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Physico-Chemical Analysis of Water at Selected Point in Kota, Rajasthan

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ABSTRACT

Water is the basic unit of life and it is essential element for all living forms and the environment health. Water is the basic unit of life and it is essential element for all living forms and the environment health. Rivers are essential for all living organism on earth. In this study, we screened the point of contamination of pollutants in Chambal river water and their concentration in different season. Present study revealed that water quality parameters (pH, EC, Chloride, Fluoride, TDS, DO, COD, BOD etc) of some sample site showed contamination and depletion in quality of Chambal River in pre monsoon. The water quality was maintained in certain sample site and all parameters were found under limit. We should maintain quality of water because Chambal River is major source of drinking water for districts of Rajasthan.

Keywords: Water quality, Chambal River, Chemical parameter

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INTRODUCTION

Chambal River plays an important role in integrating and organizing the landscape, and moulding the ecological setting of a basin. it is the most significant water resource of the state of Rajasthan it full fill the water demands of a large number of cities and towns situated on its banks. Chambal river is major source of potable water, the river is also ecologically very important as it harbors very rich biodiversity[1]. Amit et al[2] also revealed that the diversity and richness indices are an indication of moderate river health. The Chambal River is a tributary of the Yamuna River in central India, and forms part of the greater Gangetic drainage system. It is a legendary river and finds mention in ancient scriptures. The perennial Chambal originates from Mhow town, near Indore, MadhyaPradesh. The Chambal and its tributaries drain the Malwa region of north western Madhya Pradesh,while its tributary, the Banas, which rises in the Aravalli Range, drains south eastern Rajasthan. Itends a confluence of five rivers, including the Chambal, Kwari, Yamuna, Sind, Pahuj, at Pachnadanear Bhareh in Uttar Pradesh state, at the border of Bhind and Etawah districts. There are even some organisms that could exist without atmospheric oxygen (*i.e.* anaerobic microbes) but none can strive without water[3]. The ground and surface water are the most significant fresh water reservoirs. Fresh water is a vulnerable resource that quenches the needs of end users with good quality and quantity[4]. In contrast, availability of water is automatically deemed to be unfit, manifestly under polluted condition1. Rapidity of industrialization and urbanization results in polluting the nearby water reservoirs. Especially, wider the quantity of polluted water from domestic and industrial effluents drains into the river subsequently deteriorates the quality of the water system[5]. In continuation of our previous study[6-11], in this paper, an attempt has been made to assess the water quality on physico-chemical to study the extent of pollution in river Chambal in Kota district.

MATERIAL & METHODS

The samples of water were collected from different places of the river Chambal in Kota City. These samples were collected periodically from January 2018 to December 2018.Water samples were collected in different glass bottles. Physicochemical parameters for the collected samples were studied by international standard methods. Distilled water was used as a Control Sample. The water quality parameters were analysed as per standard methods supported by[12-14]. For analysis of each sample, three replicates were used.

Sampling techniques and analysis

For this purpose ten locations and four points at each location were chosen along the river Chambal in Kota City, Kota. Samples were collected in sterilized polypropylene bottles using standard procedure of grab or catch as per the methods of APHA[15] (1985) in pre-monsoon, monsoon and post monsoon season of the years 2018. Physicochemical parameters such as pH, conductivity, total dissolved solids, dissolved oxygen, chemical oxygen demand and biological oxygen demand were selected and estimated quantitatively as per standard methods & procedures of APHA[15] (1985). All the chemicals used were of AR grade used for this purpose.

RESULT AND DISCUSSION

Temperature

The results from analyses of water temperature from surface and ground water as presented in Table1.1 and Figure 1 reveals that the temperature of the surface and ground water samples are within the permissible limit as per IS:10500. The results reveals that in months of October to March the temperature vary from 10°C to 20°C whereas in the months of May to September the temperature of surface and ground water samples vary from 20°C to 30°C. It is clear from the graph that temperature is low in month of January, slight rise is observed in each months and the highest temperature is observed in month of May to August after which decreasing trend is observed. The observed trend of rise and fall of temperature in water samples is due to change in atmospheric temperature or seasonal temperature change. Increased water temperature is an important consideration when toxic substances are present in water. Many substances (i.e. cyanides, phenol, xylene, zinc) exhibit increased toxicity at elevated temperatures. These toxicities and other physiological interactions are also influenced by temperature acclimation or history of the species.

Table 1 Average monthly temperature (0C)

Month	Surface water	Ground water
January	12.5	15.4
February	14.4	17.1
March	18.8	20.6
April	25.3	21.5
May	30.4	23.8
June	27.2	24.4
July	25.7	24.3
August	26.5	24.6
September	21.4	23.8
October	17.3	20.2
November	16.7	18.7
December	13.3	17.5

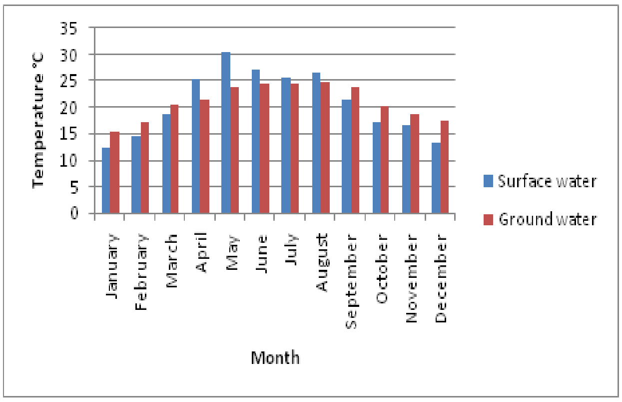

Figure 1 Graph of average monthly temperature

pH Value

The pH is a measurement of the intensity of acidity or alkalinity and also measures the concentration of hydrogen ions in water. It has no direct adverse affect on health, however, a low value, below 5.0 will produce sour taste and higher value above 8.5 shows alkaline taste. A pH range of 6.5- 8.5 is normally acceptable as per guidelines suggested by IS: 10500. The results of the analyses for the collected surface and ground water samples are presented in table 2.1 and figure 2.2. The analyses results as presented in Table 2 and Figure 2 reveals that pH values for surface water samples are comparatively high as compared to the ground water samples except for the months of July and August. The fluctuation in the months of July and August may be due to precipitation. However result reveals that the surface water samples are close enough to alkaline this is due to the contamination in the surface water. The contamination in the surface water is due to intrusion of untreated sewage water, domestic waste, addition of industrial waste from nearby surroundings. However it is clear that the contaminated surface water will have a negative impact on ground water too in coming years.

The increase in pH level of the surface water will also have adverse impact on the aquatic life too directly. It can also be never neglected that if aquatic life or aquatic process is hampered the self-purification mechanism of water will also be hampered.

Table 2Average monthly pH values of the surface and ground water samples

Month	Surface water	Ground water
January	7.6	6.5
February	7.7	6.6
March	7.8	6.5
April	8.2	6.6
May	8.3	6.6
June	7.5	6.4
July	6.6	6.4
August	6.4	6.6
September	6.5	6.4
October	6.4	6.5
November	6.6	6.6
December	6.5	6.4

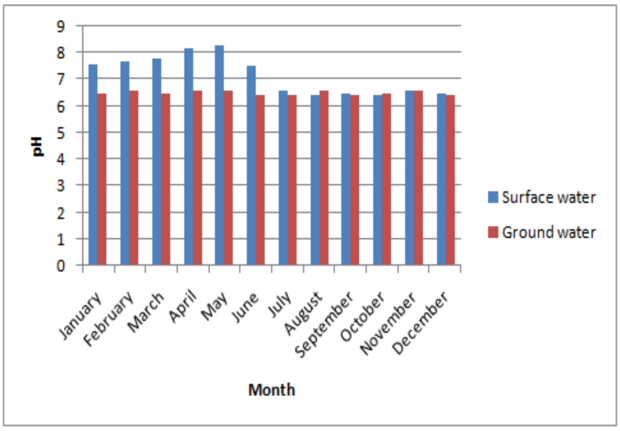

Figure 2 Graph of average monthly pH values of the surface and ground water samples

Turbidity

The analysed results for turbidity are presented in Table 3 and Figure 3 Measurement of Turbidity reflects the transparency in water. It is caused by the substances present in water in suspension. In natural water, it is caused by clay, silt, organic matter and other microscopic organisms. The prescribed limit of Turbidity for drinking water is 5-10 NTU

(IS: 10500). Turbidity was found within the permissible limit in all the water samples. However for case of surface water samples turbidity was high whereas turbidity was found low in ground water samples. The result reveals that in ground water samples turbidity varied from 6 to 6.5 that is permissible limit for drinking water whereas in surface water samples turbidity varied from 8 to 9. Thus surface water is unlike to be suitable for drinking purpose. The reason behind the high level of turbidity is due to contamination in the surface water. Additional domestic and industrial waste dumping along with stream flow and runoff from the neighbouring area are major source of high turbidity in surface water. The excess of turbidity has less impact on elders but it has a notable health issues on infants. Various breathing disorders have been identified in the areas of having high turbidity in the drinking water. However water application of high turbidity in agricultural fields does not have instant negative impact but in long term it has adverse impact on soil health.

Table 3 Average monthly values of turbidity (NTU)

Month	Surface water	Ground water
January	8.6	6.5
February	8.7	6.3
March	8.8	6.5
April	8.2	6.2
May	8.3	6.3
June	8.5	6.4
July	8.6	6.4
August	8.4	6.5
September	8.5	6.4
October	8.4	6.5
November	6.6	6.4
December	6.5	6.5

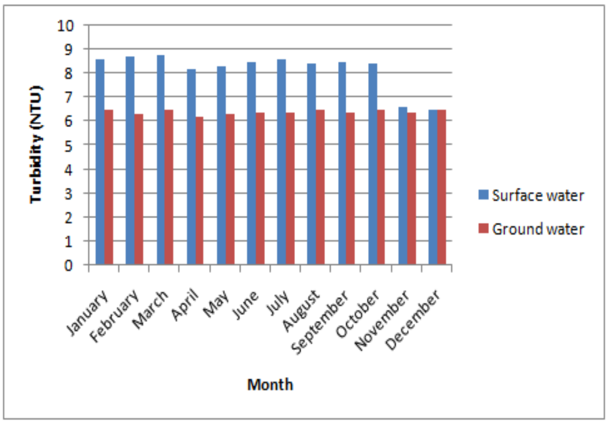

Figure 3 Graph of average monthly values of turbidity (NTU)

Total dissolved solids

Total Dissolved Solids may be considered as salinity indicator for classification of surface and groundwater. The TDS in groundwater is due to the presence of Calcium, Magnesium, Sodium, Potassium, Bicarbonate, Chloride and Sulphate ions. Analysis results for TDS in surface and ground water samples shown in Table 4 and Figure 4 reveals that the ground water samples are found to be appropriate but near to the permissible limit. TDS in surface water samples were found on end limit. TDS for surface water samples varied from 500 to 520 mg/l. Highest TDS were found for the surface water samples in the month of January and February. Domestic waste disposal is the main reason of high TDS in the surface water samples. As prescribed limit of TDS for drinking water is 500 mg/l. However TDS were almost same in ground water samples throughout the year and varied from 510 to 520 mg/l.

Table 4 Average monthly values of total dissolved solids (mg/l)

Month	Surface water	Ground water
January	519.6	512.5
February	518.7	515.6
March	516.8	514.5
April	514.2	415.6
May	515.3	514.6
June	515.5	516.4
July	518.6	515.4
August	517.4	514.6
September	516.5	514.4
October	518.4	515.5
November	515.6	513.6
December	512.5	511.4

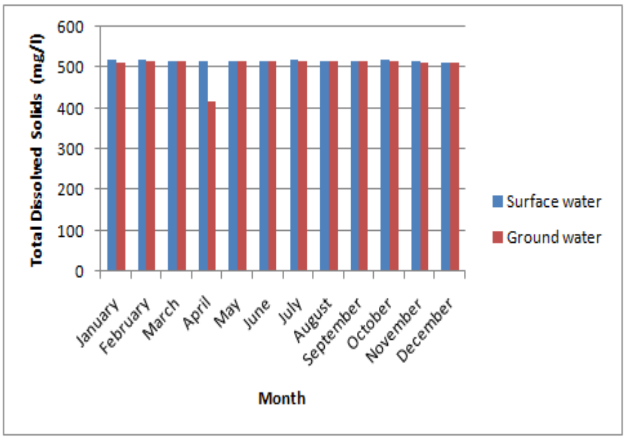

Figure 4 Graph of average monthly values of total dissolved solids (mg/l)

Hardness

Hard water does not allow the soap to produce foam and hence is not suitable for household purposes. Permissible value of Hardness for drinking purpose is 300mg/l (IS:10500). According to Hardness classification soft water is considered to have TDS 0-60mg/l, moderately hard water to have TDS 60-120 mg/l, hard water to have TDS 120-180mg/l and very hard water to have TDS value of 180mg/l and above. The results from Table 5 and Figure 5 reveal that the surface water quality of Chambal River is not suitable for drinking purpose. The surface water was found to be very hard (in the range of 284 mg/l to 288 mg/l) but the values of hardness of ground water samples were found under appropriate limit (in the range of 91 mg/l to 97 mg/l). The hardness of surface water can have a negative impact in ground water quality. The reasons for hardness of surface water samples are the toxic and chemical waste intrusion through sever lines, additional chemical transport through seen off from agriculture fields, etc.

Table 5 Average monthly values of hardness (mg/l)

Month	Surface water	Ground water
January	287.6	96.5
February	286.7	95.6
March	285.8	96.5
April	286.2	94.6
May	285.3	92.6
June	286.5	92.4
July	286.6	91.4
August	287.4	93.6
September	286.5	95.4
October	285.4	95.5
November	284.6	96.6
December	284.5	94.4

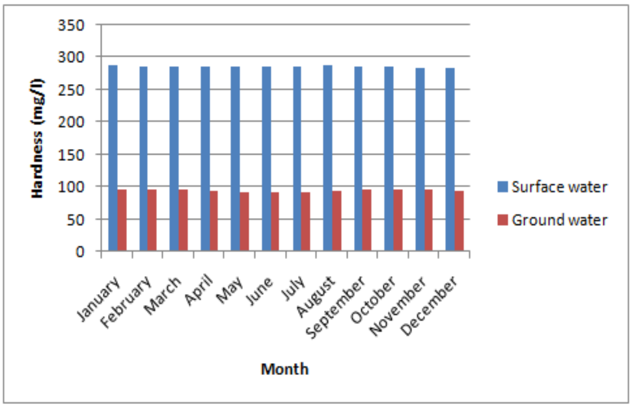

Figure 5 Graph of average monthly values of hardness

CONCLUSION

The analysed data for the year 2018 reveals that the water quality at ground water is fairly satisfactory during this entire period. Sometimes few parameters have recorded higher values of pollution indicating temporary sign of pollution which may be due to some localized affect. The water quality at the Sanctuary fairly satisfies the water quality criteria for Class C water body (Drinking water source after conventional treatment and disinfection) at almost all the instances. The overall health of the river during all the years has been found fairly satisfactory. But the water quality of surface water is not satisfactory .The present study recommends to continue the monitoring that is useful for the sustainable development through planning and for the implementation of remediation methods in the future, in order to mitigate the adverse effects of the deprived quality of river water on human health, as well as on plant growth.

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