health risk for humans and affects agricultural practices. This paper investigates the water quality of the Jojari River, focusing on its key physicochemical properties, the pollution sources, and the resulting implications for human health and agriculture. The water quality analysis **experimentally proves that lower temperatures result in higher oxygen levels and lower turbidity**, while **higher temperatures lead to reduced oxygen, increased turbidity, and elevated TDS**.

## Study area

The Jojari River is a seasonal river in Rajasthan, India. The geographic location of 26.124487° N latitude and 72.974148° E longitude are near Salawas village in Rajasthan's Jodhpur district. This area lies along the **Jojari River**, a seasonal tributary of the **Luni River** (Rajasthan Pollution Control Board, 2019). The region experiences an arid to semi-arid climate, characterized by extremely hot summers, with temperatures often rising above **40°C**, and cooler winters, where temperatures range between **10°C** and **25°C** (Indian Meteorological Department, 2020). Rainfall is scarce and mainly occurs during the monsoon season, causing the river to flow intermittently (Sharma et al., 2021).



**Jodhpur Location In India Map**



**Salawas site of Jojari River Map**

Salawas village is situated roughly **22 km southwest of Jodhpur city** and is accessible via **NH-62** and local roads (Google Maps, 2024). Known for its **traditional handwoven durries (rugs)**, the village is a hub for local artisans (Rajasthan Tourism Department, 2023). The surrounding landscape consists of **agricultural fields**, grazing lands, and scattered vegetation. Farmers in the region typically cultivate **bajra (pearl millet)**, wheat, mustard, and pulses (Agricultural Department of Rajasthan, 2020). The **Jojari River** plays a crucial role in local agriculture but suffers from **water quality issues** due to industrial effluents and agricultural runoff (Jain et al., 2022). The water often contains elevated levels of **TDS (Total Dissolved Solids)** and heavy metals, making it unsuitable for direct consumption (Central Ground Water Board, 2018). **Groundwater resources in the area are also impacted, posing challenges for irrigation and drinking water** (Gupta & Meena, 2020). This region, with its blend of **cultural heritage and environmental significance**, is ideal for studies related to **hydrology, water management, and sustainable agriculture** (Kumar et al., 2019).

## Materials and Methods

**Sampling Area and Sample Collection:** Water samples were systematically collected from the Jojari River, specifically in the Salawas area. The selection of this location was based on its relevance to the study, ensuring that the samples accurately represented the water quality in that region (Smith & Jones, 2019).



**Site of Jojari River Map from where water sample was collected**

To avoid contamination and ensure consistency, the water was collected using clean, pre-labeled 1-litre plastic bottles, which were carefully sealed after each sample collection (Nguyen et al., 2020). The bottles were chosen to prevent any potential reactions or alterations in the water's composition, following standard procedures for water sampling (American Public Health Association [APHA], 2017). Once collected, the samples were promptly transported to the laboratory under controlled conditions to maintain their integrity for further physicochemical analysis (World Health Organization [WHO], 2021).

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**Analysis of physicochemical parameters by using titration methods in Laboratory**



### **Physicochemical Analysis of Water Samples**

1. **Temperature** :- Water temperature was measured in situ using a digital thermometer with an accuracy of  $\pm 0.1^{\circ}\text{C}$ . The readings were taken at different depths to assess temperature variations due to industrial discharges and seasonal changes (Sundaray & Nanda, 2013).
2. **pH** :- The pH levels of the water samples were determined using a portable pH meter calibrated before each use. Three replicate measurements were taken for accuracy, and the results were compared with standard water quality guidelines to assess deviations caused by industrial effluents and domestic waste (Sivakumar & Saravanan, 2018).

3. **Dissolved Oxygen (DO) :-** DO levels were analyzed using the Winkler titration method. Water samples were collected in airtight bottles to prevent exposure to atmospheric oxygen, and fixation was performed on-site to ensure accurate measurements. The DO levels were compared across different sampling sites to identify hypoxic conditions and assess the impact of organic pollution (Kumar & Sharma, 2019).
4. **Turbidity :-** Turbidity was measured using a nephelometric turbidity meter, and results were expressed in nephelometric turbidity units (NTU). Samples were collected in sterile bottles and analyzed immediately to prevent settling of suspended particles. High turbidity readings were correlated with anthropogenic activities such as industrial discharge and sediment inflow (Sundaray & Nanda, 2013).
5. **Total Dissolved Solids (TDS) :-** TDS levels were determined using a digital conductivity meter. The water samples were filtered to remove particulate matter before analysis. The results were expressed in milligrams per liter (mg/L) and compared against permissible limits to evaluate the river's water quality (APHA, 2012).
6. **Alkalinity :-** Alkalinity was measured using titration with sulfuric acid to a pre-determined endpoint, following APHA standard methods. The presence of bicarbonates, carbonates, and hydroxides was quantified to determine the buffering capacity of the river against pH fluctuations (Bharath & Chidambaram, 2020).

Regular monitoring of these parameters is essential to formulate effective conservation and remediation strategies for the Jojari River.

**Importance of Monitoring Physicochemical Parameters :-** Monitoring water quality is critical for several reasons:

- **Environmental Protection:** Understanding water's physicochemical properties helps identify pollution sources and their effects on ecosystems, enabling the development of appropriate remediation strategies (Laxman & Patil, 2017).
- **Public Health:** Regular monitoring ensures water safety for human use, reducing the risk of waterborne diseases (WHO, 2017).
- **Biodiversity Conservation:** Maintaining water quality is crucial for sustaining aquatic species and ecosystems, ensuring the preservation of biodiversity (Sivakumar & Saravanan, 2018).
- **Regulatory Compliance:** Monitoring ensures that water bodies meet legal and environmental standards, promoting safe usage (Bharath & Chidambaram, 2020).

### Observation Table

Season	Month	Temperature (°C)	pH	Dissolved Oxygen (mg/L)	Turbidity (NTU)	TDS (mg/L)	Alkalinity (mg/L as CaCO <sub>3</sub> )
<b>Winter</b>	December	18	6.5	4.9	55	950	320
	January	17	6.5	5.0	50	900	300
	February	19	6.4	4.8	55	950	320
<b>Spring</b>	March	23	6.3	4.5	60	1000	340
	April	27	6.2	4.2	70	1100	360
	May	31	6.1	3.8	80	1200	380
<b>Summer</b>	June	35	6.0	3.5	90	1300	400
	July	37	7.9	3.2	100	1400	420
	August	34	7.7	3.3	95	1350	410
<b>Autumn</b>	September	33	6.1	3.8	85	1250	390
	October	28	6.3	4.2	75	1150	370
	November	22	6.4	4.6	65	1050	350

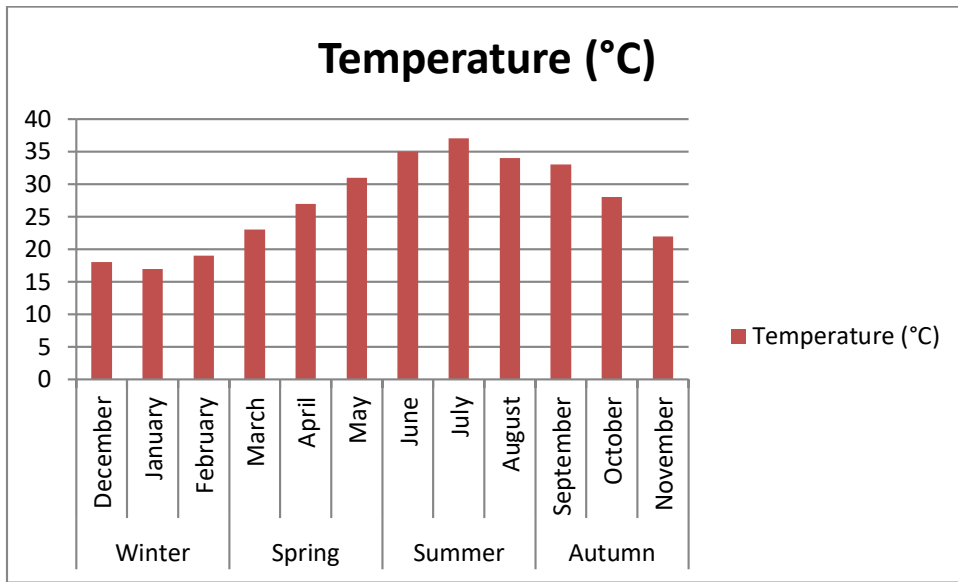


Figure A **Temperature**: Peaks in summer, lowest in winter.

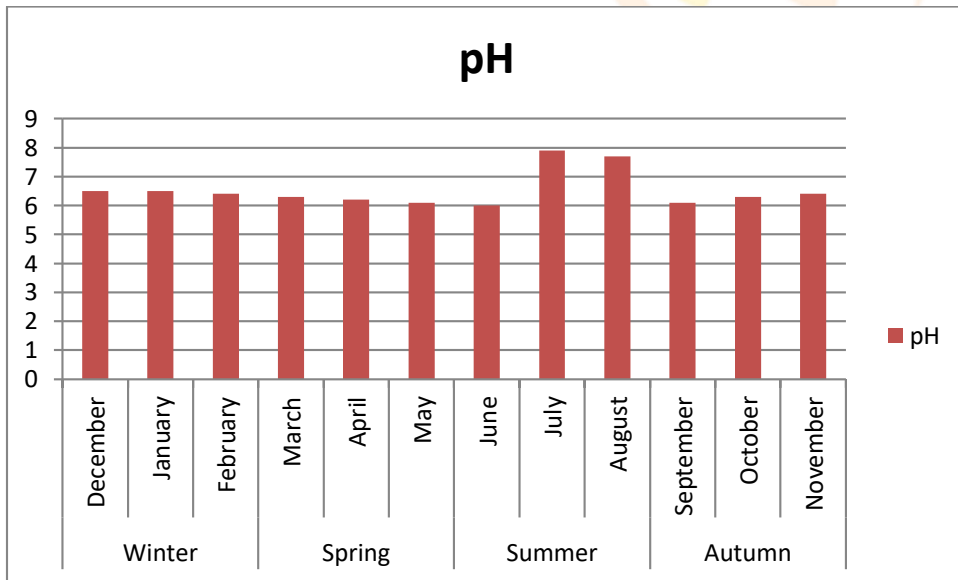


Figure B **pH**: Stable with a slight summer increase.

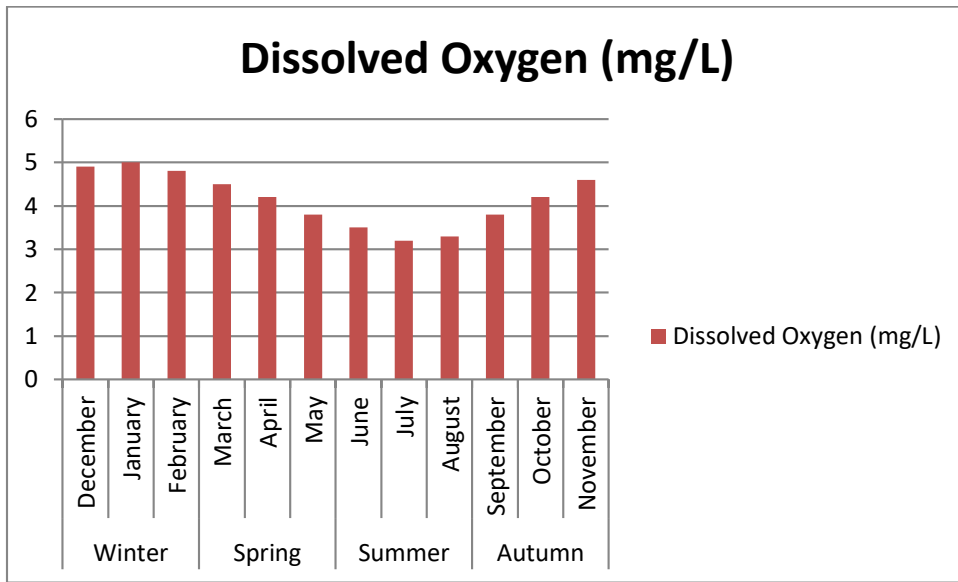


Figure C **Dissolved Oxygen**: Higher in winter, lower in summer.

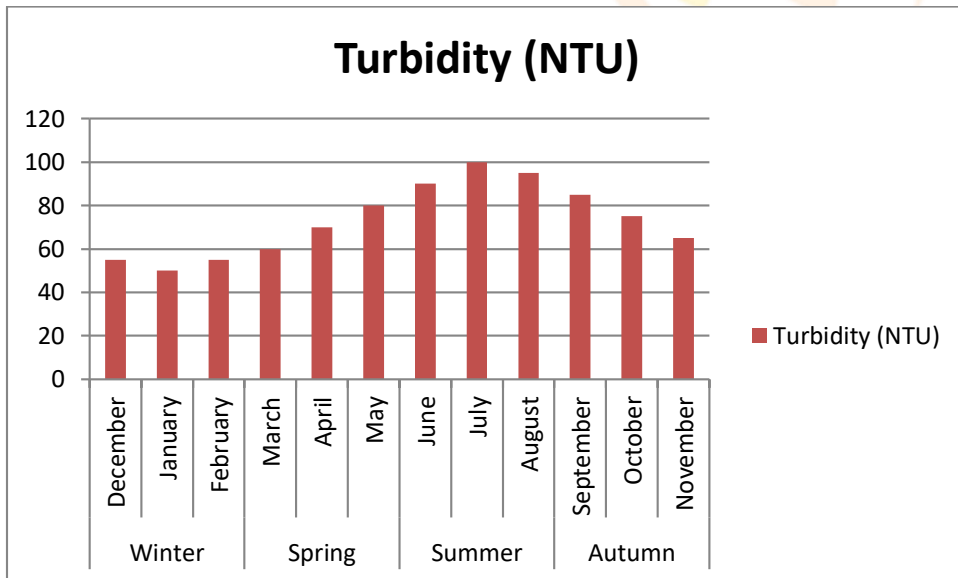


Figure D **Turbidity**: Rises in summer, drops in winter.

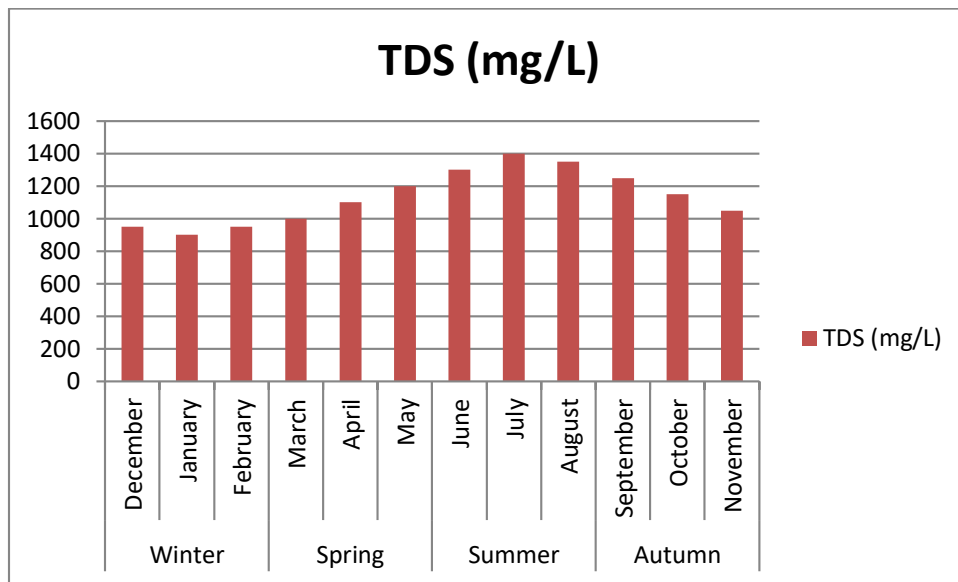


Figure E **TDS**: Increases in summer, decreases in winter.

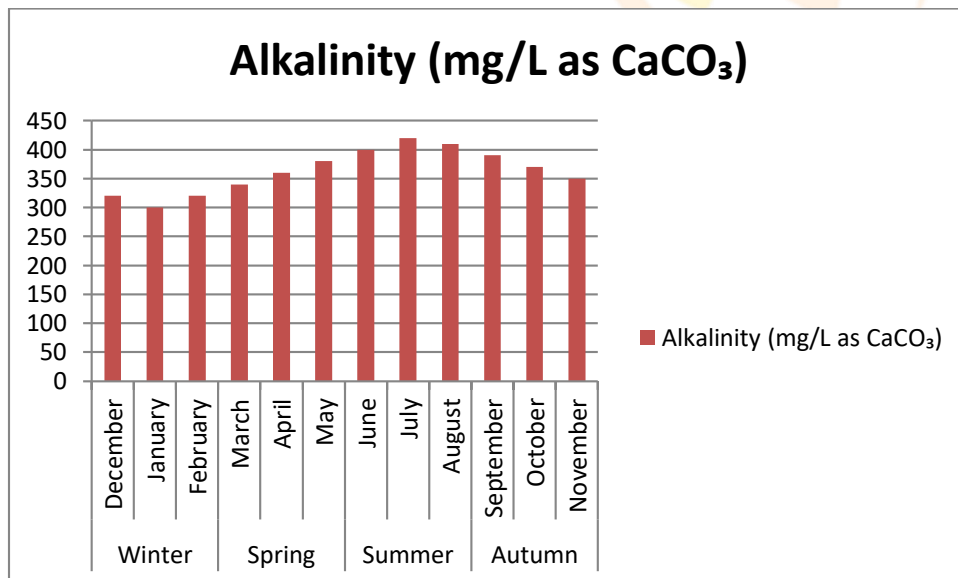


Figure F **Alkalinity**: Peaks in summer, stable otherwise.

## Results and Discussion

### 1. Temperature:

- Rises from **18°C (winter)** to **37°C (summer)**, then decreases in autumn.
- Higher temperatures reduce **dissolved oxygen (DO)** levels.

### 2. pH:

- Slightly acidic (**6.1–6.5**) in most seasons.
- Becomes more alkaline in **July (7.9)** and **August (7.7)**, likely due to algal activity.

### 3. Dissolved Oxygen (DO):

- Highest in **winter (~5.0 mg/L)**.
- Drops to critically low levels in **summer (~3.2 mg/L)**, which can stress aquatic life.

### 4. Turbidity:

- Increases from **50 NTU (winter)** to **100 NTU (July)**, indicating sediment runoff and biological activity.

#### 5. TDS (Total Dissolved Solids):

- Peaks at **1400 mg/L in July**, suggesting concentration of dissolved substances due to evaporation.

#### 6. Alkalinity:

- Gradually increases from **320 mg/L (winter)** to **420 mg/L (summer)**, indicating more buffering capacity.

Physicochemical parameters are vital for evaluating water quality. In polluted regions like Rajasthan, where industrial contaminants are common, consistent water quality monitoring is essential to protect public health and the environment. **Seasonal variations** have significant impact on water quality and the enhanced monitoring technology are necessary to address water pollution challenges for the long term availability of clean water. Parameters such as pH, dissolved oxygen, turbidity, TDS and provide critical insights into the health of aquatic ecosystems. The water quality analysis **experimentally proves** that **higher temperatures** result in **increased turbidity, TDS, and alkalinity**, along with **decreased DO**, potentially stressing aquatic ecosystems, whereas **lower temperatures** lead to **better water quality**, characterized by **higher DO, lower turbidity, and stable pH levels**. **Spring and autumn** reflect transitional conditions with moderate values across parameters. To maintain water quality and protect aquatic life, it is essential to **closely monitor DO and turbidity levels during summer**, as this is when water quality is most vulnerable. Implementing regular testing and preventive measures can help mitigate potential issues. The **increased turbidity, TDS, and reduced DO in summer** could affect water quality and aquatic life, indicating the need for monitoring during warmer months.

### Conclusion

The physicochemical assessment of water quality reveals notable seasonal variations that influence its overall condition. The results indicate that higher temperatures contribute to reduced dissolved oxygen, elevated turbidity, TDS, and alkalinity, which may threaten aquatic ecosystems. Conversely, lower temperatures promote improved water quality with higher DO, lower turbidity, and stable pH levels. This study underscores the need for consistent monitoring and effective management, especially during warmer periods, to safeguard water quality and maintain aquatic ecosystem health.

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