



# SEASONAL EVALUATION OF SOME PHYSICO-CHEMICAL PARAMETERS OF RIVER PARWAN, JHALAWAR DISTRICT, RAJASTHAN

<sup>1,\*</sup>Bharat Singh Meena, <sup>1</sup>Manju Meena

<sup>1</sup>Department of Chemistry, Government College, Kota- 324001, Rajasthan, India

\*Corresponding author

E-mail: [meenabharat81@gmail.com](mailto:meenabharat81@gmail.com)

**Abstract:** This study investigates seasonal various physicochemical parameters in river water samples of Parwan were collected from 10 sampling sites in Jhalawar District, India during three seasons (summer, rainy and winter) throughout the one year of November, 2010 to October, 2011. The physico-chemical parameters like pH, turbidity, total dissolved solids, total hardness and concentrations of ions like chloride, fluoride, nitrate and sulphate were analyzed to know the present status of the river water quality. The results were compared with the drinking water standards of ISI (10500-91) and WHO (1973). It was found that the river water was contaminated at few sampling sites therefore needs to be treated if it is to be used at all. The remaining sampling sites shows physicochemical parameters within the water quality standards and the quality of water is good and it is fit for domestic uses, drinking and agricultural purposes.

**Keywords:** River water, Drinking water, Physicochemical parameters, Water quality standards.

## I. INTRODUCTION:

Jhalawar has been gifted by nature in rivers. Many important rivers flow through this district. Rivers are important multi-usage components, such as sources of drinking water, irrigation, fishery and energy production (Suthar et al., 2010). In recent years both the anthropogenic influences such as urban, industrial and agriculture activities have increased exploitation of water resources as well as natural processes such as precipitation inputs, erosion, weathering of crustal materials, degradation of surface waters and rendering the water bodies unsuitable for both primary and secondary use runoff water and discharge of sewage into rivers are two common ways through which various nutrients enter the aquatic ecosystems resulting in water pollution (Ramakrishnaiah, et al., 2009; Jindal and Sharma, 2010; Lomsadze et al., 2017; Lu et al., 2017).

Sediments act as both carriers and sinks for contaminants in aquatic environments (Tiwari and Manzoor, 1988). Studies have shown that domestic and industrial sewage, agricultural wastes have polluted almost all of Indian rivers (Sculthorpe, 1967; Tiwari et al., 1986). Most of these rivers have turned into sewage carrying drains. This poses a serious health problem to millions of people who continue to depend on this polluted water from the rivers (Merritts et al., 1998).

Keeping above in view the present investigation was undertaken to study the seasonal hydrological assessment of the Parwan River water quality at Jhalawar District (Rajasthan). This study involves the determination of physical and chemical parameters of Parwan River of Jhalawar District. The objective of this study is to assess the present water quality, through analysis of some selected water quality parameters like temperature, pH, Turbidity, TH, TDS, Cl<sup>-</sup>, F<sup>-</sup>, NO<sub>3</sub><sup>-</sup>, SO<sub>4</sub><sup>-2</sup> and compare the results with the standards values recommended by ISI and WHO.

## II. MATERIAL AND METHODS:

### 2.1 Study area:

Jhalawar district located in the south-east of Rajasthan, between the longitudes of 75° 27' 35" to 76° 56' 48" East and latitudes of 23° 45' 20" to 24° 52' 17" North, adjoining the neighbouring state of Madhyapradesh.

### 2.2 Methodology:

Water samples were collected from 10 sampling sites of Parwan River at Jhalawar District in 2010-2011. Samples were collected in clean polythene bottles pre-washed with dilute hydrochloric acid and rinsed three to four times with the water samples before the samples were stored at a temperature below 4°C prior to analysis in the laboratory. The physico-chemical parameters such as pH, Turbidity, TDS, TH, Cl<sup>-</sup>, NO<sub>3</sub><sup>-</sup>, SO<sub>4</sub><sup>-2</sup> and F<sup>-</sup> were determined by using standard methods (APHA, AWWA, 1998). Specific reagents were used for the analysis and double distilled water was used for preparation of solutions.

### III. RESULTS AND DISCUSSION:

River water samples of Parwan River were collected and analysed as per standard methods. With the help of these, we assessed the seasonal results of Parwan River. Sampling was done during three seasons (summer, rainy and winter) throughout the one year from various villages (Nov., 2010 to Oct., 2011). Results of three seasons physico-chemical parameters are shown in Table 3.1 and minimum, maximum and average concentration of various physico-chemical parameters are represented by Figure 3.1.

Table 3.1: Physico-Chemical Parameters of Parwan River Water

S.No.	Sample No.	Village	Season	pH	Turbidity (NTU)	TDS (mg/l)	TH (mg/l)	Cl <sup>-</sup> (mg/l)	F <sup>-</sup> (mg/l)	NO <sub>3</sub> <sup>-</sup> (mg/l)	SO <sub>4</sub> <sup>-2</sup> (mg/l)
1	S <sub>1</sub>	Akawad	Summer	8.04	8.4	250	78.5	20.6	0.32	14.5	3.6
			Rainy	8.22	176.2	190	45.3	16.5	0.29	10.4	5.4
			Winter	7.98	10.8	240	80.8	25.8	0.31	15.8	4.3
2	S <sub>2</sub>	Kalan	Summer	8.13	8.2	270	85.6	27.7	0.34	12.8	4.2
			Rainy	8.28	120.3	140	49.8	18.4	0.23	9.7	6.4
			Winter	8.02	11.8	210	66.2	24.5	0.36	13.2	5.2
3	S <sub>3</sub>	Hatoli	Summer	8.24	5.3	240	72.7	21.7	0.30	9.6	2.9
			Rainy	8.16	148.6	170	39.2	20.3	0.24	11.5	6.9
			Winter	8.05	14.3	260	85.2	29.4	0.29	10.4	5.3
4	S <sub>4</sub>	Seunya	Summer	7.59	9.2	250	110.4	24.8	0.36	15.2	4.9
			Rainy	8.04	155.1	180	46.3	25.2	0.30	12.2	3.1
			Winter	7.96	5.8	200	72.4	20.4	0.32	11.3	2.4
5	S <sub>5</sub>	Bukheri	Summer	7.62	11.3	280	88.9	28.3	0.31	11.6	2.8
			Rainy	7.99	188.9	200	50.2	30.8	0.23	8.9	5.2
			Winter	8.20	6.7	240	92.1	26.4	0.36	13.8	3.7
6	S <sub>6</sub>	Manpura	Summer	7.74	9.2	290	95.6	27.5	0.29	10.7	3.5
			Rainy	8.15	178.2	190	52.4	22.4	0.24	11.9	4.9
			Winter	8.22	5.8	250	88.5	30.2	0.27	14.1	5.3
7	S <sub>7</sub>	Datia	Summer	7.82	6.7	260	102.8	22.9	0.33	12.9	2.7
			Rainy	8.29	153.4	180	61.2	26.8	0.25	10.4	4.8
			Winter	7.93	9.2	210	82.4	23.3	0.29	14.9	5.7
8	S <sub>8</sub>	Kishorpura	Summer	7.81	4.8	270	99.6	29.6	0.31	14.8	4.1
			Rainy	8.19	144.3	160	57.5	21.2	0.22	10.1	4.9
			Winter	7.95	7.6	240	100.4	27.4	0.28	15.3	3.5
9	S <sub>9</sub>	Kheri	Summer	8.22	5.2	280	112.8	23.4	0.37	13.7	3.9
			Rainy	8.09	138.7	170	37.2	19.6	0.31	9.6	3.1
			Winter	7.88	4.2	240	84.3	26.5	0.32	10.2	6.8
10	S <sub>10</sub>	Shorti	Summer	8.05	7.8	230	103.7	26.2	0.35	11.3	3.8
			Rainy	8.18	175.9	190	39.3	20.7	0.26	9.9	3.3
			Winter	7.92	9.2	270	88.4	21.3	0.30	13.2	4.9

- 3.1 pH:** pH values ranged between 7.59 to 8.29 during one year samplings. The pH values showed that river water samples were alkaline and these values were within the limits as prescribed by ISI. The average value of pH was 8.03. The minimum value of pH was monitored in sample S<sub>4</sub> and the maximum value of pH was viewed in sample S<sub>7</sub>.
- 3.2 Turbidity:** Turbidity values ranged from 4.2 NTU to 188.9 NTU and the average value of turbidity was 58.03 NTU all of the studied samples of one year. In rainy season all samples were higher values than the prescribed WHO standards. The minimum value of turbidity was examined in sample S<sub>9</sub> and the maximum value of turbidity was scrutinized in sample S<sub>5</sub>.
- 3.3 Total Dissolved Solids (TDS):** TDS values were varied from 140 mg/l to 290 mg/l and these values were within permissible limits prescribed by ISI and WHO. The average value of TDS was 225.0 mg/l. In sample S<sub>2</sub> minimum value of TDS was observed and in sample S<sub>6</sub> maximum value was surveyed.
- 3.4 Total Hardness (TH):** The data table reveals that the TH values in one year varied from 37.2 mg/l to 112.8 mg/l for all river water samples and these values were within the standard limits recommended by ISI and WHO for all samples. The minimum value of TH was observed in sample S<sub>9</sub> and the maximum value of TH was found in samples S<sub>8</sub>. 75.6 mg/l was the average value of TH.
- 3.5 Chloride (Cl<sup>-</sup>):** Chloride values ranged from 16.5 mg/l to 30.8 mg/l and the average value of chloride was 24.3 mg/l all of the studied samples of one year. All samples were lesser values than the prescribed ISI and WHO standards. The minimum value of chloride was examined in sample S<sub>1</sub> and the maximum value of chloride was scrutinized in sample S<sub>5</sub>.
- 3.6 Fluoride (F<sup>-</sup>):** The data table reveals that the fluoride values varied from 0.22 mg/l to 0.37 mg/l for all river water samples and these values were within the standard limits recommended by WHO and ISI for all samples. The minimum value of fluoride was observed in sample S<sub>8</sub> and the maximum value of fluoride was found in sample S<sub>9</sub>. 0.29 mg/l was the average value of fluoride.
- 3.7 Nitrate (NO<sub>3</sub><sup>-</sup>):** Nitrate values ranged from 8.9 mg/l to 15.8 mg/l and the average value of nitrate was 12.1 mg/l all of the studied samples of one year. All samples were within the prescribed ISI and WHO standards. The minimum value of nitrate was examined in sample S<sub>5</sub> and the maximum value of nitrate was scrutinized in sample S<sub>1</sub>.

**3.8 Sulphate ( $\text{SO}_4^{2-}$ ):** Sulphate values ranged between 2.4 mg/l to 6.9 mg/l during one year samplings. All these values were within the limits as prescribed by ISI and WHO for all studied samples. The average value of sulphate was 4.3 mg/l sulphate was monitored in sample  $S_4$  as minimum value and sulphate was monitored in sample  $S_3$  as maximum value.

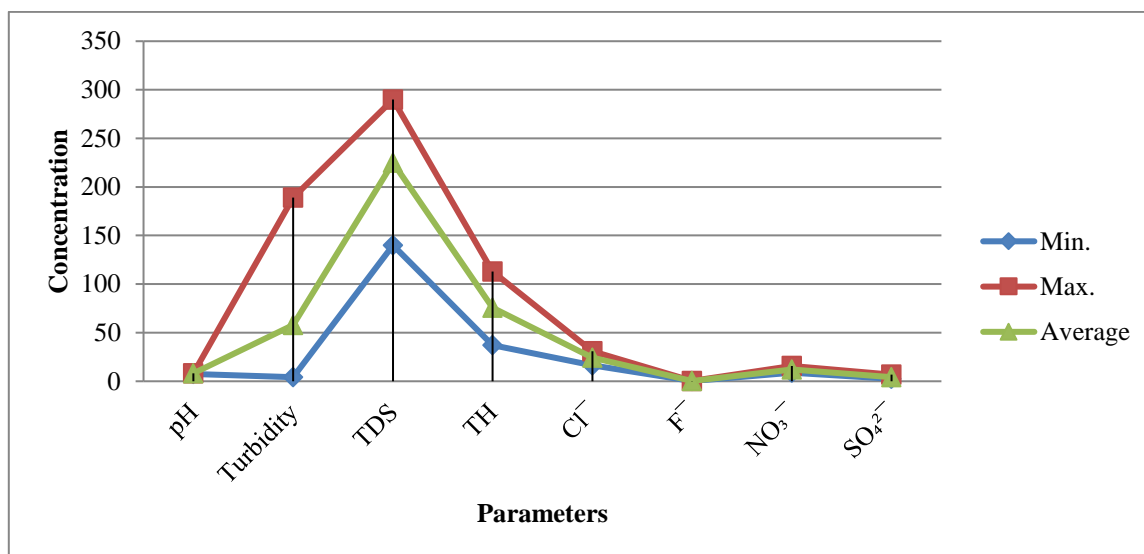


Figure 3.1: Minimum, Maximum & Average Concentration of Various Parameters in Parwan River

#### IV. CONCLUSION:

From the observations, it may be concluded that the concentration of pH, TDS, TH,  $\text{Cl}^-$ ,  $\text{F}^-$ ,  $\text{NO}_3^-$  and  $\text{SO}_4^{2-}$  are within permissible standard limits but all samples of the river water samples were high in turbidity which suggest the poor water quality in these water samples.

#### V. TREATMENT:

Addition of bleaching powder is advised so that water may attain normal pH and disinfected properly. Nascent chlorine kills microorganisms, bacteria present in the water. This water may be used for irrigation and drinking purpose through distribution tanks in the system.

Variation in TDS of Parwan River varies from 140 mg/l to 290 mg/l and turbidity varies from 4.2 NTU to 188.9 NTU indicates that in rainy season turbidity increases from its catchment area due to solid particles in rainy season alum dose is suggested 40 mg/l with 0.5 mg/l bleaching powder.

Alum treatment followed by flocculation through sedimentation, filtration and after disinfection water is supplied to the district.

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