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Assesment of water quality parameters of Kerwa Dam for drinking suitability

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ABSTRACT : Water quality has become a global concern due to over increasing population and developmental activities that had over exploit and polluted the water resources available to us. In this context an attempt has been made to assess the quality of water in Kerwa dam. The results obtained from chemical analysis were compared with two standards namely WHO and BIS. In the present study all the parameters such as TDS, pH, alkalinity, total hardness, chloride, Sulphate, nitrate, fluoride, Calcium and magnesium were found to be with in the permissible limits, while COD was found to be beyond the limit. This water body is not suitable for drinking purpose, so possible remedial method should be adopted for this water resource. As the TDS and EC values are with in the limit therefore the water of this dam can be used for irrigation purpose.

INTRODUCTION

Water is a prime natural resource, a basic human need and a precious natural asset. It is indeed required in all aspect of life and health for producing food, agricultural activity, energy generation and maintenance of environment and a substance of life and development (Tiwari, 2000).

Human activities that involve urbanization, agricultural development, over use of fertilizers, inadequate management of land use and sewage disposal have directly or indirectly affected the quality of water and making it unfit for domestic purpose. 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) and (Singh and Mathur, 2005).

Hence it is necessary to evaluate quality of water of that area in order to asses its suitability for various uses and to evolve the policies for the best use of water resources.

In Bhopal the drinking water is supplied from upper lake. But now a day the water of upper lake is not sufficient to fulfill the demand the city due to increasing population, and uncertainty of monsoon. Therefore other water reservoirs are now become important for water of Kerwa dam to find its suitability for drinking and irrigation purpose in order to meet future demands of Bhopal city.

Study area. Kerwa reservoir was constructed near Bhopal city basically to provide water for irrigation. This dam is constructed on Kerwa River. The catchments area for water availability at dam site is 34.5 sq km and its gross storage capacity is 25 M 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 sample was collected from Kerwa dam in clean polyethylene container at around 10.00 am. 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.

A comparison of the various physical-chemical characteristics of the studied water sample 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 water was found to be in the range *i.e.* 29°C.

Color, odor, 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 sample collected was found to be odorless, colorless and clear.

pH. The pH plays important role in waste water treatment and for fixing alum dose in water supply.

Higher values of pH hasten the scale formation in water heating apparatus and reduce germicidal potential of chlorine (Kumar, 2002). The pH of the sample is found to be slightly alkaline *i.e.* 7.4. It is within WHO and BIS permissible limit.

Electrical conductivity. Electrical conductivity is considered to be a rapid and good measure of dissolved solids. A sudden increase in conductivity of the water is the indicator of the addition of the pollutant to the water (Trivedi and Goel, 1984). Conductivity is an important criterion in determining the suitability of water for irrigation. The conductivity of sample was found to be 263 Micromho/cm^2.

Table 1 : Showing the comparison of the values observed for different parameters with the WHO and BIS standards.

Parameters	Bureau of Indian std (BIS		WHO (Standard)		Observed Value
	Permissive	Excessive	Permissive	Excessive	
Temperature					29°C
Turbidity	5 NTU	10 NTU			2.5 NTU
Colour	5 Hazen unit	25 Hazen unit			nil
pH	6.5-8.5	6.5-9.2	6.5-8.5	6.5-8.5	7.4
Electrical conductivity					263 micromhos/cm^2
TDS	500	1000	500	1000	170 mg/l
Alkalinity	200	600	200	600	140 mg/l
Chloride	250	1000	200	600	22 mg/l
Total hardness	300	600	100	500	144 mg/l
Calcium	75	200	75	200	36 mg/l
Magnesium	30	70	30	150	12 mg/l
Iron	0.3	1.0			Nil mg/l
Fluoride	1.0	1.5			0.41 mg/l
Sulphate	200	400	200	400	5.4 mg/l
Nitrate	45	45	45	45	30 mg/l
BOD			6		4 mg/l
COD			10		22 mg/l

Electrical conductivity value lies in the range of medium salinity zone (250-750 micromho/cm^2).

TDS. TDS indicates the general nature of salinity of water. Water with high TDS have salty taste and produce scales on cooking vessels and boilers. In present sample TDS was found to be 170 mg/l and is with in the WHO and BIS permissible limit. The salt present in water, affects soil structure, permeability, aeration, which indirectly affect the plant growth. 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 the sample 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. however chloride in excess imparts salty taste to water and people who are not accustomed to high chloride are subjected to laxative effect (Ravi Prakash and Krishnarao, 1989). The chloride content of the sample is 22 mg/l that is well with in the desirable limits.

Total hardness. The total hardness is mainly due to Ca, Mg and Eutrophication (Patel and Sinha, 1998). The water containing excess hardness is not desirable for potable water as it forms scales on water heater and utensils when used for cooking and consume more soap during washing of clothes. The total hardness value of sample was found to be 144 mg/l and it is with in the desirable 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 (Peter, 1974); (Sastry and Rati, 1998). Higher concentration of Mg makes the water unpalatable and act as laxative to human beings. The Ca and Mg concentration of the sample was found to be 36, 12 mg/l and it is with in the permissible limits WHO and BIS standards.

Iron. Concentration of iron in water get increased by corrosion of pipes and by of iron present in soil by acidic water. The primary concern about iron in drinking water is its objectionable taste**.** Kidney stone related problem may develop if calcium and iron contents are high. The concentration of iron in present sample is below the detectable limit.

Fluoride. Fluoride content is an important factor for the development of normal bones and teeth. excessive fluoride get deposited on teeth cause dental flurosis, deposited on bones cause skeletal flurosis and Cripping flurosis. The required level is 1-1.5 mg/l for drinking purpose. In Present sample fluoride content is with in the desirable limit.

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 value of the sample was found to be 30 mg/l is with in the permissible limits.

Sulphate. High concentration of Sodium and magnesium sulphate exerts a cathartic action in human beings. It is also

associated with respiratory illness. The concentration of Sulphate in present sample is 5.4 mg/l and it is well within the permissible limit.

BOD. BOD is the measure of the extent of pollutant in the water body. The untreated discharge of municipal and domestic waste in water bodies increases the amount of organic content. Therefore the microbes present in water require more amount of oxygen for its degradation. Thus the BOD of water gets increased. In present study the BOD level of the sample was with in desirable limits.

COD. The COD test measures the oxygen demand of biodegradable pollutants plus the oxygen demand of non-biodegradable oxidisable pollutants.COD is a water quality measure used not only to measure the amount of biologically active substances such as bacteria but also biologically inactive organic matter in water. For drinking water, the BOD should be less than 5 ppm and COD less than 10 ppm. The nationwide study on organic pollution of drinking water and liver cancer by Wang Qian *et. al.* (1992) showed that mortality due to liver cancer for men and women was positively correlated with the COD in drinking water. The COD of present water sample was found to be 22 mg/l which is beyond the WHO permissible limit for drinking water.

CONCLUSION

The present study leads to following conclusions :

1. Data indicate that pH, alkalinity, hardness, Ca, Mg, nitrate, fluoride, chloride and BOD were found to be with in WHO and BIS permissible limits for drinking water.
2. In present sample the value of COD is well above the WHO permissible limit. As COD is measures of water quality that reflect the degree of organic matter pollution of a water body. Therefore this water can be used for drinking purpose only after suitable treatment of water.
3. The TDS (170 mg/l) and electrical conductivity (263 Micromho/cm^2) values of the water sample are with in the WHO and BIS permissible limits. Therefore the water of Kerwa dam is suitable for irrigation purpose.

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