



Studies on the physico-chemical parameters of water body: Benisagar Dam, Satna (M.P.)

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Abstract

The present study involves physico-chemical analysis of Benisagar dam, Satna were investigated for one year from June 2015 to May 2016. Water samples from this site were analyzed for Odour, pH, TDS, Hardness, Chloride, Alkalinity, Fluoride, Sulphate, Iron, Chlorine, Carbonate and Bicarbonate. The result reveal that the range of variation in different parameters was pH 6.8 to 8.5, TDS 184 to 362 mg/l hardness 132 to 261 mg/l, alkalinity 42 to 57 ppm, chloride 9 to 20 mg/l, calcium 36.7 to 52.6 mg/l, fluoride 0.223 to 0.262 mg/l, sulphate 4.2 to 8.3 mg/l, Iron 0.243 to 0.269 mg/ml, Bicarbonate 51.23 to 58.57 mg/l, Chlorine and Carbonate were nil during different months. All the physico-chemical parameters of Benisagar Dam water are within the highest desirable limit or maximum permissible limit set by WHO.

Keywords: pollutants, physico-chemical parameters, water quality, benisagar dam, satna

1. Introduction

Satna is a district of M.P. in India. It is situated in eastern part of the state. Geographical distribution of plankton plays an important role in the aquatic ecosystem. For the convenience of the description of the dam, the planktonological biomass with special reference to zooplankton, it is essential to give the geographical status of Benisagar dam, Turki, Satna (M.P.). The district Satna of M.P. is located on the South West part of Madhya Pradesh. It is an important district of ex-Vindhya Pradesh state and part of Baghelkhand rule of second century A.D. Satna district is a pilgrim and an industrial place and area rich in Limestone, Bauxite, White clay, Geru, Ramraj and Flagstones. It is also famous for its religious places of Distt. The district Satna is the central part of Vindhya region which is situated at 18° 9' N latitude and 24° 4' E longitude. It is 365.7 above the mean sea level.

Water is one of the abundantly available substances in nature which man has exploited more than any other resources for the sustenance of life. Water of "good" quality is required for leaving organisms. The chemistry of water is influenced by the input of material containing minerals, their solubility and chemical equilibrium prevailing in the aqueous solution. Any water is capable of assimilating certain amount of pollution without serious effect due to dilution and self-purification factors.

The physico-chemical characteristics of any aquatic ecosystem and the nature and distribution of its biota are directly related to and influenced by each other and controlled by a multiplicity of natural regulatory mechanisms. However, because of man's exploitation of the water resources, the normal dynamic balance in the aquatic ecosystem is continuously disturbed, and often results in each dramatic response as depletion of fauna and flora, fish kill, change in physico-chemical character etc. (Sakhre and Joshi, 2003, Mishra 2016a & 2016b) [1-3] Artificial changes which lead to such ecological responses are referred to as pollution and pollutional stage may reach a stage when these valuable aquatic resources are no longer safe for human use.

Everything originated in the water and water sustains everything. All life on the earth depends on water. Water is significant source of habitat for plants, animals, and is found in every section of ecosphere. Source of water are atmospheric, with surface water, stored water and ground water. Stored water present in ponds, reservoirs, lakes or oceans is important features of the earth landscape. Humans have constructed lakes to stop runoff water for various uses like drinking, irrigation, and recreation during the day periods. Due to rapid population growth, urbanization, industrialization and indiscriminate development it reduces the catchments area, which ultimately leads to gradual deterioration of these lakes.

Water quality can have great influence on ability of aquatic organism to exist and to grow in a stream, pond or lake. It is well known that pollution of water cause adverse effect on fish and other aquatic organisms. Water polluted by industrial effluents decreased the amount of protein, Glycogen and lipids fresh water mullet *Liza parsia* (Bharatha, *et al.*, 2001) [4] Numerous anthropogenic activities like disposal of sewage and industrial water, recreational activities, excess fertilization of land and use of pesticides has threatened environmental health of both surface and ground water.

Effect of mass bathing on water quality of Satna river was studied by Mishra (2017) [5]. Shukla, *et al.* (2016) [6] studied the water quality characteristics of Benisagar dam, Satna (M.P.).

2. Materials and Methods

The water samples were analyzed form September 2015 to April 2016. Samples were collected in plastic containers, which were thoroughly cleaned with nitric acid and rinsed several times with distilled water. Analysis was performed to determine odour, pH, TDS, hardness, chloride, alkalinity, Fluoride, Sulphate, Iron, Chlorine, Carbonate and Bicarbonate. Hardness, alkalinity, Fluoride, Sulphate and Chlorine and other parameters were analyzed in the laboratory as per the standard methods of APHA (1998) [7].

3. Results and Discussion

Table-1 shows the range of different physico-chemical parameters important to deciding the quality criteria for

drinking water from Benisagar dam, Satna. The recorded values are also compared with quality standards as proposed by WHO (1984) [8].

Table 1: Comparison of different physico-chemical parameters with suggested surface water standards for source suggested by WHO for drinking water supply.

Parameters	Range in Benisagar dam	Desirable Standard WHO
Physical appearance	Clear	-
Odour	Unobjectionable	Unobjectionable
pH	6.8-8.2	6.5-8.5
TDS (mg/l)	184-362	500-1500
Chloride (mg/L)	9-20	250
Calcium (mg/L)	36.7-52.6	75
Total Hardness (mg/L)	132-261	300
Fluoride (mg/L)	0.223-0.262	1
Sulphate (mg/L)	4.2-8.3	200
Iron (mg/L)	0.243-0.269	0.3
Chlorine (mg/L)	Nil	0.2
Total alkalinity (mg/L)	42-57	30-500
Carbonate (mg/L)	Nil	-
Bicarbonate (mg/L)	51.23-58.57	-

Physical Parameters

The present study shows that the permissible limits of odour, taste, turbidity, and temperature are mostly narrative and the water from the present water body is acceptable for the drinking purpose.

pH

The permissible limit for pH for potable water ranges from 6.0 to 8.5. In the present study pH ranged from 6.8 to 8.2. Thus pH values are within permissible limit. The pH is being slightly

alkaline, which is very suitable condition for the growth of aquatic biota and fishing. The pH constantly remains above 7 which indicate high buffering capacity of the system (Nagraj and Patil, 2008) [9].

Total Dissolved Solids (TDS)

T.D.S. values are also within permissible limit of drinking water standards (500 to 1500 mg/lit) suggested by WHO. The minimum value found was 184 mg/l and maximum value found was 362 mg/l.

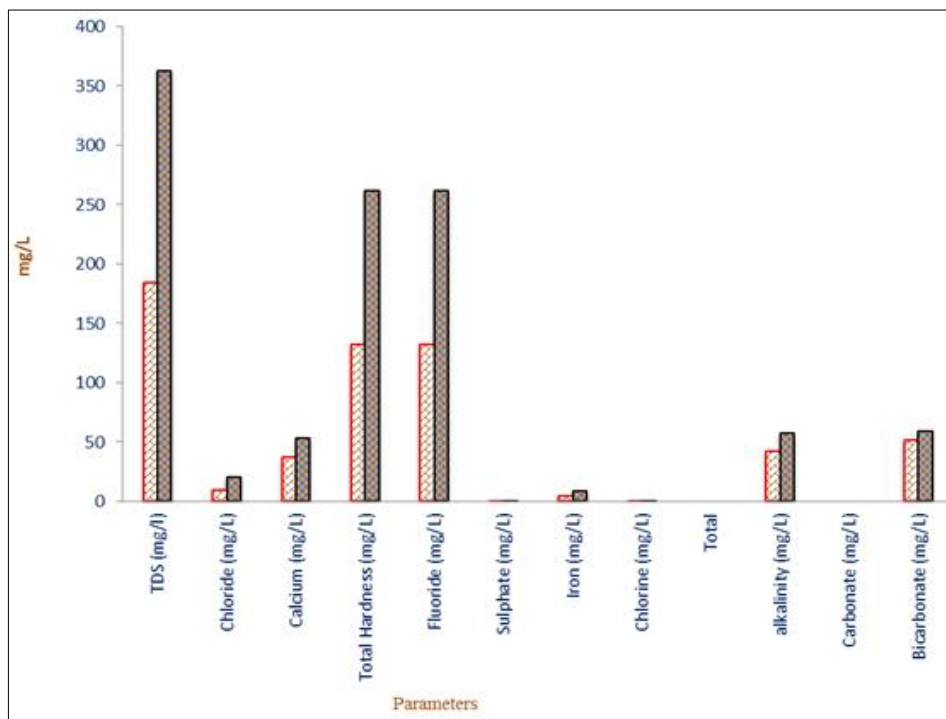


Fig 1: Comparison of different physico-chemical parameters.

Alkalinity

In the present study total alkalinity ranged between 42 to 57 ppm. That is also within permissible limits suggested by WHO (1984) [8].

Total Hardness

Total hardness which is very important parameter determining usefulness of water in different sectors is also very much below the permissible limit that is, 132 to 261 mg/lit. This denotes

that water is very soft and good for drinking purpose.

Fluoride

Fluoride is an important nutrient for the development of the normal bone and teeth. Excess fluoride deposited on bone produce skeletal fluorosis and in teeth cause dental fluorosis. The permissible limit for fluoride is 1 mg/lit and in our study it ranged between 0.223 to 0.262 mg/lit, which is very much within the permissible limit.

Sulphate

The maximum permissible limit for Sulphate is 200 mg/l and in our study it ranged from 4.2 to 8.3 mg/l, which is quite below the desirable limit for drinking water standards.

Iron (Fe)

The existence of Iron in reduced condition was found throughout the year. The minimum concentration was found 0.243 mg/l and maximum was 0.269 mg/l, which are very much within the permissible limit.

Chloride

The desirable limit for chloride is 250 mg/l and in our study it ranged from 9 to 20mg/l. The concentration of chloride is directly correlated to the pollution level (Munnavar 1970 and Mahajan and Tank, 2013) ^[10-11]. In Benisagar Dam water it is within the permissible limit.

Calcium (Ca)

In our study calcium was found within its permissible limit. The minimum value was 36.7 mg/l and maximum was 52.6 mg/l.

Bicarbonate

The value of bicarbonate ranged from 51.23 to 58.57 mg/l, which is within the permissible limit.

Carbonate

Carbonate was not detected throughout the year.

Chlorine (Residual)

Residual chlorine was not detected throughout the year.

4. Acknowledgement

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