



E-ISSN: 2706-8927
P-ISSN: 2706-8919
www.allstudyjournal.com
IJAAS 2020; 2(2): 06-07
Received: 07-02-2020
Accepted: 09-03-2020

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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 nearby 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 around 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 HNO₃ and double de–ionized distilled water respectively) clean polythene bottles without any air bubbleles 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. ($\mu\text{s}/\text{cm}$) | 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 _b 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 _b 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 | 14.95 _b 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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