Original Research Article

Analysis of water quality of Sarfa dam, Shahdol district, Madhya Pradesh, India

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Abstract

The present study explores the characterization of physicochemical parameters of surface water of different stations of Sarfa dam, Shahdol, M.P. India. The water samples collected from different stations were performed for analysis of various parameters such pH, Electrical conductivity, Temperature, TDS, Turbidity, TS.S, T.S, Total hardness, Calcium hardness, alkalinity, chloride, COD and BOD as per the standard methods recommended by APHA. The results of the present study revealed that the physicochemical parameters except turbidity and total solid, were within the permissible limit prescribed by BIS. Thus the results indicates that the water sample of sarfa dam is safe for drinking and does not cause any hazardous effect to the human life and the environment.

Key Words: Surface water, physicochemical parameters, Sarfa dam.

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INTRODUCTION

In the ecosystem, water is considered to be the second environmental factor for living beings after oxygen[1]. India is bestowed with a network of rivers and covered with snow in the Himalayan range which can meet various water requirement of the country[2]. Indian rivers seem to be the reservoir of water resources and play a significant role in numerous activities such as irrigation, drinking, fish culture and power generation. Although, most of the water on earth is not accessible, the surface water, which is most accessible, represents only about 0.02% of the total water resources. Natural water is never absolutely pure as it carries traces of other substances. The nature and amount of these substances called impurities vary with sources of the water. These added substances arbitrarily classified as biological, chemical (both organic and inorganic), physical and radiological impurities. Presently, the menace of water borne diseases and epidemics loom large on the horizon of developing countries as a result of lack of accessibility to good quality water. Polluted water has been the cause of all such cases, in which major sources of pollution are domestic and municipal wastes from urban and industrial activities, runoff from farmland, etc. These impurities may give water bad taste, colour, odour or turbidity and cause hardness, corrosiveness, staining or frothing. Water quality reflects the composition of water in terms of of measurable quantities and in respect of its suitability for a particular purpose. The composition of water is dependent on natural factors (geological, topographical, meteorological, hydrological and biological) in the drainage basin and varies with seasonal difference in runoff volumes, weather conditions and water levels. Hence, it is significant to study the physical and chemical characteristics of water, a potent environmental factor for the living beings[3-5]. Changes in the environmental factors, discharge of biological and chemical pollutants from various resources alters the quality of surface water. Increased amount of nutrients in the water leads to eutrophication and massive algal growth, which in turn raises the turbidity, suspended solids and BOD of the surface water resources[6]. With this background this study examined the water quality characteristics of the water samples collected from different stations of Sarfa dam, a reservoir of water resource situated in Shahdol district.

Study Area: The Shahdol district lies in the north east part of Madhya Pradesh extending from $29^0 39' 28''$ and $24^0 16' 13''$ north latitude and from $80^0 32' 56''$ and $82^0 12' 21''$ east longitude approximately 489 meter above the sea surface the region lies in the heart of the country. The Sarfa dam Shahdol (M.P.) is one of the most important water bodies of Sarfa River. It is 10 km away from Shahdol city. Sarfa dam is made on the river near to Navalpur village (Latitude: 23°16'57.68"

Longitude: 81°28'11.26"). The Sarfa river origin at PATHE HILLS 15-16 Km away from Sarfa Dam and mix in Sone river near Navalpur village. Width of Sarfa Dam is about 150 to 100 feet and deepest length is about 20-25. On the edge of Sarfa river 15 to 30 villages such as Kanchanpur, Navalpur, Lalpur, Harri, Dhurwar etc. are situated and the villagers uses the river water for drinking, irrigation and other livelihood purpose. Sarfa dam water is filtrate by bleaching powder and Alum, after filtration it is supplied to urban area Shahdol for drinking purpose. The river is polluted by the people by bathing, washing clothes, utensils, and bathing animals and the garbage thrown by villagers near river.

MATERIAL AND METHODS

The methodology of present study is according to the procedure recommended in APHA (2005)[8] and NEERI (1991)[9] guidelines for water quality. The physical, chemical characteristics of Sarfa dam were evaluated and sampling was done to estimate the quality of dam water from four different sites in the month of February and April of 2017. In this study eight grab samples were collected from Sarfa dam Total thirteen physicochemical parameters done for each of the sample which included pH, Electrical conductivity, Temperature, TDS, Turbidity, S.S, T.S, Total hardness, Calcium hardness, alkalinity, chloride, COD and BOD.

RESULTS AND DISCUSSION

The results obtained for the physicochemical characteristics of the selected water samples were presented in Table-1 and was compared with the acceptable limits prescribed by BIS (1991) for drinking water quality.

Table 1: Physicochemical characters of selected water samples

Parameters	Units	Standard values	W1		W2		W3		W4	
			Feb	April	Feb.	April	Feb.	April	Feb	April
pH	--	6.5-8.5	8.8	8.2	8.6	8.1	8.6	8.9	8.5	8.0
Conductivity	Mhos/cm	2250	892.1	1869.1	909.4	1795.5	904.0	1876.0	916.8	1885.0
Temperature	^{0}C	0-100	22	27	21	28	20	28	21	27
TDS	Mg/l	500-2000	218	273	208	288	213	271	213	276
Turbidity	NTU	2-10	1.5 11 1 .5	11.2	59.6	7.3	7.3	9.3	52.1	37.5
T.S.S	Mg/l	500	114	288	212	215	311	320	413	210
T.S	Mg/l	500	632	435	625	410	600	400	611	411
Total hardness	ppm	300-600	340	210	345	223	341	250	337	212
Calcium hardness	Mg/l	40-80	61	64	52	50	71	60	76	57
Alkalinity	Mg/l	200-600	400	251	286	341	360	313	221	113
Chloride	Mg/l	250-100	172.4	120.1	172.2	111.0	170.1	98.0	171.1	62.0
COD	Mg/l	<250	123	232	115	275	112	192	105	174
BOD	Mg/l	<30	6.4	2.0	6.9	4.7	3.2	6.1	6.0	5.5

Physicochemical parameters analysis of water samples: The water samples from different stations were observed to be colourless and odourless. To prepare the food for aquatic organisms, colour seems to be an important factor. Since the water samples were colourless, the rate of photosynthesis increases. pH is one of the important parameter which determines and correlates the acidic and alkaline nature of water. The pH of the selected water samples for the present study was found between 8 to 8.9 which lies within the BIS limit in the month of April but slightly above in February(6.5 to 8.5). Turbidity is the optical property that causes light to be dispersed and absorbed rather than transmitted in straight line through the sample. The values of turbidity measured in the dam water samples were higher than the guideline value of 5.0 NTU for drinking water[10]. Electrical conductivity is the measure of water capacity to convey electricity or the capability of a solution to carry out an electrical current. Electrical conductivity value ranged from 892-1885mhos/cm which was within the prescribed standard limits (2250mho/cm). Pure water is a poor conductor of electricity, when dissolved salts are higher it shows high conductivity. Thus conductivity is proportional to the amount of salts dissolved in water and it is an important tool to evaluate the purity of water[11].The low conductivity and TDS values reflect freshness of water source. Total suspended solids are the most important water pollutant which acts as a vector for

many causative pathogens. Due to its smaller size and greater surface area per unit mass of particles, it carries pollutant load and habitat for pathogens. The likelihood for disease causing microbes is proportional to the turbidity and total suspended solids. Total dissolved solids are also considered as an indicator to assess the water quality since it affects the aesthetic value of the water by increasing the turbidity[10]. The TS, TSS and TDS ranged from 400- 632mg/l, 114- 413mg/l and 208-288mg/l respectively. The above parameters were found to fall within the limits prescribed by BIS for drinking water (Table-1). Decrease in these parameters in the selected water samples shows that the water is palatable for human consumption and may be used for agricultural, industrial and household purposes. Alkalinity comprises both carbonates and bicarbonates that measure the basic property of water and its serves as a stabilizer for pH[11]. In the present study the total alkalinity ranged from 113 to 400 mg/l which was low when compared with BIS limit for drinking water and irrigation purposes (600mg/l). Alkalinity with less than 100mg/l is desirable for human use[12]. Presence of calcium and magnesium ions contributes to water hardness which states the equilibrium of water. The values of total hardness in the selected water samples ranged from 210 to 340 mg/l which lies within the permissible limit of BIS (600mg/l). Hardness below 300mg/l is considered potable but beyond this limits may cause gastro- intestinal irritation, and hence hardness does not constitute any direct health problems[13-14]. Biochemical oxygen demand determines the quantity of oxygen that microbes devour while decomposing organic matter whereas chemical oxygen demand is the measure of capability of water to consume oxygen in decomposition of organic and inorganic matters. The values of BOD and COD ranged from 2.0 to 6.9 mg/l and from 112 to 275mg/l respectively well below thw permissible values, which does not affects the aquatic fauna, submerged plants and beneficial microbes present in the water bodies[15]. Higher amount of chloride in the water samples cause unpleasant taste to water and also a risk factor to human health. In the present study, low chloride levelswere measured in the dam water samples ranged from 60 to 172.4mg/l, which lies within the BIS limit (250mg/l). Low The generally low values recorded also showed freshwater condition of the water. In fresh waters the sources include soil and rock formation and waste discharges. Chloride has little effect on fish health or behaviour and is not considered a problem in inland waters.

CONCLUSION

The present study provides baseline information on the physico-chemical quality of the water samples collected from different stations of Sarfa dam. The present study revealed a fresh water environment with low chemical pollutants burden. However, High turbidity values compared with drinking water standards were recorded. The Sarfa dam water samples which was not deteriorated, found to be harmless for human consumption and can be used for domestic and irrigation purposes. Further, public should create awareness and appropriate care to prevent the water resources getting contaminated.

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