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Study of physico–chemical quality of ground water in rural area nearby Samastipur District, Bihar

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Abstract
In this study, physico–chemical assessment of ground water samples was determine by using standard analytical methods. The objective of the study is to analyze the parameters of water along locations of 02 villages nearly Samastipur district for 3 season's pre monsoon, monsoon and post monsoon. The aim of this study was compare with levels obtained with the WHO and drinking water directive.

Keywords: Ground water, drinking water directive

Introduction
The environment, economic ground and developments are all highly influenced by water, Its regional and seasonal availability and the quality of surface and ground water. The quality of water is affected by human activities and is declining due to the rise of urbanization, population growth, industrial production, climate change and other factors. The resulting water pollution a serious threat to the well–being of both the earth and its pollution is a serious threat to the well–being of both the earth and its population.
The Physico–chemical contaminants that adversely affected the quality of ground water is likely to arise from a variety of sources, including land application of agricultural sources, including land application of agricultural chemicals and organic waters, infiltration of irrigation water, septic tanks and infiltration of effluent from sewage treatment plants, pits, lagoons and ponds used for storage [1], B. Rajappa *et al.* [2], Patil Shippa G. *et al.* [3], Promod N. Kamble *et al.* [4], Zamraka in *et al.* [5], is the groups of prominent chemist importantly contributed to assessed the quality of ground water.

Study Area and Collection of Water Samples
Ground water samples were collected from in and arround shivaginagar and Sighia village of Samastipur district. Each water sample was taken every month during June 2017 to July 2019. The samples were collected in prewashed (with detergent, diluted HNO_3 and double de–ionized distilled water respectively) clean polythene bottles without any air bubleles in the field.

Results and Discussion
The results of the physico-chemical analyses of the study areas are as shown in Tables 1 and 2 for dry and rain seasons respectively. pH values of groundwater observed varied from 5.66 to 6.87 in dry season and 5.27 to 6.29 in rainy seasons with the mean of individual areas as shown in above tables.

Conclusion
The physic-chemical assessment of groundwater in major parts of Samastipur district state based on land uses covering industrial, coastal, dry land, residential and landfill areas were carried out. The groundwater samples could generally be classified as fresh and moderately hard with acidic pH values. Majority of the quality parameters investigated were found below the WHO limits. The sources of pollutants were diverse with industrial effluent, municipal solids and septic having a great impact on the groundwater resources. There is need for continuous regulation and quality control monitoring to prevent and control pollution in order to safeguard human health.

Table 1

Areas	pH	EC. (ns/cm)	Hardness (mg/L)	TDS (mg/L)	TSS (mg/L)	HCO_3^- (mg/L)	Cl^- (mg/L)	NO_3^- (mg/L)	SO_4^{2-} (mg/L)	PO_4^{3-} (mg/L)	K (mg/L)	Mg (mg/L)	Fe (mg/L)	Ca (mg/L)	Na (mg/L)
Industrial Mean (IL) C.V.	5.66_a 21.1	0.77_a 8.5	63.19_a 55.7	347.08_a 59.7	406.92_a 92.1	55.03_a 22.0	107.30_a 82.2	1.42_a 55.7	18.55_a 37.8	1.38_a 66.7	144.19_a 70.1	21.07_a 15.9	1.85_a 26.3	53.72_a 49.5	165.55_a 35.8
Landfill Mean (LF) C.V	5.68_a 21.8	1.01_a 8.9	86.80_b 61.2	444.27_b 65.6	298.32_b 76.9	123.49_b 19.1	192.37_b 55.8	1.79_a 51.9	9.88_b 53.8	1.03_a 72.2	221.78_c 67.6	16.55_a 38.4	5.36_a 98.0	53.72_a 77.1	22.47_b
Coastal Mean (RC) C.V.	6.37_a 14.9	0.41_b 24.6	43.11_a 28.1	207.25_a 24.1	245.15_b 47.3	58.58_a 24.3	84.89_a 67.5	0.29_b 56.1	14.99_a 12.6	0.53_b 59.2	28.87_b 16.3	11.52_a 15.9	1.12_b 26.3	59.79_a 48.3	65.50_c 83.9
Resident Mean (RA) C.V.	5.58_a 17.3	0.81_a 9.9	89.05_b 48.5	400.74_b 58.7	56.77_c 21.8	32.41_c 13.3	119.43_c 26.9	1.66_a 49.0	17.26_a 16.5	0.90_b 47.6	0.243_d 37.1	96.19_b 30.2	7.59_c 83.1	53.72_a 32.3	28.73_b 32.5
Dry Land Mean (RR) C.V.	5.98_a 7.11	0.83_a 10.9	129.79_c 14.7	379.31_c 29.3	467.23_d 88.5	32.11_c 31.7	148.63_b 67.5	2.16_b 56.1	22.30_a 12.6	0.15_c 59.2	23.93_b 16.3	7.584_c 15.9	16.55_d 26.3	57.78_a 12.6	155.94_a 12.9

Same alphabet (subscripts) in each column indicate no significant difference

Table 2

Areas	pH	EC. (ms/cm)	Hardness (mg/L)	TDS (mg/L)	TSS (mg/L)	HCO_3^- (mg/L)	Cl^- (mg/L)	NO_3^- (mg/L)	SO_4^{2-} (mg/L)	PO_4^{3-} (mg/L)	Mg (mg/L)	Fe (mg/L)	Ca (mg/L)	Na (mg/L)	K (mg/L)
Industrial mean (IL) C.V	5.61_a 21.2	0.54_a 79.7	54.63_a 52.1	250.90_a 72.5	270.98_a 95.2	54.31_a 19.7	84.93_a 60.5	1.13_a 70.2	14.61_a 36.2	1.08_a 67.2	18.87_a 50.1	1.24_a 46.9	75.38_a 46.2	132.75_a 42.1	128.41_a 73.2
Landfills mean (LF) C.V	5.68_a 21.7	0.96_a 8.3	75.43_b 60.1	419.20_b 63.9	444.27_b 92.9	105.34_b 19.1	147.81_b 62.8	1.39_b 50.0	7.84_a 50.0	0.98_a 52.8	13.49_a 35.2	5.19_a 82.1	48.29_a 76.4	201.92_b 47.1	187.57_b 58.2
Coastal mean (RC) C.V	6.20_a 15.1	0.25_b 39.2	40.15_a 25.7	200.90_a 20.9	205.27_a 72.1	43.95_a 25.4	78.54_a 12.9	0.17_a 55.7	11.87_a 78.6	0.45_b 54.2	9.82_a 40.5	1.00_a 76.3	52.29_a 48.5	69.23_b 75.5	23.41_c 52.7
Resident mean (RA) C.V	5.27_a 18.9	0.73_a 8.3	76.95_b 50.7	339.81_b 61.9	400.07_b 67.9	27.83_c 14.2	98.32_c 31.3	1.21_a 55.6	15.86_a 15.3	0.88_b 37.4	79.92_b 31.8	6.50_a 74.6	230.43_b 32.3	26.91_b 32.3	0.201_d 39.8
Dryland mean (RR) C.V	5.54_a 15.5	0.67_a 8.9	109.06_c 16.7	379.30_c 28.9	50.84_c 22.6	30.02_c 29.5	123.82_b 77.1	1.50_a 65.1	18.40_a 14.7	0.09_c 86.1	7.16_c 15.6	14.95b 25.3	42.61_a 15.7	134.09_a 13.5	

Same alphabet (subscripts) in each column indicate no significant difference

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