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SEASONAL VARIATION OF PHYSICO-CHEMICAL PARAMETERS OF SEER STREAM IN OUTER HIMALAYAS

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ABSTRACT

This paper deals with water quality status in Seer stream over a stretch of 5 km for variable like Biochemical Oxygen Demand (BOD) and Dissolved Oxygen (DO) etc. The study was conducted during May, 2014 to August, 2015 to quantify the pollution status of the stream. The study shows that summers season is the most critical period when stream is having very less discharge. There is an urgent need to protect stream from further degradation in water quality and to maintain the ecological balance in the stream.

KEY WORDS: ***Seer Stream, Water Pollution, Dissolved Oxygen (DO).***

INTRODUCTION:

Seer is one of the sub tributaries of river Satleuj in Bilaspur district of Himachal Pradesh (India). It lies at a latitude of 31°26'59" north and 76°43'11" of east longitude. The Ghumarwin town falls in Shivalik hills of lower Himalayan region at the altitude of 600m above mean sea level. The town is located on left bank of Seer stream. The stream is a small rain-fed perennial stream taking its origin from near Mandi District and joins river Satluj after travelling 20 Km stretch in Bilaspur district. It swells during rainy season and gets reduced to a narrow stream during summer. The stream serves as the source of drinking water for Ghumarwin town and its surrounding area. For want of proper sewerage system, the night soil from the houses is being treated through septic tanks. The waste from kitchen, bath and night soil (human excreta) from slum area flows in open drains and is being discharged in the local nallah named as Ghumarwin nallah – I and Ghumarwin nallah – II.

Towns and cities located on the bank of rivers or streams tend to discharge their waste water treated or untreated, into rivers or streams. Phenomenal increase in the pollution of river water due to such discharge from cities and towns is causing concern of pollution regulators and also people at large.

Many instances of Water pollution have been reported in newspapers of the region, (Thakur 2002). Severe pollution of Hathli stram in Himachal Pradesh has been reported by Sharma & Gupta (Sharma 2004). A large number of fish died during summer 2010 in Seer stream near Ghumarwin town (Danik Jagran 2010), (Amar Ujala 2010).

MATERIALS AND METHODS

Monitoring of water quality was carried out at six stations along the stretch of 5 Km of Seer stream from the point where water is lifted for supply to Ghumarwin town to 5 Km downstream of the stream. (Fig. 1)

Station S_1 was selected on upstream of Seer stream before the discharge of main town enter the stream. Station S_2 was selected on Seer khad stream just upstream of the meeting point of Ghumarwin nallah –I and Seer khad stream. Station S_3 was selected on downstream of Ghumarwin Nallah – I. Sampling station S_4 was selected on D/S of Ghumarwin Nallah-II . Sampling station S_5 was selected on downstream side of meeting point of Ghumarwin nallah -II with Seer stream and Sampling station S_6 was located about 2 Km downstream of Ghumarwin town. The guide lines given by USEPA (1997)in "Volunteer Stream Monitoring, A Method manual" were followed for sampling. The sampling was repeated after 15 days and the present study is spread over a period of one year. All the physico-chemical parameters were determined following the standard methods (APHA 1992).

Figure (1) Location Plan of Sampling Station on Seer Stream

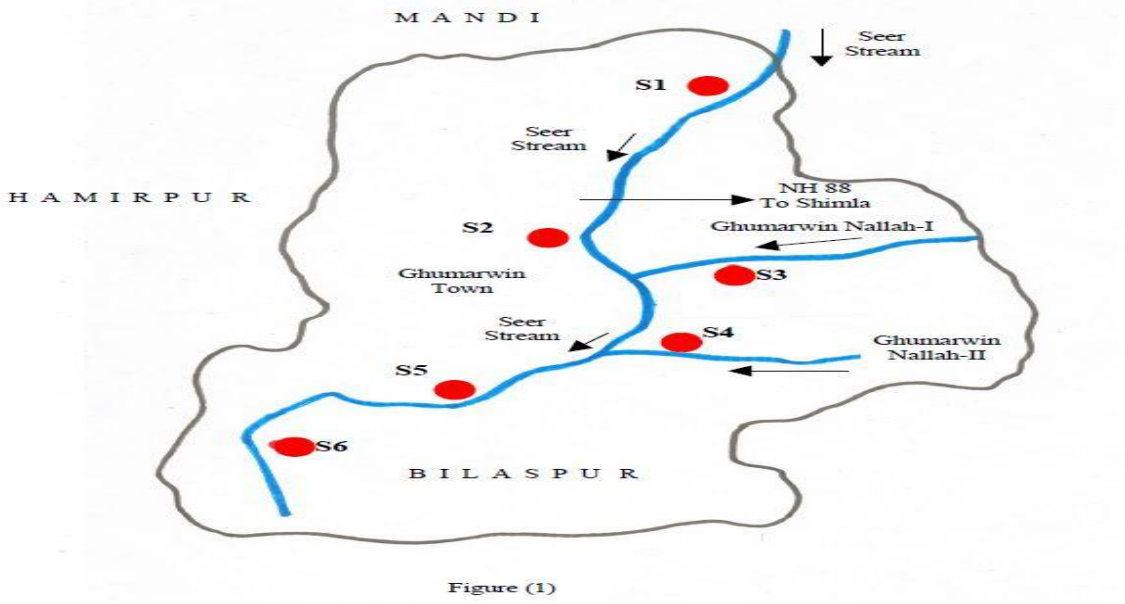

Figure (1)

RESULTS AND DISCUSSIONS

The experimental investigations of Physico-chemical parameters of water samples are given in Table 1.

TEMPERATURE

The temperature in Seer stream varies in the range of 9^0 to 26^0 C. The maximum temperature was recorded during summer and minimum during the winter. No significant difference of temperature values was found in the surface and bottom layers.

Hydrogen ion Concentration (pH): The pH of all water samples was found to be alkaline in nature (7.0-8.60). The pH level were within the limits set for protection of aquatic life, 6.5-9.0 (USEPA 1975), irrigation, 5.5 to 9.0 and for domestic use 7.0 and 9.0 (ICMR, 1975). The season wise values showed maximum during summer and minimum during winter.

ELECTRICAL CONDUCTIVITY (EC)

The Electrical Conductivity in the main Seer stream varies in the range of 257 to 786 micorsiemens/cm. It was found to increase gradually from Staion S-3 to S-5 and then decrease towards station S-6. The increase is due to influx of wastewater from Ghumarwin nallah-I and Ghumarwin nallah-II. The highest EC was recorded at S-6 during summer. The EC in Ghumarwin nallah -I varies form 373 to 962 µS/cm. The EC in Ghumarwin nallah-II varies from 600 to 1492 µS/cm. The highest values of EC were recorded during summer, followed by monsoon and winter seasons.

TURBIDITY

The turbidity values in the Main stream vary from 0 to 125 NTU. The highest turbidity has been recorded in the monsoon period and lowest in winter followed by summer seasons. The turbidity in the Ghumarwin nallah -I varies from 1.6 to 16.0 NTU. The turbidity in the Ghumarwin nallah -II varies from 1.6 to 280 NTU. It was found to increase gradually from Station S-3 to S-5 and then decrease towards Station S-6 the increase in turbidity is due to influx of wastewater having high turbidity from Ghumarwin nallah –I and Ghumarwin nallah-II

TOTAL ALKALINITY

The total alkalinity in the main stream varies from 145 mg/l during winter at station S-1 to 340 mg/l as $CaCO_3$ during summer at station S-5. The total alkalinity in the Ghumarwin nallah -I varies from 188 to 30 mg/L. The total alkalinity in the Ghumarwin nallah-II varies from 210 to 470 mg/l. In the main stream it was found to increase gradually from Station S-3 to S-5 and then decrease at station S-6. The increase in alkalinity is due to influx of wastewater from Ghumarwin nallah-I and Ghumarwin nallah –II. There is no signification change in the average values of total alkalinity in the stream during the year.

TOTAL HARDNESS

The total hardness in the main stream vary from 130 mg/l during monsoon at station S-1 to 380 mg/l as $CaCO_3$ during monsoon at station S-5. The total hardness in the Ghumarwin nallah-I varies from 162 to 380 mg/l. The total hardness in the Ghumarwin nallah-II varies from 260 to 480mg/l. In the main stream it was found to increase gradually from Station S-3 to S-5 and then decrease form station S-6. The increase in alkalinity is due to influx of wastewater from Ghumarwin nallah - I and Ghumarwin nallah - II. The values are highest in summer followed by monsoon and winter seasons. The water in this region is hard.

CHLORIDE

The chloride contents in the main stream vary from 7.5 mg/l during monsoon at station S-1 to 50 mg/l, during winter at station S-5. The Chloride contents in the Ghumarwin nallah - I varies from 14 mg/L to 63mg/L. The Chloride contents in the Ghumarwin nallah - II varies form 28 to 126 mg/L. In the main stream it was found to increase gradually form station S-3 to S-5 and then decrease from station S-6. The increase in Chloride is due to influx of wastewater from Ghumarwin nallah - I and Ghumarwin nallah - II.

DISSOLVED OXYGEN (DO)

The DO levels were found to vary in the wide range of 2.5 to 11.8, mg/l in the main stream and 3.8 to 8.7 mg/l in the Ghumarwin nallah - I to 0 to 6.2 in the Ghumarwin nallah - II. The lowest DO (2.5 mg/L) in the main stream during day was recorded in the month of May and early June at S-5 and the maximum was observed at station S-1 during winter, when the water temperatures is vary low (9^0C). The DO levels vary widely from season to season, the highest are during the winter followed by monsoon and pre-monsoon periods. The anoxic condition at station S-5 age due to the utilization of DO for the degradation of domestic wastewater of the town reaching this station from Ghumarwin nallah - I & II.

BIOCHEMICAL OXYGEN DEMAND (BOD)

The BOD levels were found to vary in the wide range of 1.2 to 40.0 mg/l in the main stream and 13.0 to 30.0 mg/l in the Ghumarwin nallah - I and 80 to 160 mg/l in the Ghumarwin nallah - II. The maximum BOD values were obtained at S-4 160 mg/l during summer, while minimum 1.2 mg/l being obtained at S-1 during winter season. In summer, high BOD was due to prevailing high temperature and high concentration of oxidizable organic matter.

STREAM FLOW

The discharge in the main stream varies from 4 liter per second during summer at station S-1 to 1600 liter per second during monsoon at station S-6. The discharge in the Ghumarwin nallah - I varies from 13 to 312 liters per second. The discharge in the Ghumarwin nallah - II varies from 5 to 50 liters per second. In the main stream it was found to increase gradually from Station S-1 to S-6. The increase in discharge is due to influx of wastewater from Ghumarwin nallah - I and Ghumarwin nallah – II and seepage from rocks on the either side bank of stream. The discharge values are highest in monsoon followed by winter and summer season. Summer is the most critical period when discharge is the minimum in the main stream.

Therefore the careful analysis of the pollution parameter reveal that the stations S-1, is least polluted& station S-6 is slightly polluted, but the station 2,3,4,5 are heavily polluted. The municipal wastewater, which contributed the maximum organic pollution, resulting in an increased BOD, is playing a key role as main source of pollution in the stream. The high concentration of BOD, EC and other anions at stations S-2, S-3, S-4 & S-5 are definitely undesirable and beyond the permissible limits.

Table 1. Summary of Seasonal Variation in Physico-Chemical Parameters of Seer Stream.

Sampling station		Temperature in Degree Celsius			pH			Elect. Conductivity micromho/cm			Turbidity in NTU			Total Alkallnity as $CaCo_3$		
		S	R	W	S	R	W	S	R	W	S	R	W	S	R	W
S-1	Range	15-26	20-26	9-20	7.38-8.29	7.40-8.33	7.0-8.42	372-505	352-498	299-528	0.4-4.0	1.2-6.0	1.2-6.0	160-210	160-230	145-200
	Average	22	23	14	7.85	7.75	7.8	421	416	366	1.8	3.3	1.5	181	185	180
S-2	Range	15-26	20-26	9-20	7.3-8.1	7.4-8.3	7.0-8.2	613-773	373-962	422-575	2.5-6.0	1.6-16.0	3.2-8.0	240-315	188-280	210-300
	Average	22	23	14	7.7	7.8	7.7	685	595	506	4.9	6.5	5.1	259	228	239
S-3	Range	15-26	20-26	9-20	7.3-8.3	7.5-8.5	7.2-8.4	481-715	332-570	323-425	0.8-6.0	0.8-10	0.4-10	195-270	140-255	167-276
	Average	22	23	14	7.90	8.00	7.80	581	427	377	4	4	4.2	233	174	217
S-4	Range	15-26	20-26	9-20	7.30-8.30	6.7-8.3	7.3-8.2	960-1492	600-1065	620-1040	10-140	6.0-110	14-280	360-480	210-385	230-470
	Average	22	23	14	7.7	7.7	7.7	1118	798	850	79	36	95	398	289	335
S-5	Range	15-26	20-26	9-20	7.30-8.21	7.49-8.36	7.32-8.32	495-740	411-612	396-706	2.0-40	1.2-24	2.8-50.0	210-340	150-290	165-295
	Average	22	23	14	7.8	7.89	7.83	666	512	463	18.3	9.3	17.7	281	210	223
S-6	Range	15-26	20-26	9-20	7.7-8.6	7.66-8.12	7.10-8.55	492-786	386-497	364-498	2.0-8	0.0-4.0	2.0-8.0	170-250	170-220	170-240
	Average	22	23	14	7.90	7.82	7.91	574	468	440	4	2	4	209	199	206

S= Summer Season, R = Rainy Season, W = Winter Season, l.p.s. = Liter Per Second.

TABLE: 2. SEASON VARIATION OF PHYSICO-CHEMICAL PARAMETERS OF SEER.

Sampling station		Total Hardness as $CaCo_3$			Chloride in mg/l			D.O. in mg/l			BOD in mg/l			Discharge in l.p.s.		
		S	R	W	S	R	W	S	R	W	S	R	W	S	R	W
S-1	Range	160-270	130-300	140-250	14-22	7.5-37	11-42	6.0-8.5	5.7-8.0	7.0-11.0	1.4-5.0	2.0-6.0	1.2-4.0	4-60	75-7082	70-540
	Average	208	201	193	20	15.9	22	7.1	7.1	9.0	3.0	3	2.1	16.8	551	171
S-2	Range	240-300	162-380	200-360	28-44	14-44	14-63	3.8-7.3	5.0-7.5	6.0-8.7	16-24	14-30	13-24	26-50	60-312	49-100
	Average	273	238	266	35	24	37	5.5	6.2	7.3	20.8	19.3	18.7	35.6	144	64
S-3	Range	220-340	150-320	180-260	24-38	10-38	14-47	4.2-8.7	5.2-7.8	7.0-10.3	8.1-20.0	5.0-12.0	4.6-9.5	30-110	135-1394	120-640
	Average	265	216	223	30	19	28	6.2	6.9	8.5	16.1	6.9	7.3	52.5	696	235
S-4	Range	290-465	260-460	260-480	66-126	28-96	43-116	0.0-4.0	0.0-6.2	0.0-5.2	102-160	80-142	80-160	5-15	11-50	9-26
	Average	383	326	319	101	63	80	1.8	3.3	3.2	142	104	134	8.8	25	15.7
S-5	Range	230-340	140-380	216-340	27-47	11-40	17-50	2.5-6.5	4.5-7.8	6.4-8.5	29-50	6.8-31	10-45	40-120	163-1435	120-661
	Average	296	224	242	40	21	32	5	6.2	7.3	40.0	15.7	28.4	61.3	722	241
S-6	Range	190-280	190-240	190-300	20-42	12-45	24-46	6.1-8.2	6.6-7.9	7.5-11.3	1.8-8.5	1.8-5.6	1.6-4.5	50-102	200-1600	160-700
	Average	242	218	244	29	23	37	7	7.1	9.1	3.9	3.8	2.4	70	917	284

CONCLUSIONS

On the basis of present study the following conclusions can be drawn. The stream is heavily polluted below the point where Ghumarwin nallah - I meets the stream. The water pollution is due to wastewater of the town. The monitoring results on six stations indicate that, Seer stream is having the conservative

parameters as per standards except few exceptions (WHO, 1991), IS: 10500 -1993). The DO is reasonably high, except in Ghumarwin nallah-I, which is having very high BOD due to less dilution. The BOD in Seer stream is within standard of 5 mg/l before the town wastewater enters the stream. Summer season is the most critical period when stream is having very less discharge. The entire stretch of stream after the wastewater enters the stream has high BOD especially after Ghumarwin nallah-I meet the stream. There is an urgent need for water quality management of the area and to protect the ecological balance in the stream.

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REFERENCES

- APHA, 1992. Standard Methods for the Examination of Water & Wastewater 18th Edition, Washington, D.D.
- USEPA, 1997, Volunteer Stream Monitoring, A Methods Manual, EPA 841-B-97-003.
- Amar Ujala daily, 2002. "Hepatitis –E Spreads in Mandi Town due to Polluted Water" dated 26, 2002
- Dainik Bhaskar daily 2002, "Hepatitis in Bilaspur Town after Mandi" dated May,9, 2002.
- IS: 10500 1993, Indian Standard Specification for Drinking Water, B.I.S. New Delhi.
- ICMR, 1975 Manual of Standard of Quality for Drinking Water Supplies, India Council of Medical Research, Spl. Rep. S.No. 44.
- Sharma, Moti Ram, Bassin, J.K. and Gupta, A.B. 2001. Water quality management of Hathli stream in Himachal Pradesh, Abstracts of Conference of Enviornmental Values and Sustainable Development, Nov.-17-19, 2001, Jaipur, p. 17
- Sharma, M.R. and Sharma, R.N. 2002. Water Quality of Springs in Bilaspur Area of Lower of Himalayas, Journal of IWWA, Vol. XXXIV, No. 3, pp. 225-229.
- Thakur Ravinder, "Spreading of Gastro-entitis in Hamirpur" in Amar Ujala daily, Chandigarh, dated September 08, 2002.
- USPEA, 1975 Quality Criteria for Water, Ed. Train, R.E. Castle House Pub. Great Britain.
- WHO, Guidelines for Drinking Water Vol. 2 1991, CBS Publishers and Distributors, New Delhi.

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