Seasonal variation in the aquatic environment of Industrial effluents of Sitapura industrial area (Pre-monsoon and monsoon season 2007)

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ABSTRACT

A comparative study has been carried out to study the variation in the quality of industrial effluent of Sitapura Industrial Area, Jaipur in pre-monsoon and monsoon season. The industrial effluent samples were analysed for various parameters like pH, Electrical Conductivity, Total dissolved solids, Total suspended solids, Total solids, Sodium, Potassium, Chloride, Nitrate, Hardness, Total Alkalinity, Sulphate, Phosphate, Fluoride, Chemical Oxygen Demand and Dissolved Oxygen were analysed in pre-monsoon and monsoon season and the results of analysis indicated that most of the parameter were at higher level in the pre-monsoon season.

Keywords: Sitapura Industrial Area, Industrial effluents, Comparative study, Pre-monsoon and monsoon season.

INTRODUCTION

The industries, which are burgeoning at a fast rate, produce about 55,000 million m3 of waste water per day, out of which 68.5 million m3 is discharged into rivers and streams1. Resulting the degradation of water resources, urban pollution increases rapidly by industrial development. Industrialization and urbanization lead to generation of large volumes of waste water from domestic, commercial and industrial purposes. The industrial effluent from Sitapura Industrial Area (SIA), Jaipur is discharged into the nearby drain. Which may effect the quality of underground water in the nearby area². Therefore a attempt has been made to study the physico-chemical characteristics of effluent of various industries located in SIA and of mixed effluent in the pre-monsoon season and to compare the results with the results of monsoon season samples.

MATERIALS AND METHODS

The industrial effluents of 3 textile industries, 4 pharmaceuticals industries, 4 printing industries, 4 food products industries, 3 samples of mixed effluents in both seasons i.e. pre-monsoon and monsoon season were collected. The samples were collected at the discharge points of different industries while mixed effluent samples were taken from the points where this mixed effluent is discharge into the nearby nala. These were systematically analysed. Samples were collected in sterilized bottles. The analysis of these samples were carried out using standard methods^{3,4}.

The pH meter, Digital Conductivity meter, UV-VIS Spectrophotometer, Digital Flame Photometer instruments were used to determine pH, electrical conductivity, Nitrate, Sulphate, Sodium, Potassium, Phosphorus. While chloride, alkalinity, hardness, dissolved oxygen COD were determined by using titrimetric method, TDS and Suspended solids were determined by gravimetric method.

RESULTS AND DISCUSSION

As per the table-1, the value of pH ranged from 6.21 to 8.76 during pre-monsoon season and from 6.3 to 8.6 during monsoon season. After comparison it is found that the mostly the pH value decreased in samples except few effluents samples. In these cases pH value slightly increased. A guick evaluation of acidic and alkaline nature of water can be done by the determination of pH which is an important parameter of water5. The pH value of industrial effluents was under permitted limit of Industrial Effluent Standards in both season. The value of electrical conductivity ranged from 1.06 to 4.13 mmho/cm in the pre-monsoon season and in monsoon season from 1 to 3 mmho/cm. Electrical Conductivity of monsoon samples was low from premonsoon samples. During rainy season, dilution of water resulted in lowering the specific conductivity values. Landfill leachate, domestic sewage and urban factors affect the ground water systems6.

TDS values varied from 509.5 to 2431.5 mg/L of pre-monsoon samples and 680 to 2142 mg/L for monsoon samples. TDS of textile effluents and printing effluents decreased and TDS of pharmaceutical effluents also decreased except one sample in monsoon season. TDS of food products effluents and mixed effluents was increased except one sample in each. This may be excess use of preservatives, edible dyes, inorganic and organic chemicals. TDS of all samples are under permitted limit as per Industrial Effluent Standards. Total Suspended Solids were found in the range of 1.2 to 1239.6 mg/L of pre-monsoon samples and 1.6 to 860.6 mg/L of monsoon samples. TSS of few samples was increased in monsoon season. TSS of few samples was at higher side from the permitted limit of Industrial Effluent Standards.

Chloride value varied from 139.96 to 1109.66 mg/L of pre-monsoon samples and from 120.26 to 905.5 mg/L of monsoon samples. The chloride value of all effluents samples was decreased in monsoon season. Total alkalinity of all samples was noted from 250 to 1400 ppm in pre-monsoon season and from 200 to 1560 ppm in

S. No.	Parameters	Pre-monsoon season 2007		Monsoon Season 2007	
		Minimum	Maximum	Minimum	Maximum
1	рН	6.21	8.76	6.3	8.6
2	Ec mmho/cm	1.06	4.13	1	3.3
3	TDS	509.5	2431.5	680	2142
4	TSS	1.2	1239.6	1.6	860.6
5	Chloride	139.96	1109.66	120.26	905.5
6	Alkalinity	250	1400	200	1560
7	Sodium	225.2	905.46	200	795
8	Potassium	9.52	50.49	4	55
9	Nitrate	1.01	15.81	0.8	20
10	Sulphate	32.08	396.48	26	210
11	D.O.	0	4	0.4	4.8
12	C.O.D.	122	847.2	110	710
13	Hardness	115	530	126	420
14	Phosphorus	1	24	1	28
15	Fluoride	0.57	2.84	negligible	2.86

Table 1: Result of analysis of pre-monsoon and monsoon season samples

Note: All the parameters are expressed in mg/L except pH and EC.

Total Samples = 38

monsoon season. Alkalinity values of mostly all samples were decreased in monsoon season except few. The value of sodium and potassium were in the range of 225.20 - 905.46 ppm and 9.52 -50.49 ppm in pre-monsoon samples and 200 - 795 ppm and 4-55 ppm in pre-monsoon samples. Sodium and potassium value of mostly all samples were decreased in monsoon season except few samples. The nitrate values were found from 1.01 to 15.81 mg/L in pre-monsoon samples and from 0.8 to 20 mg/L in monsoon samples. The nitrate values were observed under permitted limit. Nitrate value of mostly all samples was increased in monsoon season except few. Its higher values during monsoon period may be due to addition of nitrates into water run off from agricultural fields^{7,8}.

The sulphate value varied between 32.08 to 396.48 in pre-monsoon samples and 26 to 210 mg/L in monsoon samples. Sulphate of mostly all samples was decreased in monsoon season except few. Dissolved Oxygen values were noted from 0 to 4 mg/L of effluents samples of pre-monsoon season and 0.4 - 4.8 mg/L of effluents samples of monsoon season. The dissolved oxygen in some effluents was absent in both seasons. D.O. decreased in some samples in monsoon season. COD was found to be from 122 to 847.2 mg/L in pre-monsoon season and from 110 to 710 mg/L in monsoon season. COD values of all effluents samples were found on the lower side in monsoon season in comparison to its value for pre-monsoon season samples. Some of the samples had higher COD value as per Industrial Effluent Standards. The value of COD should not exceed 400 mg/L. Hardness found to be from 115 to 530 in samples of pre-monsoon season and from 126 to 420 mg/L in samples of monsoon season.

Hardness of mostly all samples was decreased in monsoon season except few. The value of phosphorus varied between 1 to 24 mg/L in samples of pre-monsoon season and 1 to 28 mg/L in samples of monsoon season. The observed Phosphorus of mostly all samples was decreased in monsoon season except few. Fluoride in premonsoon samples was noted from 0.57 to 2.84 mg/ L and from negligible to 2.86 mg/L in monsoon samples. Mostly the fluoride was found lower in monsoon season except few.

CONCLUSION

Physico-chemical analysis of effluent samples of SIA, Jaipur in pre-monsoon and monsoon season revealed that, the concentration of most of the parameters decreased during the monsoon season, which may be dilution of effluent with rain water. During monsoon season, the runoff from the nearby agriculture field may be one of the reasons for the increased concentration of the nitrate and TSS in few effluent samples.

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