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IMPACT OF SUGAR INDUSTRY EFFLUENTS ON THE QUALITY OF GROUNDWATER NEAR BANKHEDI SUGAR INDUSTRY DIST. NARSINGHPUR (MP) INDIA

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ABSTRACT

Industrial pollution continues to be a major factor causing the degradation of the environment around us, affecting the water we use, the air we breathe and the soil we live on. The exponential increase in industrialization is not only consuming large areas of agriculture lands, but simultaneously causing serious environmental degradation as well as to soil. Water originating from various industries is finding their place in agriculture. The present study was focused on impact of sugar mill effluent on groundwater which is used for domestic purpose, the quality of ground water were studied during January to December 2012. In this analysis the different parameters like pH, Electrical conductivity, DO, BOD, COD, Alkalinity, Hardness, Chloride, Sulphate, Phosphate, TDS are studied in nearby area of sugar industry. The study indicates that water quality parameters nearby the sugar industry is very high and exceeds the permissible limits.

INTRODUCTION

Environmental pollution has been recognized as the major problems of the modern world. The problem of environmental pollution on account of essential industrial growth is practical terms, the problem of disposal of industrial effluent, whether on solid, liquid or gaseous. All the three types of wastes have the potentially of ultimately polluting water. The effluents coming from industries some time percolates through subsoil and reaches the ground water uses of industrial effluents and sewage sludge on agricultural land has become a common practice in India as a result of which these toxic metals can be transferred and concentrated into plant tissues from the soil .These metals have damaging effects on plants themselves and may became a health hazards to man and animals.

Sugar Industry: Sugar industry is one of the most important agro based industries in India. Sugar industries play an important role in Indian economy. It is the second largest industry in the country. Sugar industry is seasonal nature and operates only for 120 - 200 days in a year. A significant large amount of waste is generated during the manufacture of sugar and contains a high amount of production load par-

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ticularly in terms of suspended solids, organic matters, effluent, sludge, press mud and bagasse.

MATERIALS AND METHODS

The samples taken from the nearby area of sugar industry throughout the year and brought to the laboratory and stored at 4°C. on a monthly basis for the period of 12 month from Jan to Dec 2012 samples are collected from three different locations which is situated nearby sugar industry. Samples collected in clean polyethylene bottles and immediately transported to the laboratory for the estimation of various physico-chemical parameters via pH and dissolved oxygen were recorded at site where as the other parameters like Alkalinity, chlorides, hardness, magnesium, potassium, phosphate, hardness were estimated in the laboratory by using titration method, BOD of was measured by dilution method, COD was measured by close reflux method for the estimation of water given by APHA (1998) .

RESULTS AND DISCUSSION

In the present investigation it was observed that the pH value between 6.1-7.0 (Fig. 1). The maximum value of alkalinity was recorded in the month of Sept 480 mg/L (Fig. 6), maximum value of alkalinity due to increase in bicarbonates in the water. The value of total hardness fluctuated from 610mg/L to 880mg/L (Fig. 7). The values of chlorides in different months were found to be various ranges from 242 mg/L to 642 mg/L (Fig. 8). The chloride contents indicate industrial pollution. The maximum value of chloride was recorded in the month of June and minimum value was recorded in the month of March. The maximum value of sulphate was observed 68.4mg/L (Fig. 9) in the month of Jun and the minimum value 30.6mg/L was recorded in the month of Dec. higher value of sulphate responsible for corrosion. Phosphate values ranges between 0.31mg/L to 0.62mg/L (Fig. 10). DO, BOD and COD are not a pollutant but they are pollution indicator. The values of BOD and COD were higher than the permissible limits. Higher values of these parameters in ground water indicate industrial pollution. It is that the ground water becomes polluted due to the sugar industry effluents from surrounding areas. Hence, it is not suitable for human consumption without prior treatment. Moreover, the water is used for irrigation and domestic purposes in that area. In the present investigation it was observed that the sugar industry effluents have effect on the groundwater quality. Higher values of these parameters indicate the contamination of water due to the accumulation of salts, minerals from the industrial wastewater to the soil and leaching to the ground water and harmful for domestic purpose.

CONCLUSION

Different physico-chemical parameters measured during the study have higher values. The present study indicates that those parameters affect the water quality around the sugar industry also affect the ecosystem. It was observed that 50% to 70% of pollution load is from effluent. The study also has resulted in several policy changes and strict regulatory measures for water quality maintenance in the system are required. There is need for continuous monitoring of pollution nearby sugar industry.

Table 1. Physico-chemical status of groundwater of Bankhedi Sugar Industry

S.No.	Parameters	Units	Permissible Limits	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
1.	pH	-	6.5-8.5	6.3	6.7	6.5	7.0	6.7	6.4	6.1	7.0	6.9	6.4	6.2	6.3
2.	EC	µ/cm	300	2186	2650	3187	2265	3015	3245	3564	3812	3205	2624	2472	2784
3.	DO	Ppm	6	7.1	6.9	5.8	5.5	5.9	6.7	7.2	8.1	7.5	8.4	8.0	7.9
4.	BOD	Ppm	6	164	182	195	162	140	105	135	170	140	192	130	120
5.	COD	Ppm	10	210	245	230	190	215	220	238	222	188	145	174	168
6.	Alkalinity	Mg/L	600	235	472	411	393	361	330	370	415	480	380	450	425
7.	Total Hardness	Mg/L	600	610	760	730	750	690	670	720	840	880	810	790	740
8.	Chlorides	Mg/L	1000	512	480	242	384	530	642	580	360	625	520	340	625
9.	Sulphates	Mg/L	400	40.2	52.3	54.7	45.0	59.1	68.4	60.2	59.9	48.2	67.5	35.2	30.6
10.	Phosphates	Mg/L	0.1	0.62	0.31	0.47	0.55	0.40	0.38	0.42	0.48	0.39	0.42	0.51	0.45
11.	TDS	Mg/L	500	1665	1210	1610	1380	1740	2230	2115	2060	2240	1960	2090	1986

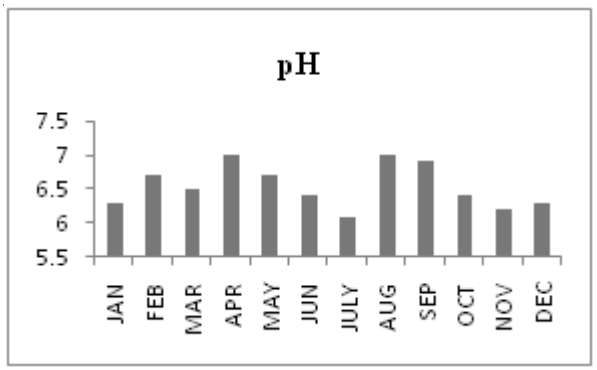

Fig. 1 Monthly trends in pH values

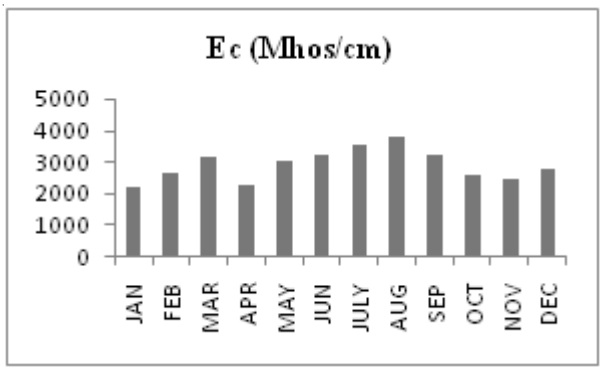

Fig. 2 Monthly trends in Ec values

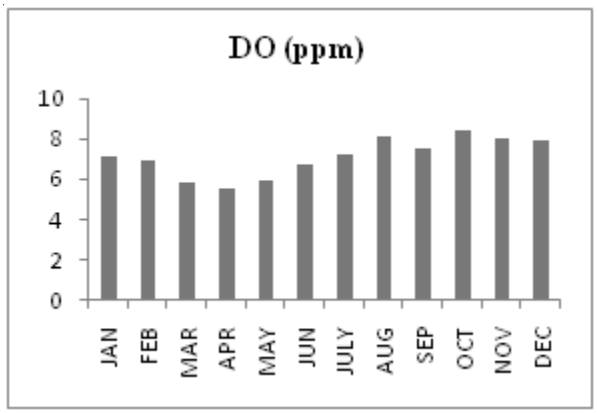

Fig. 3 Monthly trends in DO values

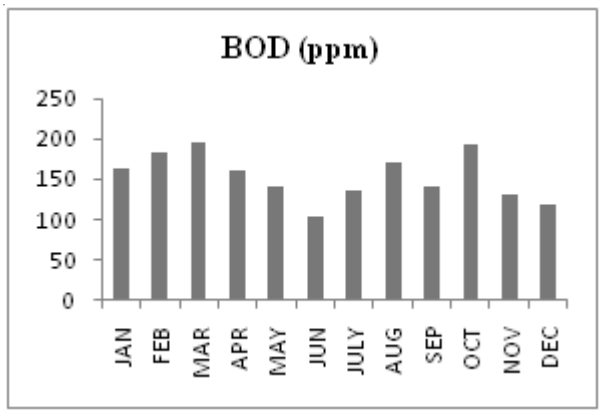

Fig. 4 Monthly trends in BOD values

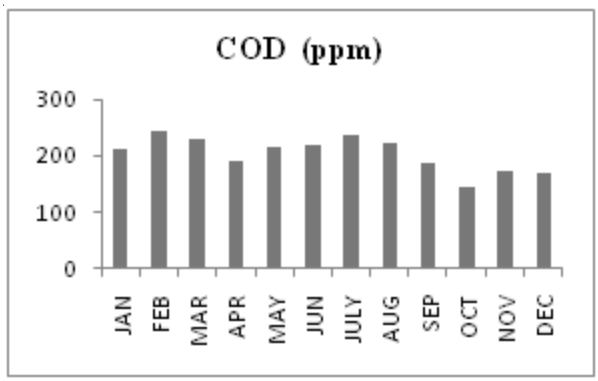

Fig. 5 monthly trends in COD values

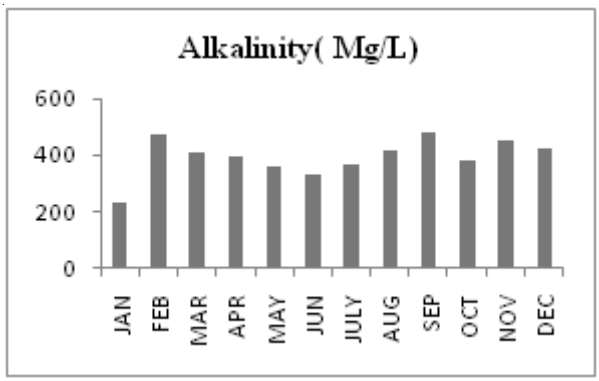

Fig. 6 Monthly trends in Alkalinity values

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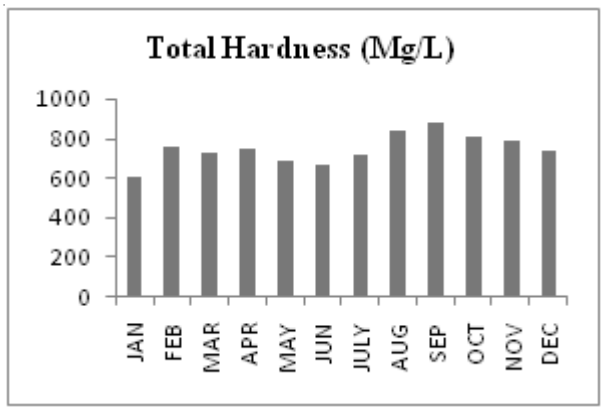

Fig. 7 Monthly trends in Total Hardness values

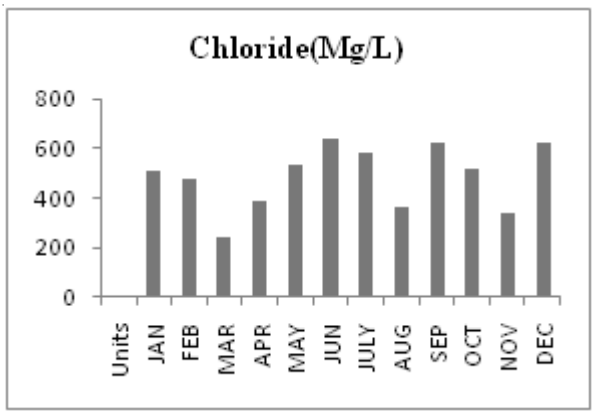

Fig. 8 Monthly trends in Chlorides values

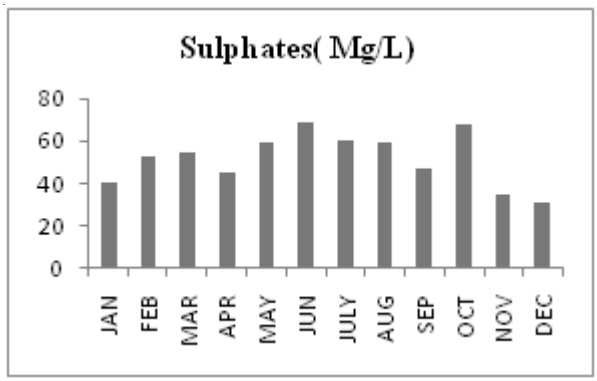

Fig. 9 Monthly trends in Sulphate values

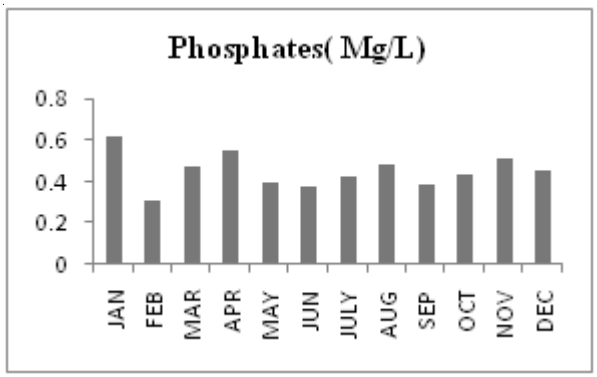

Fig. 10 Monthly trends in Phosphates values

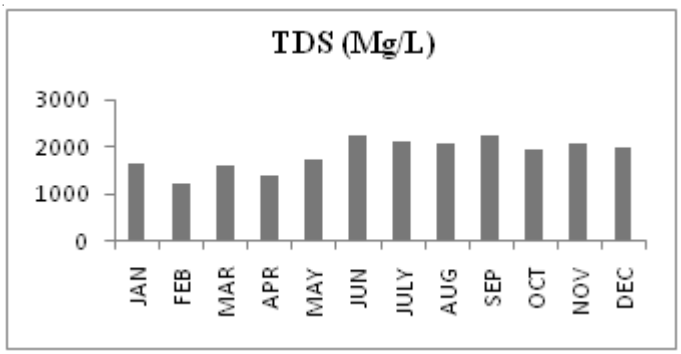

Fig. 11 Monthly trends in TDS values

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