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Assessment of water quality of Kerwa and Kaliasote rivers at Bhopal district for irrigation purpose

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ABSTRACT : water quality has become a major concern due to ever increasing human developmental activities that over exploit and pollute the water resources. A hydro chemical study of Kerwa and Kaliasote dam water in Bhopal district has been carried out to examine the suitability of water for irrigation purpose. In the present study all the parameters such as TDS, pH, alkalinity, total hardness, chloride, Sulphate, nitrate, fluoride, Iron, Calcium and magnesium were found to be with in WHO and BIS permissible limits. The TDS and EC values obtained for both the rivers lie with in WHO and BIS permissible limits. Electrical conductivity value and TDS of both the dam water samples lies in the range of medium salinity zone. Therefore water of these dams can be used for irrigation purpose.

Keywords : Kerwa dam, Kaliasote dam, water quality, irrigation, TDS, EC

INTRODUCTION

Water is the most essential and prime necessity of life. It is essential for the growth and maintenance of our bodies, as it is involved in a number of biological processes. Surface water generally available in Rivers, Tanks, Ponds, and Dams is used for drinking, irrigation, and power supply etc.

Water resources in India have reached a point of crisis due to unplanned urbanization and industrialization (Singh, Pathak and Singh, 2002). Urbanization has direct negative impacts on water bodies (Khan, Bhatnagar and Saxena, 1988). Therefore now a days fresh water has become a scare commodity due to over exploitation and pollution (Ghose and Basu, 1968, Gupta and Shukla, 2006, Patil and Tijare, 2001, Singh and Mathur, 2005).

The concentration and composition dissolved constituents in water determine its quality for irrigation use. Quality of water is an important consideration in any appraisal of salinity or alkali conditions in an irrigated area. Good quality water has the potential to cause maximum yield. Poor quality water can develop various soil and cropping problems. Therefore special management practices may then be required to maintain full crop productivity. Keeping in view the above facts, an attempt has been made to examine the suitability of Kerwa and Kaliasote for irrigation purpose.

Study area. Kerwa reservoir was constructed on Kerwa River near Bhopal city. The catchments area for water availability at dam site is 34.5 sq km and its gross storage capacity is 25M cum. the water of this dam is supplied to 35 villages of near by district for various activities.

MATERIAL AND METHOD

The present study was carried out in the month of July 2009. The water samples was collected from Kerwa dam and Kaliasote dam in clean polyethylene container in morning. The temperatures and pH of water samples were recorded at the site itself.

All other parameters such as electrical conductivity, total dissolved solids, BOD, COD, are analyzed by standard methods (APHA, AWWA, WEF, 1998). Alkalinity, total hardness, Chloride, Ca and Mg ions were determined by titration method. Irons, Nitrate, Sulphate are analyzed by spectrophotometer method (APHA 1989).

RESULT AND DISCUSSION

The analyzed physical and chemical parameters were tabulated in Table 1 and 2.

A comparison of the various physical-chemical characteristics of the studied water samples has been made with the WHO (1984) and BIS (1998) standards.

Temperature. The temperature plays a crucial role in physical-chemical and biological behavior of aquatic system (Dwivedi and Pandey, 2002). The temperature of the water samples were found to be in the range 28-29°C.

Color, Odour, and Turbidity. The water samples are generally colored due to the presence of colloidal substance, inorganic impurity, aquatic growth, and decomposition of vegetation. The water samples collected was found to be odourless, colorless and clear.

pH. Higher values of pH fasten the scale formation in water heating apparatus and reduce germicidal potential of chlorine (Arvind Kumar, 2002). The pH of water samples ranged between 7.4-7.8. The pH of water samples is slightly alkaline. It was within WHO and BIS permissible limits (6.5-9.2).

Electrical conductivity. Electrical conductivity is considered to be a rapid and good measure of dissolved solids. Conductivity is an important criterion in determining the suitability of water for irrigation. The conductivity of kerwa water was 263Micromho/cm^2 whereas it was 297 Micromho/cm^2 in Kaliasote water. Electrical conductivity value of both the samples lies in the range of medium salinity zone (250-750 micromho/cm^2).

Table 1 : Comparison of chemical parameters of Kerwa and Kaliasote dam with BIS and WHO standards.

Paremeters	BIS Standards		WHO Standards		Kerwa Dam	Kaliasote Dam
	Per	Excess	Per	Excess		
Temperature					29°C	28°C
Turbidity	5 NTU	10 NTU			2.5 NTU	1.5 NTU
Colour	5 Hazen unit	25 Hazen unit			nil	nil
pH	6.5-8.5	6.5-9.2	6.5-8.5	6.5-8.5	7.4	7.8
Electrical conductivity					263 micromhos/cm^2	297 micromhos/cm^2
TDS	500	1000	500	1000	170 mg/l	197 mg/l
Alkalinity	200	600	200	600	140 mg/l	140 mg/l
Chloride	250	1000	200	600	22 mg/l	54 mg/l
Total hardness	300	600	100	500	144 mg/l	140 mg/l
Calcium	75	200	75	200	36 mg/l	28 mg/l
Magnesium	30	70	30	150	12 mg/l	16 mg/l
Iron	0.3	1.0			Nil mg/l	0.2 mg/l
Nitrate	45	45	45	45	30 mg/l	

Table 2 : Classification of irrigational water.

ZONE	TDS mg/l	CONDUCTANCE micromhos/cm
Low salinity(1)	<200	<250
Medium salinity(2)	200-500	250-750
High salinity(3)	500-1500	750-2250
Very high salinity(4)	1500-3000	2250-5000
WATER QUALITY	**TDS mg/l**	**CONDUCTANCE micromhos/cm**
Excellent	<200	<250
Good	200-500	250-750
Permissible	500-1500	750-2250
Unsuitable	1500-3000	2250-5000

7TDS. TDS indicates the general nature of salinity of water. Water with high TDS produces scales on cooking vessels and boilers. Water containing more than 500mg/l of TDS is not considered suitable for drinking water supplies. In Kerwa water sample TDS was 170 mg/l and kaliasote water it was 197 mg/l .the values of both the sample lies in the WHO and BIS permissible limit (500-1000mg/l). TDS value of the sample lie in the range of low salinity zone (200 mg/l).

Alkalinity. Alkalinity is due to the presence of bicarbonates, carbonates or hydroxides (Trivedi and Goel, 1984). The weathering of rocks is the potential source of alkalinity. The alkalinity value of both the samples was found to be 140 mg/l which is within the permissible limit of WHO and BIS standards**.**

Chloride. High chloride content in water sample may be due to the pollution from chloride rich effluent of sewage and municipal waste. People who are not accustomed to high chloride are subjected to laxative effect (Ravi Prakash and Krishnarao, 1989). The chloride content in Kerwa water was 22 mg/l and in Kaliasote water chloride content was 54mg/l which is higher than Kerwa river ,but it was well with in the WHO and BIS desirable limits.

Total hardness. The total hardness is mainly due to Ca; Mg and Eutrophication .the water containing excess hardness is not desirable for potable water. It consumes more soap during washing of clothes. The total hardness level in Kerwa water sample was 144 mg/l whereas in Kaliasote water it was 140 mg/l. These values were with in WHO and BIS permissible limits.

Calcium and Magnesium. The sources of Ca and Mg in natural water are various types of rocks, industrial waste and sewage. There is evidence that hard water plays a role in heart diseases (Sastry and Rati, 1998). Higher concentration of Mg makes the water unpalatable and act as laxative to human beings. The Ca and Mg concentration in Kerwa water was 36, 12 mg/l where as in Kaliasote water it was 28, 16 mg/l. The Ca and Mg levels in both the water sample was with in the permissible WHO and BIS permissible limits.

Iron. Concentration of iron in water get increased by corrosion of pipes and by of iron present in soil by acidic water. Kidney stone related problem may develop if calcium and iron contents are high. The level of Kerwa water was below the detectable limit where as in Kaliasote water it was 0.2mg/l. It was well with in the WHO and BIS permissible limits.

Nitrate. The main sources of nitrate in water are human and animal waste, industrial effluent, use of fertilizers and chemicals, silage through drainage system (Robertson et al. 1991). When nitrate concentration is above 40 mg/dm^3, it may leads to a disease called "Methamoglobinemia" or "blue baby" in children. The nitrate level in of Kerwa sample was 30 mg/l where as it was 2 mg/l in Kaliasote. It was found to be with in the WHO and BIS permissible limit (45 mg/l).

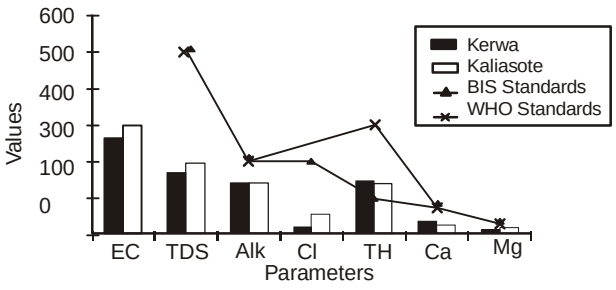

Fig.1. Comparision of various parameters of Kerwa and Kalistote dam with BIS and WHO standards.

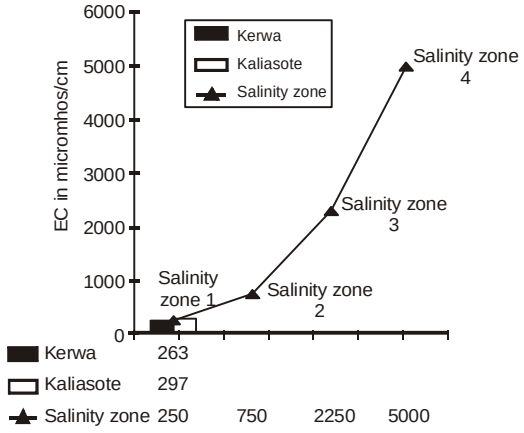

Fig.2. Salinity zone of dam.

CONCLUSION

The present study leads to following conclusions:

1. Data indicate that in both rivers Kerwa and Kaliasote the values of parameters such as pH, alkalinity, hardness, Ca, Mg, Nitrate, Iron and chloride were found to be with in WHO and BIS permissible limits. Therefore water of these dams can be used for irrigation purpose.
2. The TDS of Kerwa river was170 mg/l where as it was 197 mg/l in Kaliasote river. TDS value of both the sample lies in the range of low salinity zone (200 mg/l). Electrical conductivity values of Kerwa River was 263Micromho/cm^2 whereas it was 297 Micromho/cm^2 in Kaliasote water. High values of TDS and EC was obtained for Kaliasote River as Compared to Kerwa River. The TDS and EC values obtained for both the rivers lie with in WHO and BIS permissible limits. Electrical conductivity value and TDS of both the dam water samples lies in the range of medium salinity zone. Therefore water of these dams can be used for irrigation purpose.

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