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Impact on the Water Quality of the Border Area of the Industrial Belt Bhiwadi, Alwar (Rajasthan)

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Abstract: This study aims to analyze the impact of domestic and industrial waste effluents on the water an quality of the industrial belt of the Bhiwadi. For the collection of the samples of water stations were identified. Water and soil pollution levels at the various spots in the study area were monitored for the purpose, to provide safety to the villagers from the above mentioned pollutants. The present analyses reveal that some of the stations are contaminated with the nitrate, total dissolved solids and slightly hard, and hence unfit for the human consumption as well as other purposes. In the period of present course, the fluoride concentration was observed in very low range which is also made health hazards for the human being.

Keywords: Domestic, industrial waste, pollutants, fluoride, hazards etc.

Introduction

We already know that water is the most important resource on the planet. It is the essence of all life on earth. Water pollution is a phenomenon that is characterized by the deterioration of the quality of water as a result of various human activities. In fact for centuries, rivers and lakes have been used as dumping ground for the human sewage and industrial wastes of every conceivable find, many of them have been highly toxic. Added to this has been the materials leached and transported from land by water percolating through the soil and running on its surface to aquatic ecosystems. In the era of urbanization and industrialization,[1,2] the problem of water pollution is emerging very fast. Keeping these facts in view, an effort has been made to assess the impact of industrial and domestic wastes effluent on the water quality of the study of Bhiwadi. The continuous periodical monitoring of water quality is necessary, particularly in the area of industrial settlements, so that appropriate steps may be taken for water resource management practices. Bhiwadi is an industrially developing area in Alwar, Rajasthan.

Experimental

The quality test survey of the surface and subsurface water was conducted in the month of January 2016 by collecting underground water samples from the tubewell, borewell, tank and handpump as well as surface water collecting from the industry effluent. The water samples were collected during the evening hours between 4.30 to 6.00 p.m. For which air tight stopper containing two liter capacity polythene bottles were used and brought to the laboratory for the analyses.

Results and Discussion

The physico-chemical examination of the water samples was carried out for the various water quality parameters. The analytical results of the various sampling sources have been shown in Table 1. The temperature of the water varied from 18.0 to 25.0°C. The various chemical and biological reactions in water depend to a great extent on temperature. The pH of the water samples varied from 7.1 to 8.2 showing slight alkaline nature of the samples. It is known that pH of water does not causes any severe health hazard.

DO is one of the most central parameters in assessing water quality and reflects the physical and biological processes prevailing in the water.[2] The concentration of DO was found in the range of nil to 7.6 mg/L.The amount of BOD showed variation between nil to 56 mg/L. The nil value was measured at the sampling sites-3, 5, 8 and 10 and maximum value was noticed at the sampling site-12. The measured COD concentration was ranging from nil to 490 mg/L. The nil COD was noticed from the drinking water sources and the maximum value was found from the industrial water samples. COD test is extensively used for the analyses of industrial wastes and helpful in indicating organic matters.[2] The values of the turbidity in the water samples varied from minimum of nil to maximum of 42 NTU. The analysed sulphate amount was obtained in the range 22 to 490 mg/L. The minimum sulphate was noticed from the HP water sample while the maximum value was found in the

industrial effluent samples. High value of this parameter produces bitter taste to the water and exerts adverse effect on health.[2] The chloride content of the water samples are within the limit. It is varied from 110 to 400 mg/L. The minimum and maximum values were monitored in the water stations 6 and 12, respectively. The estimated concentration of fluoride was ranging from 0.24 to 1.82 mg/L. The very low value of this parameter is also responsible for the health hazardous and for dental cavities in the living being. Nitrate in water supplies in concentration over than 100 mg/L causes blue baby disease, particularly in infants, whose main liquid in take is powdered milk with formula made up with tap water containing high concentration of nitrates. Nitrate forms nitrosamines in stomach which causes gastric cancer.[3] The nitrate concentration was found in the range of 26 mg/L to 390 mg/L. The least value was noticed from the Dam sample station while the highest value was observed in the industrial effluent sample. It may be due to the nitrogen containing dyes which are being used in these units. The amount of the nitrite in the water sample varied from the nil to 2.30 mg/L. The estimated total alkalinity concentration was ranging from 225 to 495 mg/L. The minimum amount was found in the borewell water and the maximum concentration was noticed in the sampling sites 4 and 13.During the entire investigations, the minimum EC value was 875 Scm^{-1} and the maximum EC value was 3480 Scm^{-1}. It can allow a rough estimate to be made of dissolved salts of the water samples.[4]

Total hardness of the water samples varied from 135 to 635mg/L. The lowest concentration was measured in the HP water and the highest amount was noticed in the industrial waste water. The concentration of calcium hardness was estimated in the range of 65to 320 mg/L. The minimum and maximum values were noticed at the sampling sites 5 and 4 and 12, respectively. The estimated magnesium hardness was ranging from 32 to 465 mg/L. The minimum value was found in the tank water and the maximum value was noticed in the industrial waste water sample. Calcium concentration of the water samples varied between 26 to 125 mg/L. The measured value of the magnesium was found in the range of 14.8 to 109.5 mg/L. Desirable limit of the TDS is 500 mg/L. All the values obtained are much higher than the prescribed limit. TDS is an important parameter for drinking water and such water should be used for other purposes.[5] The measured TDS of the water samples was ranging from 600 to 2155 mg/L. The minimum amount was noticed in the HP water and the maximum concentration was found in the industrial water samples.

Conclusions and Recommendations

The Table.1 clearly shows that the concentration of TDS is increasing with the anions concentration as well as the EC values along with the TDS values. From the recent investigations it is concluded that mostly parameters are present in the range of the permissible limit. Nitrate and TDS high values are clearly show their pollution level in the water. The main aim of the present text is to convey about the pollution level in the study area. Thus, it has been concluded that the high values of the aforementioned parameters are more likely to be increased due to the disposal of the untreated wastes from the industries. During our study we have found that the areas of the industrial belt are more polluted. Most of these contaminants are being used in the industrial processes. However, their presence in the effluents and waste are well established.

Table 1. Physico-chemical characteristics of the various water samples collected from the entire study area, Bhiwadi,Alwar.

Parameter	Sampling												
	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9	S-10	S-11	S-12 Industry	S-13 Industry
Temperature °C	18.0	19.2	24.2	19.1	23.6	23.4	19.3	19.1	19.0	24.0	19.2	23.2	22.9
pH	7.8	7.1	7.5	7.6	7.8	7.9	7.3	7.6	7.4	7.6	7.4	8.2	7.8
DO (mg/L)	Nil	1.4	7.5	1.0	7.6	3.7	0.9	6.0	1.1	4.2	Nil	4.2	3.2
BOD (mg/L)	46	38	Nil	44	Nil	Nil	28	Nil	32	Nil	22	56	40
COD (mg/L)	110	80	Nil	92	Nil	Nil	55	Nil	118	Nil	42	480	490
Turbidity (NTU)	42	39	Nil	34	Nil	14	33	Nil	29	8	23	16	18
Sulphate (mg/L)	120	120	126	120	68	30	210	56	120	22	165	360	490
Chloride (mg/L)	310	280	290	240	200	110	290	180	310	270	375	400	395
Fluoride (mg/L)	0.24	0.31	0.26	0.62	0.43	0.81	0.29	1.82	0.29	0.80	0.80	0.39	1.05
Nitrate (mg/L)	26	42	95	38	96	62	76	80	72	65	110	390	300
Nitrite (mg/L)	0.29	0.30	Nil	0.36	Nil	Nil	0.20	Nil	0.32	Nil	0.15	1.10	2.35
Total alkalinity (mg/L)	300	310	225	490	280	280	410	320	300	270	240	470	495
EC (µScm^{-1})	2460	1508	1900	1460	1250	875	1960	1620	1605	1377	2045	3295	3480
Total Hardness (mg/L)	330	490	600	550	360	135	635	140	600	250	590	540	520
Calcium Hardness (mg/L)	110	120	160	300	80	65	160	110	210	70	270	200	320
Magnesium Hardness (mg/L)	220	370	465	250	280	60	450	32	340	180	320	340	220
Calcium (mg/L)	44	48	64	120	32	26	64	44	84	28	108	82	125
Magnesium(mg/L)	52.0	88.9	105.8	60.0	67.3	14.8	109.5	7.2	93.7	43.2	76.9	85.0	52.8
TDS (mg/L)	1370	990	1150	1100	820	600	1405	870	1050	840	1270	2010	2155

Table 2– The physico-chemical characteristics of the various soil samples which were collected from the edge of industrial waste during post monsoon season, 2016.

Parameter	Depth					
	0"	12"	24"	36"	48"	60"
pH	7.6	7.6	7.3	7.3	7.3	7.2
Total Hardness (mg/kg)	470	290	340	240	135	100
Calcium Hardness (mg/kg)	360	235	270	175	100	75
Magnesium Hardness (mg/kg)	110	55	70	45	35	25
Calcium (mg/kg)	144	94	108	70	40	30
Magnesium (mg/kg)	26.4	13.2	16.8	10.8	8.4	6.0
Total Alkalinity (mg/kg)	30	22	20	12	14	10
Fluoride (mg/kg)	0.34	0.39	0.43	0.44	0.49	0.49
Nitrate (mg/kg)	540	520	500	490	465	470
Sulphate (mg/kg)	210	175	200	178	165	148
Chloride (mg/kg)	75	60	48	40	35	30
Electrical Conductivity (μScm^{-1})	810	590	710	600	550	475
Organic Matter (%)	0.34	0.32	0.24	0.20	0.17	0.17
Organic Carbon (%)	0.20	0.19	0.14	0.12	0.10	0.10
Available Nitrogen (%) **N**	0.40	0.35	0.32	0.30	0.27	0.26
Available Phosphorus (kg/ha) **P**	29	25	21	19	18	17
Available Potassium (kg/ha) **K**	420	217	240	225	215	200

Table 3. Concentration correlation in different parameters.

	Sampling Site												
Parameter	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9	S-10	S-11	S-12	S-13
SO_4^{-2} (mg/L)	120	120	128	120	68	30	210	56	120	22	165	360	490
Cl^- (mg/L)	310	280	290	240	200	110	290	180	310	270	375	400	395
NO_3^- (mg/L)	26	42	95	38	96	62	76	80	72	65	110	390	300
EC (μScm^{-1})	2460	1508	1900	1460	1250	869	1960	1620	1605	1377	2045	3295	3475
TDS (mg/L)	1370	990	1150	1100	820	600	1405	870	1050	840	1270	2010	2155

References

1. C.T. Pawar and M.V. Joshi; Impact of urbanization and industrialization on water quality; Nat. Environ. Poll. Tech. 1(4), 351 (2003).
2. C. Chatterjee and M. Raziuddin; Abatement of nutrients levels of polluted river water by water hyacinth; Nat. Environ. Poll. Tech., 1(4), 357 (2002).
3. D. Majumdar and N. Gupta; Nitrate pollution of groundwater and associated human health disorder; Indian J. Environ. Hlth., 42(1), 28 (2002).
4. M.C. Mandal and V.S. Singh; Analyis of uncentined aquifer response to delineate potential groundwater recharge zone in hard rock terrain. In proceeding of the 2nd Asia Pacific Association of hydrology and water resources conference, Suntel, Singapore S-9 July 2, 445-452 (2004).
5. K.S. Pande and S.D. Sharma; Distribution of organic matter and toxic metals in the sediments of Ramganges River at Moradabad, Poll. Res., 18(1), 43-47 (1999).
6. M.K. Ghose and M.K., Kundu; Soil profile studies as a part of environmental Management in coat mining area, Indian J. Environ. Prot., 11(6), 413-417 (1999).
7. Chen Q., Mei K., Dahlgren R.A., Wang T., Gong J., Zhang M. Impacts of land use and population density on seasonal surface water quality using a modified geographically weighted regression. *Sci. Total Environ.*;**572**:450–466(2016).
8. Bu H., Meng W., Zhang Y., Wan J. Relationships between land use patterns and water quality in the Taizi River Basin, China. *Ecol. Indic.* **41**:187–197(2014).
9. Shen Z., Hou X., Li W., Aini G., Chen L., Gong Y. Impact of landscape pattern at multiple spatial scales on water quality: A case study in a typical urbanised watershed in China. *Ecol. Indic.***48**:417–427(2015).
10. Ding J., Jiang Y., Liu Q., Hou Z., Liao J., Fu L., Peng Q. Influences of the land use pattern on water quality in low-order streams of the Dongjiang River basin, China: A multi-scale analysis. *Sci. Total Environ.***551–552**:205–216 (2016).