



A Physicochemical Study on the Pollution Level of Water of Chambal River in Kota Rajasthan and it's Effect on Productivity

Shaheena Khan¹ and A.V. Trivedi²

1. Research Scholar 2. Research Supervisor

School of Basic and Applied Sciences

Career Point University Kota Rajasthan

ABSTRACT

River water not only effects human health but also it affects the productivity of crops. In the present study physicochemical parameters of chambal river water of Kota Rajasthan India have been studied. Total eleven parameters, viz. pH, Turbidity, TDS, total alkalinity, chloride, fluoride, nitrate, phosphate, sulphate, calcium and magnesium were studied. Four sites of chambal river from Kota thermal riverside have been chosen for the present study. Results of the study reveals that except fluoride and phosphate all parameters were found under the permissible limit as given by Indian standard specification for drinking water (IS 10500). Thus it has been recommend that this water can be used for drinking after proper purification. It has been found that pollution decreases productivity of the crops.

INTRODUCTION

Rivers play a very very important role in the life process. People along the globe use water for many purposes e.g., for drinking, for forming and for industry purposes etc.,. However, the water quality of rivers are deteriorating due to human activities like opanthropogenic activities, industrialization, farming activities, transportation, urbanization, animal and human excretions and domestic wastes disposal etc.[1]. The poor quality of water not only causes many diseases in the humans but also effect the productivity of crops so that quality of the water must be tested regularly [2-4]. Pollution of river is a global problem [5]. As be already reported in our previous paper that in India about 70% of the available water is polluted. The chief source of pollution is identified as sewage constituting 84 to 92 percent of the waste water. Industrial waste water comprised 8 to 16 percent [6 - 8]. Much attention have already been paid to study pollution of rivers like Godavari, Krishna, Tungbhdra, Cauvery, Jhelum, Kosi, Alaknanda, Betwa, Ganga and

Yamuna etc. [9 - 11]. However little attention has been so far paid for the river Chambal. Currently this river is facing big pollution problems due to encroachments, discharge of untreated domestic and industrial waste, dumping of solid waste and illegal diversion of water. We therefore studied pollution level of chambal river of Kota Rajasthan for various physicochemical parameters viz., pH, turbidity, TDS, chloride, fluoride, nitrate, calcium and magnesium etc. and their comparison with the Indian standard IS 10500. In this research paper we also studied effect of pollution on the productivity of crops.

STUDY AREA

The present study focuses on the Chambal river that flows through heart of the Kota City, one of the most prominent industrial and educational town of Rajasthan state in India. The district Kota lies between $24^{\circ} 25'$ and $25^{\circ} 51'$ North latitudes and $75^{\circ} 31'$ and $77^{\circ} 26'$ East longitudes with total area of 5767.97 Sq Kms. "Kota City" is located at extreme South of it at $25^{\circ} 11'$ North latitude and $75^{\circ} 51'$ East longitude occupying total area of 238.59 Sq Kms with average height 253.30 meters from sea level. The following locations of Kota city have been selected for the pollution study of chambal river. The samples were collected from these locations from the Kota thermal riverside (Chambal river has two sides chambal gardens riverside and Kota thermal riverside) following the standard procedure and analysed according to the APHA and standard methods.

1. Sample site - I Kota Garh Palace
2. Sample site - II Under Chambal Bridge Nyapura
3. Sample site - III Adharshila
4. Sample site - IV Gawadi

EXPERIMENTAL

Sampling :

All chemicals used were of AR grade purity. Water samples were collected for the present investigation from four different experimental sites of chambal river. Kota thermal riverside have been chosen to collect samples. The water samples were collected from, Under Chambal Bridge, Purani puliya Nyapura, Adharshila and Gawadi in the Month of December 2021. The Samples were collected in screw capped polyethylene bottles. Sample bottles were thoroughly rinsed with distilled water and then rinsed with river water before collecting samples. Caps of bottles were closed tightly after filling up of can to avoid changes in physico-chemical characteristics.

Analysis of water samples:

All chemicals used were of AR grade purity .Total 11 parameters namely pH, Turbidity, TDS, total alkalinity, chloride, fluoride, nitrate, phosphate, sulphate, calcium and manganese were determined according to the procedure prescribed by APHA. All the analysis were done at public health engineering department (PHED) chemical laboratory which is a Government of Rajasthan laboratory in Kota Rajasthan.

Table 1: Physicochemical parameters of Chambal river in Kota Rajasthan

S. No.	Parameters	Site - I	Site - II	Site - III	Site - IV
1.	pH	7.50	7.20	7.40	7.20
2.	Turbidity	4.50	2.80	2.90	3.40
3.	TDS	300	319	300	302
4	Total alkalinity	140	180	130	150
5	Chloride	58	44	78	44
6	Fluoride	0.02	0.29	0.34	0.26
7	Nitrate	6.00	8.00	8.10	7.00
8	Phosphate	0.18	0.06	0.27	0.22
9	Sulphate	10.00	14.00	10.00	14.70
10	Calcium	50.00	60	35.00	40.00
12	Magnesium	12.00	16.00	17.00	15.00

* All units are in mg/l except turbidity which is in NTU

** Sampling site I = Adhar Shila II = Purani Puliya Nyapura III = Ghar palace ke piche IV = Gawadi

*** All samples were collected from Kota thermal riverside

Effect of Pollution on the Productivity of Crops

To study effect of pollution on the productivity of crops we have chosen two sites one which is directly irrigated by chambal water and another which is irrigated by tube well water and a general comparison were done with the survey of farmers. Results of the study are given in the following table - 2 and 3.

Table 2 : Productivity of crop in Udiya Basti Gawadi Kota Rajasthan

S.N.	Name of the Crop	Productivity/Hactare in Quintal	Physical Health of Crop
1	Wheat	16.00	Medium
2	Black Gram	8.00	Medium
3	Mustard	12.00	Medium

* Directly irrigated from the polluted water of chambal river

Table 3 : Productivity of Crop in Jhangeerpura Sultanpur Kota Rajasthan

S.N.	Name of the Crop	Productivity/Hactare in Quintal	Physical Health of Crop
1	Wheat	36.00	Good
2	Black Gram	16.00	Good
3	Mustard	20.00	Good

* irrigated from tube well

RESULTS AND DISCUSSION

Results of the present investigation are given in the above table 1-3. As per the above results water quality of chambal river in the study area are discussed below along with the comparison of Indian standard specification for drinking water IS 10500. The negative logarithm of hydrogen ions is called pH. The value of pH of a solution is a measure of their acidity or alkalinity. The permissible limit of pH values for drinking water is specified as 6.5 to 8.5 as per IS 10500. The pH values of chambal water samples from all four sample sites I to IV were found between 7.20 to 7.50. This is under permissible limit. Turbidity of site I to IV were found to be 2.80 to 4.50 which is under acceptable limit 10 NTU as per the IS 10500. TDS (Total dissolve solids) in the present case were found in the range of 300 to 319 mg/l which shows good quality of water as per IS 10500. Total alkalinity were found to be 130 to 180 mg/l which is under permissible value 200 mg/l. In the present study chloride and fluoride concentration were found to be between 44 to 78 mg/l and 0.02 to 0.34 mg/l respectively. Chloride concentrations are acceptable as per Indian standard IS 10500. However as per IS 10500 concentrations of fluoride is below 0.6 mg/l thus water is rejected for drinking purpose. Low concentration of nitrate i.e. 6.00 mg/l to 8.1 mg/l were found in the sites I to IV this is acceptable because as per IS 10500 upper limit of Nitrate is 45 mg/l. Concentration of phosphate were found to be 0.06 to 0.27 mg/l. There is no IS 10500 standard permissible limit for phosphate for drinking water, while WHO (1993) has fixed it to be 0.1 mg/l. Thus only in one sample site (site - II) phosphate concentration was found under WHO limit, i.e. 0.06 mg/l. The Concentration of sulphate were found to be 10.00 to 14.70 this is acceptable under IS 10500 limits. Concentrations of magnesium and calcium were found to be 12.00 to 17.00 mg/l and 35.00 to 60.00 mg/l respectively. As per IS 10500 maximum acceptable limit of magnesium is 100 mg/l and that of calcium is 200 mg/l. Thus both metals are found within acceptable limit. Thus chambal water of investigated area of Kota Rajasthan can only be used for drinking after proper purification. Results of the survey to study effect of pollution on the productivity of crop are given in the above table 2 and 3. It is very clear from the results that pollution effects productivity. The physical health of crope which were irrigated with tube well were found good and productivity were approximately double for all the cropes, i.e. wheat black gram and mustard.

References

1. Nitin Gupta et al. ; Physico-chemical assessment of water quality of river Chambal in Kota city area of Rajasthan state (India); Rasyan J. Chemistry ; 4 (2) 686-692; (2011)
2. WHO ; Animal waste, water quality and human health. Geneva, Switzerland, World ; (2012)
3. Thebo, A.L. et al. ; A global, spatially explicit assessment of irrigated croplands influenced by urban wastewater flows ; Environmental Research Letters ; 12: 074008 ; (2017)
4. Kumm, M. et al.; Lost food, wasted resources: global food supply chain losses and their impacts on freshwater, cropland, and fertiliser use; Science of the Total Environment; 438: 477–489 ; (2012)
5. R.K. Trivedy et al.; River pollution in India ; Ashish Publishing House, New Delhi ; 26, 99 (1990).
6. Shaheena Khan and A.V. Trivedi ; A Study on the Pollution Level of Water of Chambal River in Kota Rajasthan ; JETIR ; 8 (12) 225 -227; (2021)
7. D. M. Joshi et al.; Studies on physicochemical parameters to assess the water quality of river ganga for drinking purposes in haridwar district; Rasayn J. Chem. ; 2(1) 195 - 203 (2009)
8. P.K. Goel; Water Pollution: Causes, Effects and Control; New Age International Publishers, ISBN: 8122418392 (2006).
9. D.N. Saksena et al.; Water quality and pollution status of Chambal river in National Chambal sanctuary, Madhya Pradesh; J. Environmental Biology; 29(5) 701-710 ; (2008)
10. Bhutiani, R. et al. Assessment of Ganga river ecosystem at Haridwar, Uttarakhand, India with reference to water quality indices. Appl. Water Sci. 6, 107–113 ; (2016)
11. Rohit Sharma et al. ; Analysis of Water Pollution Using Different Physicochemical Parameters: A Study of Yamuna River ; Frontiers in Environmental Science ; 8 ; 1 - 18 ; (2020)