



## ORIGINAL ARTICLE

## Studies on Total Hardness and Calcium Content in Chambal River at Dholpur District

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## ABSTRACT

*This study was carried out in each season for one year, deals with the assesment of physico-chemical parameters of chambal River water in Dholpur district. The samples were tested for their hardness and calcium indicating the deteriorating life sustaining capacities of the River due to domestic and industrial pollution*

**Key words:** *Biomonitoring, Chambal River, Hardness, Calcium content*

## INTRODUCTION

The present study was conducted to understand the physico-chemical characteristics of Chambal River, in Dholpur in Madhya Pradesh. The Chambal River is located in west central India and flows through three Indian states; Madhya Pradesh, Rajasthan and Uttar Pradesh. The Chambal also forms part of the Rajasthan-Madhya Pradesh boundary. The stretch of Chambal River contained in the National Chambal sanctuary (located at 25 ° 23'-26 ° 52'N, 76 ° 28'-79 ° 15'E) is extending up to 600 km downstream from Kota (Rajasthan) to the confluence of the Chambal with Yamuna River. On the basis of various parameters studied, Chambal River in this stretch can be placed under the category of Class C as per CPCB standards. The analysed water quality data of year 2004-2005 indicates that the Chambal River water in the sanctuary area is pollution free and can serve as a good habitat for many aquatic flora and fauna including endangered species. Hardness of water indicate that boiling point of water increase due to presence of cations and Anions in water. In water hardness mostly occur due to major cations of Calcium and Magnesium. The Anion which are responsible for hardness of water are bicarbonate, carbonate, sulphate and chloride. Temporary hardness of water associated mainly due to carbonate and bicarbonates while permanent hardness of water is mostly due to sulphate and chlorides.

## MATERIALS AND METHODS

**TOTAL HARDNESS (EDTA Titrimetric Method):**

It is the property of water which prevents the lather formation with soap and increases the boiling point of water-principal cation imparting hardness are Ca and Magnesium however other. Cation like strontium, iron and Mn also contribute to hardness. The anions responsible for hardness are mainly bicarbonate, carbonate, sulphate, chloride, Nitrite & Silicate. Temporary hardness caused by bicarbonate and carbonate while permanent hardness caused by sulphate & chloride of the metals. Hardness in laboratory determined by EDTA (APHA\_1992).

**Process:** For measuring hardness, take 25 ml sample in conical flask, added 1 ml buffer solution followed by 1 ml inhibitor. Then at pinch of eriochrom black-T indicator and titrated against standard 0.01 M-EDTA till the wine red colour changes to blue.

**Calculation:**

$$\text{Calcium (mg/litre)} = \frac{\text{Titrant used} \times N \times 1000}{\text{ml sample}}$$

Where,

N = volume of EDTA used.

**CALCIUM (EDTA TITRIMETRI METHOD):**

It is one of the most abundant substance of the natural waters being present in high quantities in the rocks, it is leashed from their to contaminat the water.

Disposal of sewage and industrial wastes are also important source of calcium concentration of the calcium is reduced at high pH due to its precipitation as CaCO<sub>3</sub>.

**Process:** Taken 25 ml sample in conical flask then add 1.0 ml NaOH solution. Then add a pinch murexide and titrated against 0.01 EDTA till the pink colour changes to purple.

**Calculation:**

$$\text{Calcium (mg/litre)} = \frac{\text{Titrant used} \times N \times 1000}{\text{ml. sample}}$$

Where,

N = volume of EDTA used

**RESULTS AND DISCUSSION**

**TOTAL HARDNESS:** There was significant variation in the total hardness of Chambal water at different four sampling stations. However the total hardness of Chambal water varies significantly after each three months intervals.

**Table 1:** Average hardness

| Month    | Hardness (mg/l) |        |        |        |
|----------|-----------------|--------|--------|--------|
|          | Site A          | Site B | Site C | Site D |
| Oct-04   | 83.0            | 112.0  | 163.0  | 117.0  |
| Jan-05   | 86.0            | 109.0  | 172.0  | 190.0  |
| April-05 | 90.0            | 108.0  | 176.0  | 178.0  |
| July-05  | 96.0            | 100.0  | 161.0  | 179.0  |

Site A= High way, Site B= Shamshan Ghat, Site C= Shergarh Fort, Site D= Near railway bridge

**Calcium:** There was no significant variation of Calcium in Chambal water at different four sampling stations. However, the Calcium of Chambal water varies after each three months intervals.

**Table 2:** Average Calcium

| Month    | Calcium (mg/l) |        |        |        |
|----------|----------------|--------|--------|--------|
|          | Site A         | Site B | Site C | Site D |
| Oct-04   | 43.0           | 45.0   | 45.0   | 60.0   |
| Jan-05   | 47.0           | 47.0   | 54.0   | 63.0   |
| April-05 | 45.0           | 49.0   | 53.0   | 66.0   |
| July-05  | 46.0           | 50.0   | 52.0   | 64.0   |

Site A= High way, Site B= Shamshan Ghat, Site C= Shergarh Fort, Site D= Near railway bridge

**TOTAL HARDNESS**

The measurement of hardness of Chambal River water in the present investigation increased throughout the study period. However increasing of hardness has been observed to be non significant in the month of July 2005. probably due to the dilution of Chambal River water but significant increase in hardness has been noted from oct. 2004 to April 2005 may account for reduced availability of Chambal water and mingling of untreated sewage in the River. Further the hardness of water declined and remain almost constant in the month of July 2005. During this period it is due to rainy water. It becomes quite clear that the hardness of Chambal water is due to increasing of different pollutant in Chambal. The finding of hardness in the present investigation are in support to Das *et al.* (1992), Sinha, *et al.* (1981), Sarita, *et al.* (2005) who also reported high values of hardness in River Bhrahmputra, Sai, Sendth respectively due to discharge of domestic and

sewage effluents. It is therefore concluded that the hardness of Chambal River probably be due to the discharge of effluents and sewage as well as domestic waste in the River. As well as the underground water which is quite hard and contain calcium and magnesium also responsible for increasing hardness of Chambal River because in Dholpur area ground water mostly used in domestic purposes in discharge on routine basis in River water. Further high values of hardness could be possible due to human activity including bathing, washing of cloths that incorporate use of detergent.

#### CALCIUM

The present investigation clearly indicates that calcium is significantly increased at down stream site (D) as compared to up stream site (A) throughout this period. The increased values of calcium is probably due to, the existing calcium in the ground water which is already an established fact. Various small scale industries of Dholpur directly are responsible as their effluents are being discharged in to River and thus increased calcium. Chambal River receives million litres of untreated domestic sewage which is one of the cause for increase in calcium of Chambal water. The above findings support by the finding of Rai, *et al.* (1990), Sinha, *et al.* (2005) who also reported high values of calcium in River Godawari, Sabarmati and Chambal River respectively due to discharge of industrial effluents. The ground water of Dholpur is very hard and contains high amounts of calcium in it.

#### REFERENCES

1. Das, Kalita H.B., Sackia L.B., Borah K. and Kannur S.B. (1992): Physico chemical characteristics of Brahmaputra water act Tezpur. Poll. Res., 11(3): 169-172.
2. Rai J.P.N. and Sharma H.C. (1990) Impact of industries on the quality of surface and ground .water in the north-west region of Utter Pradesh. National Symposium on Protection of environment of city water fronts New-Delhi.
3. Sarita Sharma & Alka Mishra (2005): studies of the Physico-chemical parameters of the Sendth-River Int. J. Mendel, 22(3-4):117-118.
4. Sinha A.K. (1988): A Comprehensive study of Ganga and its dependents. Final Technical report submitted to ministry of Environment, Govt. of India. 1-356.
5. Sinha Lalit K. (1981): Water quality modeling in a small stream problems, considerations and results, paper presented in International symposium on Energy and Ecological modeling April 20-23. Louisville, Kentucky, U.S.A.
6. Sinha M.K., Pandit N., Saha L.C. and Dulla J.S.M. (1992): comparisons limnological study of two revisions ponds Papharni & suntanned of Mandor Hill, Bounsi, Bhagalpur (Bihar) J. Fresh water Prior. 4(4): 256-260.