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Water Quality Assessment of River Shivna Near Kannad, District Aurangabad,(M.S.) India

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Abstract

Assessment of water qualityofShivna River near Kannad citywerestudiedin terms of different water quality parameters such as pH, Turbidity, Alkalinity, Hardness, Free CO_2, DO,BOD, Phosphate, Nitrate, Chloride, etc. The water samples werecollected from two spots of river ShivnaaroundKannad region near Gautala Forest Sanctuary during one year from June 2018 to May 2019.The analysed data were compared with the water quality standards of WHO, ISI andBIS. Rapid industrialization and exceed use of chemical fertilizers, pesticides, insecticides in agriculture are causing heavyand varied pollution in aquatic environment leading todeterioration of water quality and depletion of aquatic biota. Due to use of contaminated water, human population suffers from water borne diseases. It is therefore necessary to check the water quality at regular interval of time. The objectives of this investigationis to know the water quality of this river because lot of people depends on it.
The data obtained in the investigation indicatesthat most of the water samples were in poor condition and exceeded standard limits. We suggest that water is of poor of quality in downstream and not entirely safe for drinking and requires prior treatment before consumption.
Keywords: Water Quality, WHO, ISI and BIS, Shivna River etc.

Introduction

Water is one of the most important natural resource required for the life and health of all living animals, birds, and plants[1]. It helps to enhance beauty and health of environment. It is the life of aqua culture and terrestrial ecosystem. The water is used for industrial, agricultural and many other multiple purpose due to its unique physical and chemical properties. In India, about 77% of water is used in agricultural sector and 6% water is used for industrial purpose.Human being depends on water for almost every development[2]. Though 71% part of the earth is occupied by water, only 0.003% is available to us in the form of ground and surface water.Water quality is changed by natural as well asanthropogenic activities. Surfaceand ground water as a resources of drinking water and even today more than half of the world'spopulationdepends onground water forsurvival. The 45 million people from all over world are affected by water pollution marked by excess fluoride, arsenic, iron, or the ingress of salt water[3].So it's very important to know its

quality for different purposes. In India, most of the people are always suffered from water contaminated disease like jaundice, typhoid, cholera, diarrhoea etc in rainy seasons. We have selected Shivna River near Kannadcityto study the water quality.This is because Kannadtaluka is well known for cultivation of maximum yield of crops by using modern methods and advance tools and techniques in agriculture. The farmers of Kannadtaluka cultivate cash crops like turmeric, cane sugar, ginger, cotton and vegetables crops in addition to conventional crops. This farming need routine doses of fertilizers and spraying of pesticides,herbicides and insecticides. They are well known for high yield cultivation of crops in all over Maharashtra.The quality of groundwater is severely affected because of the widespread pollution of surface water[4]. Besides, discharge of untreated waste water through bores and leachate from unscientific disposal of solid wastes also contaminates rivers, lakes ponds, and dams and ultimately the groundwater, thereby reducing the quality of fresh water resources. The intense competition among the farmers to drill bore well and extract water, decreased the level of water[5]. The digging of 400-600 feet deep bore well contaminates the unwanted hazardous minerals and salts in the bore well water and borne genetic disease and soil erosion.

Two spots were selected for investigation of water quality of ShivnaRiver.One spot is before entering in Kannad (KhatkaliS$_1$)and other is after leaving Kannad city(MaliwadaS$_2$). TheShivnaRiveris a minor but most important tributary of GodavariRiver. It is lying entirely within Aurangabad district in Maharashtra.It rises in theKannad taluka,from the south-western slope of the Ajanta Hills which also holds the origin to another major tributary Purna river. The river collects streams draining the Gautala Wildlife Sanctuary from the southern slopes of the Ajanta Hills. From the point of origin flows southeast for a short course till the town Kannad. The Ambadi dam[6] is situated on ShivnaRivernearKannad,which is a source of drinking water for kannad city. FromKannad, the river flows in a south-eastern direction and is impounded by another dam known as the ShivnaTakli Dam[7]. The river ends itself by merging seamlessly into the back waters of the NathSagar Reservoir formed by the Jayakwadi Dam on the river Godavari viakatepimpalgaon and Jambarkheda.

Table 1: sample data analysis of two spot of river shivnatqkannad district aurangabad During year 2018-2019(All the data is expressed in mg/l except pH, Temperature EC&Turbidity.**)**

Month→ Parameter ↓	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Temp S$_1$	32.2	32.1	31.7	31.4	31.1	18.4	17.2	17.0	17.5	25.7	29.7	36.5
S$_2$	32.6	32.6	32.2	32.1	31.2	18.6	17.8	17.5	17.5	25.8	30.4	36.4
Turbidity S$_1$	905	930	987	970	850	840	650	640	635	660	680	760
S$_2$	903	927	981	960	840	835	640	635	636	667	690	750
EC S$_1$	302	290	350	355	390	394	392	394	401	410	425	430

(µs/cm) S_2	320	310	370	360	396	397	396	398	406	413	430	436
TDS S_1	585	581	627	636	540	462	453	351	360	570	545	550
S_2	587	587	635	645	555	450	460	356	370	585	550	547
P^H S_1	6.8	6.5	6.6	7.0	7.6	7.9	8.1	8.3	8.2	8.4	8.6	8.7
S_2	6.9	6.7	6.9	7.5	7.8	8.0	8.4	8.5	8.5	8.6	8.7	8.7
Alkalinity S_1	159	165	170	172	176	181	185	184	173	169	162	158
S_2	162	167	175	177	177	185	186	185	175	170	165	161
Hardness S_1	735	761	785	835	825	801	780	725	735	754	789	822
S_2	745	764	790	845	830	796	785	732	745	762	790	835
Free CO_2 S_1	292	301	296	287	270	302	308	265	270	266	271	286
S_2	300	306	284	278	261	296	313	268	275	268	278	289
DO S_1	6.9	7.1	7.3	7.5	8.2	8.5	8.6	8.8	7.0	7.6	7.9	8.4
S_2	7.1	7.2	7.2	7.5	8.3	8.7	8.7	8.9	7.2	7.8	8.2	8.6
BOD S_1	6.3	6.8	7.6	8.1	8.3	8.6	8.2	7.8	6.4	7.2	8.6	9.2
S_2	7.1	7.3	7.8	8.2	8.5	8.9	8.5	8.2	7.3	6.9	8.3	8.7
Phosphate S_1	0.29	0.30	0.23	0.20	0.18	0.16	0.12	0.10	0.07	0.06	0.02	0.01
S_2	0.28	0.28	0.22	0.19	0.17	0.14	0.10	0.09	0.04	0.05	0.02	0.00
Nitrates S_1	42	45	47	47	48	55	58	64	66	68	69	71
S_2	43	46	49	48	49	57	59	67	68	68	68	73
Chlorides S_1	160	166	178	198	209	213	216	227	220	199	176	170
S_2	166	168	185	208	212	216	224	230	218	187	166	168

Experimental Section

Sample water during investigation period were collected in a sterilized and cleaned plastic polyethylene bottles from two spots, one is from before Kannadcity(Khatkali) (S-1) and other is afterKannadcity,Maliwada(S-2).Water samples were analysedfor different abiotic (Physico-Chemical) parameters[8-15]such as pH, Turbidity, Alkalinity, Hardness, Free CO_2, DO, BOD, Phosphate, Nitrate,Chloride, etc.using standard methods available in the laboratories of Chemistry and Zoology of this institution.

pH and electrical conductivity (EC) weremeasured pH and EC meters. Samples were analysed in the laboratory for the major ions employing standardmethods [2]. The hardness [Calcium (Ca2+) and magnesium (Mg2+)]were determined titrimetrically using standard EDTAcomplexometric titrations methods. Chloride(Cl-) was determined by the standard $AgNO_3$ titration method. Carbonate CO_3weredetermined by titration with HCl.TheSulfate(SO_4) and NO_3- by spectrophotometric turbidimetry.

Results and Discussion

All the water testing parameters which are important to know the purity of water were determined and the analysed data were compared with the water quality standards of WHO, ISI and BIS[16-30]. In summer season less amount of water is available as a stagnant water .The values of two spots S_1 and S_2 were enlisted in Table 1.

1. Temperature: It isan important parameter and inversely related to DO. Its value ranged from 17.0^{0}C to 36.5^{0}CatS-1 while 17.5^{0}C to 36.4^{0}C at S-2.It increases in summer and decrease in winter season.

2. Turbidity: It decreases the transparency of waterand caused by particulate matter such as organic, inorganicmatters and planktons, etc.It increases in rainy season and become clear in winter. Its value ranged from635 to 987 at S-1 while 635 to 981 at S-2.

3. **EC:** Electrical conductivity (EC) is a measure of the potential of water to carry an electrical current. This capacity is connected to the total amount of solids dissolved in the water. Hence water with high ions content tends to have higher conductivity, which is an indicator of high solid concentration dissolved in the water. The values of water conductivity in the River Shivna varied from 290-430 µs/cm (upstream) and 310-436µs/cm to in the downstream.

4. pH: It shows the acidity or alkalinity of the waters. Sampling waterwasalkaline. Its value ranged from 6.5 to 8.7 atS-1 while from 6.7 to 8.7 at S-2.It decline in rainy season and increase in winter and summer.

5. Total Alkalinity: It showsthe buffering capacity of water.It isdirectlyrelated to pH.100mg/l to 250mg/l is good for river water. Its value ranged from 158 mg/l to 185 mg/l at S-1 while 161mg/l to 186 mg/lat S-2.

6. Total Hardness: It indicates the presence of Ca and Mg salts in the water. Hardness is due to natural accumulation of salts from contact with soil, it may be enter through industrial effluents and domestic sewage. Its value ranged from 725mg/lto 835mg/l at S-1 while 732mg/lto845mg/l at S-2.

7. Free CO_2: It is also an important parameter to measure biotic activities. It is highly soluble in water. Its solubility depends upon the temperature, pressure and minerals in water.CO_2in water bodies is contributed by the respiratory activity of animals.Its value rangedfrom 266mg/l to 308 mg/l at S-1 while 278mg/l to 306mg/l at S-2.

8. DO: It indicatesthe organic pollution level in water.It plays an important role in aquatic environmentand is essential for growth of phytoplanktonsand fish productivity. Its value ranged from 6.9 mg/l to 08.8mg/lat S-1 while from 7.1 mg/l to 8.9 mg/l at S-2.

9. BOD: It measures the pollution strength of domestic and industrial wastes in terms of oxygen utilization. Its value ranged from 6.3mg/l to 9.2 mg/l at S-1 while at S-2, it was from 6.9mg/l to 8.9mg/l.

10. Phosphate: It is useful in determining whether the pollution is due to domestic sewage. According to BIS its value is permissible to 0.05 to 0.3 mg/l. Its value ranged from 0.01mg/l to 0.3mg/l at S-1 while at S-2, it was from 0.02mg/l to 0.28mg/l.It is found within range.

11. Nitrate: Nitrate is an important nutrient but also a good indicator of contamination from natural and humanactivities. Levels above 42mg/l are consideredharmful to aquatic organisms and infants. Its value ranged from 42 mg/l to 71 mg/l at S-1 while at S-2, it was from 43 mg/lto73 mg/l.

12. Chloride: It is toxic in nature and its concentration in water bodies depends upon eutrophication. The chloride values above 250mg/lis not good for irrigation. Its value ranged from 160mg/l to 220mg/l at S-1 while from 166mg/l to 224mg/lat S-2.

Conclusion

Water quality in the upstream sections of the Shivna River has been in a better condition than the downstream river sections. There have been significant deterioration in values of the most important water quality parameters (DO, pH, BOD, temperature) downstream of the rivers, which indicates that the local pollutants may be contributing incrementally to the degradation of river quality.

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