RECENT TREND IN PHYSICO-CHEMICAL PARAMETERS OF SONG RIVER AT NEPALI FARM DISTRICT DEHRADUN, UTTRAKHAND, INDIA

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Abstract

The present study deals with the analysis of physico-chemical parameters of the Song River at Dehradun (U.K.). In the present study various physico-chemical characteristics of Song River viz Temperature, pH, Turbidity, TS, TDS, TSS, DO, BOD, COD, FreeCO2, Acidity, Alkalinity, Hardness, Calcium, Magnesium and Chloride were done. During the course of study only minor differences in physical and chemical parameters of study area were observed.

Keywords

Song River, Limnology, Pollution, Physico-chemical

Introduction

In Vedic literature water is mainly called as Apah. Water is the most important natural resource and essential for life, as it provides habitat for diverse types of aquatic life in rivers, lakes and ocean and makes 65% of human body. The great historical cities grew around rivers and lakes because of human dependence on water. The expansion of agriculture and industrial development has not only increased water consumption considerably but has also affected water quality. Water is easily polluted because of its great ability to dissolve substances. Even before raindrops touch the earth, they start picking up pollutants. Once on the ground, water picks up things rapidly and becomes contaminated. The various human activities and industries not only require water in large amounts, they also pollute it while using it. Apart from industries, water is polluted by agricultural and domestic or municipal sources. The water pollutants vary in nature; they include biological agents, chemicals that make water rich in nutrients, chemicals that poison water, sediments, heat and radioactive waste. Nearly all water bodies are affected by

pollution, including ground water. Safe drinking water is essential to humans and other lifeforms even though it provides no calories or organic nutrients. The quality of water is a vital concern for mankind, since it is directly linked with human welfare. It is a matter of history that fiscal pollution of drinking water caused water born diseases which wiped out entire population of these cities. At present, the menace of water born diseases and epidemics still booms large on the horizons of developing countries. River pollution in India has now reached to a point of crisis due to unplanned urbanization and rapid growth of industrialization. The entire array of life in water is affected due to pollution in water. The problem of water quality deterioration is mainly due to human activities such as disposal of dead bodies, discharge of industrial and sewage wastes and agricultural runoff which are major cause of ecological damage and pose serious health hazards (Meitei et al., 2004). It is estimated that community waste from human activities accounts for four times as much wastewater as industrial effluents, most of which is discharged untreated/partially treated into the water courses in India(Sahu, 1993).

Material and Method

The present study deals with the study of Physico-chemical parameters of Song river at Nepali Farm district Dehradun. Analysis of water samples were done according to standard methods as prescribed in APHA (1998), and Khanna and Bhutiani (2007).

Result and Discussion

Site wise observations for various Physico-chemical parameters are given in tables 1-4. Increasing demand of water and diseases associated with the water quality develops the need to define the quality of water of specific uses. Accurate assessment of water quality depends on the results generated by specific monitoring activities, which defines the condition of the resource. During the study period out of all the sampling site maximum temperature

(23.20 0C) observed was at sampling site-4 and minimum (18.00 0C) at sampling site-1. A more or less similar trend has been observed in the river Yamuna by Chakrabarty et al. (1959) and in the Kallayi (John, 1976). Badola and Singh (1981) reported similar trend in river Alaknanda. The fluctuation of temperature was well within the limit for survival of fishes. Similar types of fluctuations were reported by Dwivedi et al. (1995) in two ponds at Patna. Site-3 (21.20 0C ±2.13) showed the maximum average value of temperature during study period. Turbidity in this study remains nil at all the four sampling site. The value of total solid observed to be maximum (1000.00 mg/l) at sampling site-3 and minimum (400.00 mg/l) at sampling site-4. Observing the value of the entire sampling site it was found that highest (829.00 mg/l ±118.27) average value at sampling site-3 and lowest (693.00 mg/l ±185.12) average value at sampling site-IV was observed for total solid.The value of total dissolved solid observed to be maximum (690.00 mg/l) at sampling site-2 and minimum (200.00 mg/l) at sampling site-2. Observing the value of the entire sampling site it was found that highest (492.50 mg/l ±104.12) average value at sampling site-3 and lowest (382.00 mg/l ±119.22) average value at sampling site-IV was observed for total dissolved solid.The value of total suspended solids observed to be maximum (475.00 mg/l) at sampling site-3 and minimum (200.00 mg/l) at sampling site-3. Observing the value of the entire sampling site it was found that highest (336.50 mg/l ±96.38) average value at sampling site-3 and lowest (289.50 mg/l ±82.27) average value at sampling site-2 was observed for total suspended solid.David (1956) and Verma and Shukla (1976) reported the similar trend for total solid in their study. pH represent the intensity of acidity or alkalinity of water. It plays a limiting role in the growth of flora and fauna of aquatic body. In the present study the value of pH observed to be maximum (7.70) at sampling site-3 and minimum (7.10) at sampling site-3. This observation was similar to the findings of Sagun and Sharma (1985), Meshram (1996). Maximum (7.44 ±0.07) and minimum (7.24 ±0.15) average value of pH also observed at site-1 and site-4 respectively. During this study

the highest (3.66 mg/l) and lowest (1.08 mg/l) value of BOD was observed at sampling site-1 and 2 respectively but the maximum (2.44 mg/l ±0.91) average BOD at sampling site-1 and minimum (1.60 mg/l ±0.47) average BOD at sampling site-2 was found. Seasonal trend found in this study was similar to the findings did by Khanna (1993), Chugh (2000).Sampling site-3 showed the maximum (11.50 mg/l) and minimum (5.50 mg/l) value of COD at site 1 and 3 respectively. Site-4 also showed the highest (9.18 mg/l ±0.94) average value of COD but the lowest (8.00 mg/l ±.26) average value of COD was observed at sampling site-3.The maximum (11.84 mg/l) and minimum (8.32 mg/l) value of DO on comparing the observation of all sampling site was at sampling site-a and 2 respectively. Similar trend of DO was also observed by Badola and Singh (1981) for river Alaknanda, Khanna (1993) and Chugh (2000) for the river Ganga. Highest (10.80 mg/l ±0.77) average value of DO was recorded for sampling site-4 and lowest (9.72 mg/l ±1.09) at sampling site-3 out of all the four sampling site. Highest value of DO was recorded for river Cauvery by Somashekar (1984) and for Kosi River by Bhatt et al. (1984). Free CO2 showed a regular trend of increasing from winter to monsoon at all the four sampling site. Comparing all the observation it was found that the value of CO2 found was maximum (23.10 mg/l) at sampling site-4 and minimum (6.60 mg/l) at sampling site-2. Average value of CO2 was maximum (15.62 mg/l ±4.17) at sampling site-4 and minimum (12.10 mg/l ±3.36) at sampling site-1. Seasonal trend observed in this study was similar to the findings of Pahwa and Mehrotra (1966), Chakrabarty et al. (1959).Maximum (115.00 mg/l) and minimum (22.50 mg/l) value of acidity were observed at sampling site-1 during the study period. On comparing the average value of acidity we found that sampling site-2 showed the minimum (58.25 mg/l ±23.86) and sampling site-2 showed the maximum (63.00 mg/l ±34.50) values.Alkalinity is the measure of carbonate and bi-carbonate. It showed variation in its value from maximum (80.00 mg/l) to minimum (30.00 mg/l) which were observed at sampling site-1 and 4 respectively. This observation is similar to the findings of Venkateshwarlu and

Jayanti (1968) for the river Sabarmati. The value of total hardness is governed by the contents of calcium and magnesium salts, largely combined with bicarbonate, carbonate, sulphate and chloride. The maximum (380.00 mg/l) and minimum (195.00 mg/l) value of total hardness was observed at sampling site- 2 during the study period. The maximum (293.80 mg/l ±40.16) and minimum (257.00 mg/l ±32.82) average value of total hardness were observed at sampling site-3 and 1 respectively. Chloride in the water occurs as salt of sodium and calcium. The concentration of chloride vary from maximum (22.01 mg/l) at sampling site-4 to minimum (10.65 mg/l) at sampling site-1. But the average value was maximum (15.90 mg/l ±3.42) at sampling site-4 and minimum (14.41 mg/l ±1.80) at sampling site-1.The concentration of calcium vary from maximum (90.18 mg/l) at sampling site-2 to minimum (60.12 mg/l) at sampling site-2. But the average value was maximum (75.15 mg/l ±4.04) at sampling site-4 and minimum (67.13 mg/l ±6.43) at sampling site-1. The concentration of magnesium vary from maximum (73.16 mg/l) at sampling site-2 to minimum (31.93 mg/l) at sampling site-2. But the average value was maximum (53.64 mg/l ±9.55) at sampling site-3 and minimum (46.14 mg/l ±6.93) at sampling site-1.

Table 1: Variation in Physico-Chemical Parameter of Song River at Sampling Site I

04-Feb-2013	18.00	Nil	600	400	200	7.5	8.39	1.47	8.40	7.7	55	27.50	15.62	277	64.12	51.94
12-Feb-2013	18.20	Nil	800	450	350	7.5	8.45	1.33	11.50	7.7	60	22.50	12.78	283	66.13	52.91
20-Feb-2013	18.00	Nil	800	600	200	7.4	10.08	1.56	8.45	9.9	80	55	14.2	275	70.14	49.98
26-Feb-2013	20.50	Nil	850	650	200	7.4	11.36	2.43	8.60	11	65	75	13.49	290	72.14	53.15
04-Mar-2013	21.50	Nil	600	350	250	7.5	11.84	3.66	9.60	13.2	40	105	10.65	292	76.15	52.60
11-Mar-2013	21.50	Nil	800	450	350	7.5	11.23	2.91	8.40	12.1	55	40	15.62	257	76.15	44.12
17-Mar-2013	22.10	Nil	850	500	350	7.4	11.63	3.51	8.80	11	45	42.5	17.04	240	64.12	42.19
02-Apr-2013	22.50	Nil	720	370	350	7.4	8.85	1.73	7.50	14.3	50	42.5	14.91	241	64.12	43.15
09-Apr-2013	22.10	Nil	920	475	445	7.3	10.81	3.50	8.0	17.6	50	105	14.20	201	56.11	35.53
15-Apr-2013	22	Nil	800	450	350	7.5	10.61	2.29	8.1	16.5	65	115	15.62	209	62.12	35.83
Average ± SD	20.64 ± 1.85	Nil	774 ± 104.90	469.5 ± 94.71	304.5 ± 85.52	7.44 ± 0.07	10.33± 1.32	2.44 ± 0.91	8.74 ± 1.12	12.1 ± 3.36	56.5± 11.56	63 ± 34.50	14.41 ± 1.80	257 ± 32.82	67.13 ± 6.43	46.14 ± 6.93

Table 2: Variation in Physico-Chemical Parameter of Song River at Sampling Site II

Date/Parameter	Temperature °C	Turbidity (JTU)	Total Solid (mg/l)	Total Dissolved Solid (mg/l)	Total Suspended Solid(TSS)	pH	DO	BOD	COD	Free CO2	Alkalinity	Acidity	Chloride	Total Hardness	Calcium	Magnesium
04-Feb-2013	18.10	Nil	650	400	250	7.2	8.52	1.40	8.50	6.6	60	25	17.75	270	62.12	50.72
12-Feb-2013	18.10	Nil	850	600	250	7.3	9.27	1.48	10.50	8.8	50	30	15.62	360	68.13	71.21
20-Feb-2013	18.50	Nil	750	500	250	7.4	9.33	1.15	8.30	9.9	60	52.5	19.80	323	76.15	60.71
26-Feb-2013	21.30	Nil	890	690	200	7.2	10.62	1.75	9.20	15.40	60	80	14.91	380	80.10	73.16
04-Mar-2013	22.40	Nil	420	200	220	7.1	9.81	1.47	9.20	16.5	35	100	13.49	353	86.17	65.10
11-Mar-2013	22.60	Nil	550	300	250	7.3	11.77	2.63	9.50	13.2	35	55	14.91	299	90.18	50.95
17-Mar-2013	22.90	Nil	800	525	275	7.3	10.55	1.62	8.50	8.8	40	45	12.78	264	66.13	48.28
02-Apr-2013	23.10	Nil	950	500	450	7.3	8.72	1.28	8.20	8.8	45	45	12.78	244	60.12	44.86
09-Apr-2013	22.10	Nil	900	550	350	7.2	8.32	1.08	8.30	16.5	45	70	13.49	195	64.12	31.93
15-Apr-2013	22.10	Nil	825	425	400	7.3	10.27	2.09	8.20	18.7	55	80	17.04	214	60.12	37.54
Average ± SD	21.12 ± 2.05	Nil	758.5 ± 169.44	469± 143.47	289.50± 82.27	7.26 ± 0.08	9.72 ± 1.09	1.60 ± 0.47	8.84 ± 0.75	12.32 ± 4.2	48.5 ± 10.01	58.25 ± 23.86	15.26 ± 2.33	290.2 ± 63.36	71.33 ± 11.06	53.45 ± 13.84

Table 3: Variation in Physico-Chemical Parameter of Song River at Sampling Site III

Date/Parameter	Temperature °C	Turbidity (JTU)	Total Solid (mg/l)	Total Dissolved Solid (mg/l)	Total Suspended Solid(TSS)	pH	DO	BOD	COD	Free CO2	Alkalinity	Acidity	Chloride	Total Hardness	Calcium	Magnesium
04-Feb-2013	18.10	Nil	1000	600	400	7.6	9.81	2.30	7.70	8.8	50	30	16.33	273	60.12	51.94
12-Feb-2013	18.20	Nil	800	450	350	7.5	9.06	1.40	9	11.0	45	22.5	13.49	275	64.12	51.45
20-Feb-2013	19.20	Nil	850	650	200	7.5	8.59	1.89	6	14.3	60	42.5	19.90	317	72.14	59.74
26-Feb-2013	20.10	Nil	1000	650	350	7.7	11.50	1.80	5.50	17.6	55	67.5	16.33	339	74.14	64.62
04-Mar-2013	23.00	Nil	600	400	200	7.3	9.94	1.62	8.90	22	40	90	12.78	361	78.15	69.01
11-Mar-2013	23.20	Nil	820	450	370	7.3	8.79	2.45	8.20	19.8	45	47.5	14.91	289	84.16	49.98
17-Mar-2013	23.00	Nil	720	500	220	7.1	11.16	2.02	8.50	17.6	45	40	14.20	297	78.15	53.39
02-Apr-2013	23.00	Nil	800	400	400	7.1	10.55	1.82	9.20	7.7	55	57.5	13.49	310	78.16	56.56
09-Apr-2013	21.20	Nil	850	375	475	7.3	10.61	1.88	8.50	13.2	50	115	16.33	228	76.15	37.04
15-Apr-2013	23.00	Nil	850	450	400	7.2	10.21	1.83	8.40	16.5	45	100	17.75	249	74.18	42.65
Average ± SD	21.2 ± 2.13	Nil	829± 118.27	492.5 ± 104.12	336.5 ± 96.38	7.36 ± 0.21	10.02 ± o.98	1.90 ± 0.30	8.0 ± 1.26	14.85 ± 4.70	49.0 ± 6.15	61.25 ± 31.16	15.6 ± 2.21	293.8 ± 40.16	73.95 ± 7.10	53.64 ± 9.55

Table 4: Variation in Physico-Chemical Parameter of Song River at Sampling Site IV

Date/Parameter	Temperature °C	Turbidity (JTU)	Total Solid (mg/l)	Total Dissolved Solid (mg/l)	Total Suspended Solid(TSS)	pH	DO	BOD	COD	Free CO2	Alkalinity	Acidity	Chloride	Total Hardness	Calcium	Magnesium
04-Feb-2013	18.2	Nil	700	350	350	7.1	10.89	2.16	11.00	9.9	57	27.5	17.04	286	70.14	52.66
12-Feb-2013	18.1	Nil	400	200	200	7.2	10.62	2.64	10.20	13.2	40	30	12.78	306	74.14	56.57
20-Feb-2013	20.5	Nil	800	450	350	7.1	9.20	2.91	9.00	15.4	55	52.5	22.01	337	78.15	63.15
26-Feb-2013	20.5	Nil	850	500	350	7.2	11.09	1.14	8.50	18.7	50	62.5	17.75	333	76.15	62.17
04-Mar-2013	22.00	Nil	450	220	230	7.1	11.43	1.22	9.30	23.1	45	102.5	14.91	339	82.16	62.66
11-Mar-2013	22.5	Nil	450	250	200	7.3	12.04	2.50	9.50	20.9	30	52.5	14.20	281	80.16	49.00
17-Mar-2013	21.20	Nil	780	450	330	7.2	11.09	1.94	9.30	15.4	35	50	12.07	300	74.14	55.10
02-Apr-2013	22.00	Nil	850	525	325	7.2	10.35	1.71	9.00	11.0	60	75	11.36	271	70.14	49.00
09-Apr-2013	22.10	Nil	850	450	400	7.5	10.21	1.87	7.70	14.3	65	52.5	17.75	216	72.14	35.10
15-Apr-2013	22.50	Nil	800	425	375	7.5	11.08	1.08	8.3	14.3	50	80	19.17	234	74.14	39.00
Average ± SD	21.0 ± 1.65	Nil	693± 185.12	382± 119.22	311± 73.29	7.24 ± 0.15	10.8 ± 0.77	19.2 ± 0.64	9.18 ± 0.94	15.62 ± 4.17	48.7 ± 11.22	58.5 ± 22.71	15.90 ± 3.42	290.3 ± 42.01	75.15 ± 4.04	52.44 ± 9.68

FIG 1.1 SATELLITE IMAGERY AND MAP OF SONG RIVER AT NEPALI FARM

FIG 1.2 – SAMPLING SITE (1) SONG RIVER NEARCHIDDERWALA

FIG 1.3 - SAMPLING SITE (2). SONG RIVER NEAR NEPALI FARM.

FIG 1.4 –SAMPLING SITE(3) SONG RIVER NEARRAILWAY BRIDGE

FIG1.5–SAMPLING SITE (4) SONG RIVER NEAR KHADRI VILLAGE.

Conclusion

The Study Concludes that although therewere minor fluctuations in physico-chemical parameters of Song River at all the four different sampling sites but it is an alarming situation of increasing pollution load as most of the parameters studies are nearby to the permissible limits.

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