

SEASONAL ASSESSMENT OF PHYSICO-CHEMICAL PARAMETERS OF RIVER KANTLI, JHALAWAR DISTRICT, INDIA

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Abstract: Water quality of Kantli river, Jhalawar District, India was evaluated by measuring various physicochemical parameters during November, 2010 to October, 2011. River water samples of Kantli were collected from 10 sampling sites and analysed as per standard methods. Sampling was done during three seasons (summer, rainy and winter) throughout the one year from various villages. 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, Physiochemical parameters, Water quality standards.

I. INTRODUCTION:

Water is a natural resource essential for life in any ecosystem (Lomsadze et al., 2017). Maintaining its quality is a major concern for the society which must meet the growing needs for water with the rapid development of the modern economy and the continuous expansion of population (Lu et al., 2017). It is an essential and most precious commodity of life. Freshwater river systems are vital and essential for the sustenance of life (Suthar et al., 2010). The water quality of most of the river water is contaminated due to heavy pollutant loads in India (Jindal and Sharma, 2010; Ramakrishnaiah, et al., 2009).

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 Kantli River water quality at Jhalawar District (Rajasthan). This study involves the determination of physical and chemical parameters of Kantli 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⁻, F⁻, NO₃⁻, SO₄²⁻ 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 Kantli 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⁻, NO₃⁻, SO₄²⁻ and F⁻ 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 Kantli River were collected and analysed as per standard methods. With the help of these, we assessed the seasonal results of Kantli River. Sampling was done during three seasons (summer, rainy and winter) throughout the one year from various villages (November, 2010 to October, 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 Kantli River Water

S.No.	Sample No.	Village	Season	pH	Turbidity (NTU)	TDS (mg/l)	TH (mg/l)	Cl ⁻ (mg/l)	F ⁻ (mg/l)	NO ₃ ⁻ (mg/l)	SO ₄ ⁻² (mg/l)
1	S ₁	Singhpur	Summer	8.06	12.4	290	88.4	24.6	0.18	11.2	3.7
			Rainy	7.99	174.3	210	41.7	15.8	0.11	7.9	4.9
			Winter	8.24	6.5	230	90.5	20.8	0.20	15.4	6.7
2	S ₂	Arukheri	Summer	7.88	10.3	310	134.5	29.7	0.17	14.6	5.0
			Rainy	8.14	195.4	220	36.8	17.9	0.09	6.8	6.8
			Winter	8.25	12.8	270	85.9	22.3	0.22	16.9	8.3
3	S ₃	Khokheri	Summer	7.94	9.8	260	81.2	28.7	0.19	12.8	4.9
			Rainy	8.13	180.8	200	44.9	13.5	0.13	5.9	7.8
			Winter	8.38	7.5	210	99.8	21.8	0.25	13.6	9.4
4	S ₄	Bani	Summer	7.98	9.9	270	78.5	26.4	0.17	13.9	4.5
			Rainy	8.19	168.7	180	50.8	12.8	0.12	7.8	5.4
			Winter	8.49	3.6	230	100.2	24.6	0.24	18.2	7.8
5	S ₅	Karawan	Summer	8.03	11.4	240	98.3	30.9	0.16	10.6	4.9
			Rainy	8.22	144.1	160	38.7	14.3	0.08	6.8	6.2
			Winter	8.36	5.6	280	102.6	20.6	0.19	12.2	3.3
6	S ₆	Khakheriya khurd	Summer	7.72	9.2	260	108.7	25.7	0.20	12.8	4.8
			Rainy	7.99	158.3	200	42.2	16.8	0.10	7.2	3.1
			Winter	8.45	7.8	220	82.8	29.7	0.23	13.9	3.6
7	S ₇	Gangiyakheri	Summer	7.84	10.8	280	102.5	27.8	0.19	14.6	4.5
			Rainy	7.97	176.2	190	32.9	14.1	0.14	6.9	2.9
			Winter	8.21	13.9	240	98.6	23.3	0.22	16.4	5.7
8	S ₈	Jhamirkheri	Summer	7.74	8.6	270	89.3	29.9	0.17	13.4	6.8
			Rainy	7.89	188.5	210	37.8	11.8	0.13	8.3	7.5
			Winter	8.19	9.2	220	100.8	22.6	0.20	14.7	5.2
9	S ₉	Manavada	Summer	7.58	9.4	280	111.6	28.4	0.16	12.2	7.2
			Rainy	7.78	163.6	200	36.7	12.2	0.15	9.3	5.3
			Winter	8.17	10.3	240	89.6	21.2	0.22	10.2	6.8
10	S ₁₀	Silehgarh	Summer	7.64	8.7	230	109.7	28.9	0.18	11.9	4.7
			Rainy	7.87	169.9	180	32.2	13.6	0.12	8.5	5.9
			Winter	8.09	5.2	270	93.3	22.3	0.24	13.6	6.8

- 3.1 pH:** pH values ranged between 7.58 to 8.49 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 8.04. The minimum value of pH was monitored in sample S₉ and the maximum value of pH was viewed in sample S₄.
- 3.2 Turbidity:** The data table reveals that the turbidity values in one year varied from 3.6 NTU to 195.4 NTU for all river water samples and in rainy season, these values were not within the standard limits recommended by WHO. The minimum value of turbidity was observed in sample S₄ and the maximum value of turbidity was found in sample S₂. 63.42 NTU was the average value of turbidity.
- 3.3 Total Dissolved Solids (TDS):** TDS values were varied from 160 mg/l to 310 mg/l and these values were within permissible limits prescribed by ISI and WHO. The average value of TDS was 235.0 mg/l. In sample S₅ minimum value of TDS was observed and in sample S₂ maximum value was surveyed.
- 3.4 Total Hardness (TH):** The data table reveals that the TH values in one year varied from 32.2 mg/l to 134.5 mg/l for all river water samples and they all were within permissible limits recommended by ISI and WHO standards. The minimum value of TH was observed S₁₀ and the maximum value of TH was found in sample S₂. 78.0 mg/l was the average value of TH.
- 3.5 Chloride (Cl⁻):** All values of chloride were under recommended standards in one year. Chloride values varied between 11.8 mg/l to 30.9 mg/l. The minimum value of chloride was found in sample S₈ and the maximum value of chloride was detected in sample S₅. The average value of chloride was 21.7 mg/l.
- 3.6 Fluoride (F⁻):** Fluoride values ranged from 0.08 mg/l to 0.25 mg/l and the average value of Fluoride was 0.17 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 fluoride was examined in sample S₅ and the maximum value of fluoride was scrutinized in sample S₃.
- 3.7 Nitrate (NO₃⁻):** Nitrate values ranged from 5.9 mg/l to 18.2 mg/l and the average value of nitrate was 11.6 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 nitrate was examined in sample S₃ and the maximum value of nitrate was scrutinized in sample S₄.
- 3.8 Sulphate (SO₄⁻²):** Sulphate values were varied from 2.9 mg/l to 9.4 mg/l during one year sampling. The average value of sulphate was 5.6 mg/l. All values of sulphate were under recommended WHO and ISI. The minimum value of sulphate was monitored in sample S₇ and the maximum value of sulphate was viewed in sample S₃.

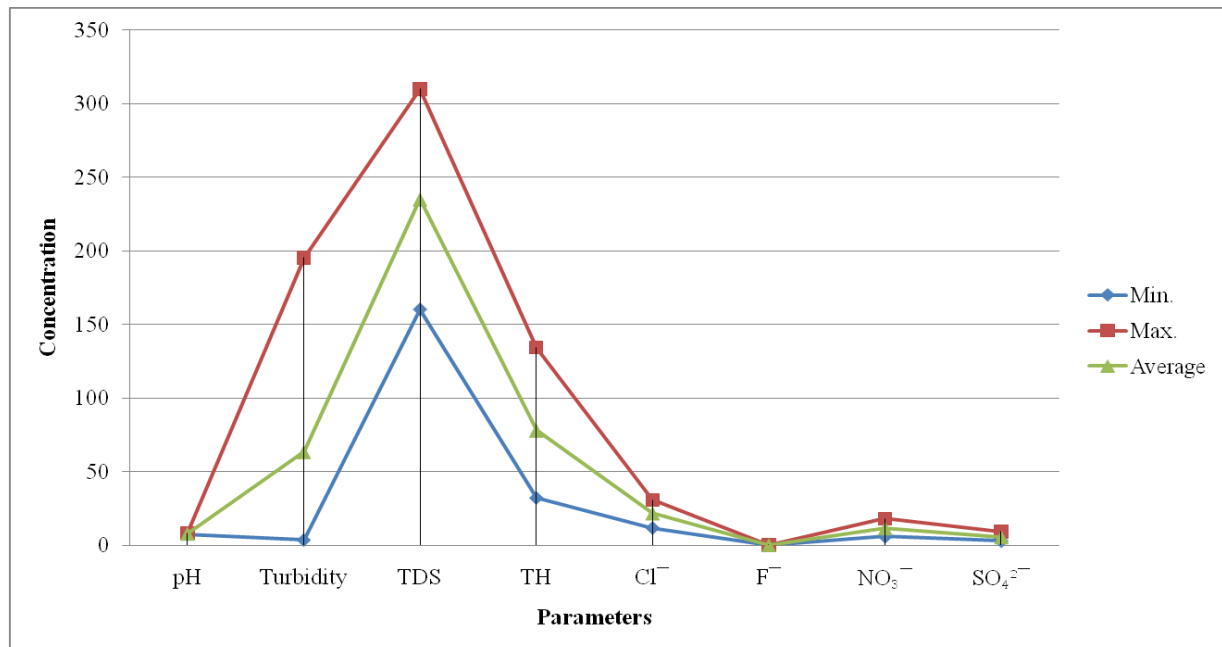


Figure 3.1: Minimum, Maximum & Average Concentration of Various Parameters in Kantli River

IV. CONCLUSION:

From the analysis, it is evident that the values of pH, TDS, TH, Cl⁻, F⁻, NO₃⁻ and SO₄²⁻ are within permissible standard limits but all samples of the river water were high in turbidity which suggest the unpotable water in these water samples.

V. TREATMENT:

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

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