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STUDIES ON QUALITY ASSESSMENT OF CHANDRALOI RIVER WATER NEAR KOTA, RAJASTHAN

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ABSTRACT

The water quality of Chandraloi river was monitored during pre-monsoon season near Kota, Rajasthan. The parameters examined were; pH, electrical conductivity, total dissolved solids, alkalinity, total hardness, chlorides, nitrates, dissolve oxygen, biochemical oxygen demand, chemical oxygen demand, calcium and magnesium at five sampling sites. The results showed that water quality at these sites were with in permissible limits except for EC, DO, BOD, nitrates, calcium and magnesium. Urban settlements near Kota city at site-2 (Kaithoon) and site-3 (Devali-arab) were observed as moderately contaminated ones.

INTRODUCTION

Chandraloi river originates near Mawasa village and flow along with urban settlements of Kota namely Kaithoon, Ummedganj, Devali-arab, Raipura, Borkhandi, Jaggannathpura, and near Manasgoan it joins Chambal river. A large number of pollutants, especially the municipal waste drains, urban-agricultural wastes, wastewater from large and small scale industries located nearby mixes in the river and make the river water as contaminated one.

The present study was undertaken to carry out quality assessment of river water at five different sites along this river as to ascertain its suitability for drinking, domestic and irrigational purposes and important findings are reported in this communication.

STUDY AREA

The study area viz. Kota city located in the south-east at 25'10" N latitude and 75'52" longitude of Rajasthan state is on the bank of river Chambal. The climate of the area is dry to sub humid. The average annual rainfall of the area is about 852mm. The south-west monsoon advances into the area from June end to September. After a preliminary survey of Chandraloi river near Kota, following five sites were selected.

1. Mawasa: It is about 22 km from Kota city. The river originates from this place. There was no pollution at this site.

2. Kaithoon: It is about 15 km away from Kota city and has urban settlement of Kota city that add municipal wastewater to the river.

3. Devali-arab: It is about 6 km away from Kota city and industrial effluents are discharged in to river from near by industries.

4. Jaggannathpura : It is about 10 km from Kota city and is comparatively less polluted site.

5. Manas-gaon: It is about 20 km from Kota city. At this place, river meets Chambal river. Here dilution takes place. It can be considered as clean site.

MATERIAL AND METHODS

Water samples were collected from 5 sites during pre-monsoon period (April-May) in the year 2010 and analysed for different physico-chemical parameters. Two liters of a water sample collected in clean plastic can from a site in morning hours (between 8 am to 10 am) was analysed following standard methods (APHA 1989). The results were also compared with the Indian standards.

RESULT AND DISCUSSION

The various physico - chemical parameters of river water are presented in the Table1 and Fig.1.

pH values (7.5 to 8.8) of all sites were close to recommended values (6.8 - 8.5) of water for drinking purpose, with the exception at Site-3 (Devali-arab) having a little higher pH value (slight alkaline).

Electrical conductivity values closely correlated with content of total dissolved solids. EC values were as per US guidelines for potable water and irrigation water and were less than 0.7 dS/m. The water samples having 0.7-3.0 dS/m values of EC are considered as moderately contaminated

and those with EC higher than 3.0 dS/m are regarded as severely contaminated water. Its higher values were recorded at site 2 (Kaithoon: 2.7 dS/m). In the present study, the EC values falls in the moderate contaminated category (Fig.1). Similar observations were observed by Krishnamurthy and Bharti (1994) for Kalu river in North Karnataka.

Total dissolved solids denote presence of different minerals in water. In natural water, TDS is mainly on account of carbonates, bicarbonates, chlorides sulphates, phosphate, nitrate, calcium, potassium, iron (Trivedy and Goel 1986). TDS levels tested at all sites were with in the permissible limits. A high values was observed at site-2 (Kaithoon). Alkalinity is a measure of the capacity of water to absorb hydrogen ion. The higher values of alkalinity indicate presence of bicarbonates, carbonate and hydroxide in water body (Jain et al. 2000). Alkalinity levels tested at all sites were with in the permissible limit (104-306 mg/L) as recommended by BIS (1991).

The principal cations imparting hardness are Ca++ and Mg++ while the anions are mainly bicarbonates, carbonates etc. The hardness values ranged from 164-384 mg/L, falls under permissible limits. The observed results are in close agreement with the studies of Vyas and Sawant (2008) in urban areas of Kohlapur city, Maharashtra.

The desirable limit for chlorides is of 250 mg/L as prescribed by BIS (1991). Presence of higher level of chlorides is considered as pollution indicator (Reddy and Venkateshwarlu 1987). Chloride concentrations were slightly high at site-2 (Kaithoon) and site-3 (Devali-arab). Higher values at these urban sites are due to large amount of sewage discharges and increased rate of decomposition of organic matter because of high temperature during pre-monsoon season (Khanna and Bhutani 2003).

The nitrate concentrations ranged from 9-46 mg/L (Fig.1). Higher values were observed at site-2 (Kaithoon) and site-3 (Devali-arab) because of mixing of various effluents from industries and agricultural wastes including fertilizers. Similar observations were made by Sridhar et al. (2006) in the Palk Bay of South-East coast of India.

Dissolve oxygen is an important parameter affecting chemical as well as biological reactions in an ecosystem. Its values lower than 4 mg/L. are not suitable for aquatic life. Dissolve oxygen at different sites fluctuated from 2.0 to 5.9 mg/L (Fig.1), being very low at site-2 and site-3. This may be due to the microbial decomposition of organic component of sewage and agricultural wastes in the river water.

BOD is proportional to the amount of the decomposable organic matter present in water (Solanki et al. 2007). It was found maximum at Site 2, 3 and 4 on account of presence of dead organic matter and waste of anthropogenic origin (Fig.1).

The chemical oxygen demand values ranged from 27-38.5 mg/L. Higher values are due to chemically oxydisable organic matter contributed by anthropogenic activities. Site-3 and site-4 had higher COD values.

Table1. Quality of Chandraloi river water near Kota Rajasthan during pre-monsoon season in the year 2010

Parameters	Site-1 Mawasa	Site-2 Kaithoon	Site-3 Devali-arab	Site-4 Jaggan-nathpura	Site-5 Manasgaon
pH	7.5	8.3	8.4	8.8	8.3
Electric Conductivity / EC	0.85	2.7	1.194	1.526	1.045
Total Dissolve Solids / TDS	563	1890	836	1418	732
Alkalinity	104	296	286	306	136
Total hardness	164	384	368	364	224
Chlorides	164	252	256	212	176
Nitrates	9	46	28.2	16.5	8
Dissolve Oxygen / DO	5.9	2.0	2.6	3.1	4.1
Biochemical Oxygen Demand / BOD	2.8	8.7	12	13.5	4.5
Chemical Oxygen Demand / COD	27	32	38.5	37.5	28
Calcium	35	84	109	94	48
Magnesium	19	48	28	31	25

Except pH and EC (dS/m), all units are in mg/L

Desirable limit of calcium ion in drinking water is 75 mg/L and permissible limit is 200 mg/L (BIS 1991). Its concentration ranged from 35-109 mg/L and was with in permissible limit (Fig.1). Site-3 recorded slight higher values of calcium.

The desirable limit of magnesium for drinking water is 30 mg/L and permissible limit is 100 mg/L (BIS 1991). Its higher values were observed at site-2 (Fig.1).

Mathivanan et al. (2005) were of the opinion that higher values of calcium and magnesium may be due to addition of salts from detergents and other man-made activities. Due to lack of effluent treatment facilities and proper disposal system of waste water, water bodies are getting polluted day by day and causing adverse effects on soils, flora and fauna. The physico-chemical parameters of water are the important determinants of an aquatic ecosystem although they are greatly influenced and modified by climate and vegetation (Hutchinson 1975).

Chandraloi river flows near Kota city and its water is used for drinking, domestic and irrigational purposes. The river water quality however, deteriorated at site-2 (Kaithoon) and site-3 (Devali-arab) making it unfit for drinking and irrigational

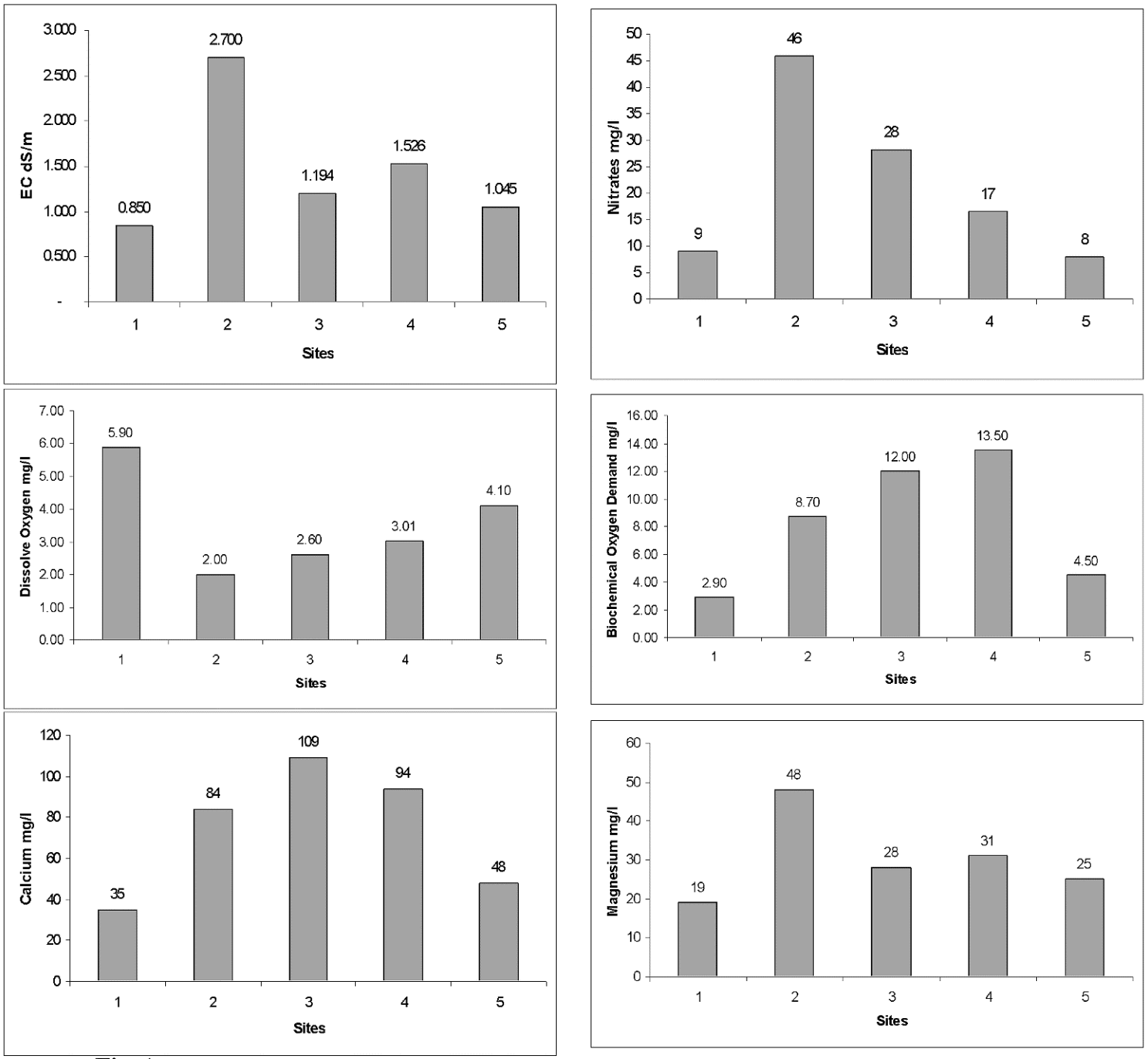

Fig. 1. Physico-chemical characteristics of Chandraloi river water at different sites during pre-monsoon season

purposes A regular monitoring of the water quality and check on input of effluents are needed, so that river water remains good for drinking and other recreational purposes.

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