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ORIGINAL ARTICLE

PHYSICO-CHEMICAL ANALYSIS OF GROUND WATER OF SELECTED AREA OF DARBHANGA CITY-A CASE STUDY

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Abstract:

The planet Earth along with atmosphere sustaining life is called Biosphere. Water, one of the important constituent of this biosphere may be considered as precious gift of nature which is essentially required by all kinds of life and is most abundantly available on the planet earth. In this paper, a study has been conducted to monitor the ground water quality of selected sites of Darbhanga city by examining the various physico-chemical parameters like pH, TD.S., D,O.& CO2 etc. It is found that the quality of ground water under study is nearly fit for drinking purpose, but it is recommended that ground water analysis should be carried out from time to time to monitor the rate and kind of contamination along with analysis of DBPs to corroborate the present study

KEY WORDS:

Physico-chemical parameters, Water characteristics, Ground water analysis.

1.INTRODUCTION

Over burden of the population pressure, unplanned urbanization, unrestricted exploration policies and dumping of the polluted water at inappropriate place enhance the infiltration of harmful compounds to the ground water. Studies regarding the ground water quality analysis has been made by many authors like Badola and Singh (1981) on Alkhananda river. Sinha et. al. (1986) of Ganga river, Satata et. al (1995) of Gaga river. The work of on drinking water at Darbhanga district is very scanty, Available work on ponds in Darbhanga district Siddiqui (1983) Bazmi (1989) and Dudeni (1987) Rahmatullah (2000).Shikha Bisht et al.(2007).They concluded that it is the high rate of exploration then its recharging, inappropriate dumping of solid as well as liquid wastes, lack of strict enforcement of law and loose governance are the cause of deterioration of ground water quality. Municipal Corporation of Darbhanga facilitates the drinking water in limited area, in alternate to this people keeps option as hand pumps and jet pumps etc. from last few years it has been seen that the water quality of the alternative sources like hand pumps, wells has been deteriorating and its responses are in the form of yellowish and uncommon odor of the water people in this area using chlorine tablets for disinfect the drinking water. The objective of this work is to assess the quality of drinking water in Darbhanga city.

2. MATERIALS AND METHODS:

2.1 Study area:

The experiment was conducted at Dept. of Zoology Marwari .College, Darbhanga. The coldest months here are December-January and the hottest months are May-June. The Temperature varies from 5°

to 17° centigrade in winters and 300 to 42° in summers. But sometimes winter temperature ebbs to 3° C and summer temperature shoots up to 450C. In the summers, which begin from March and last till Mid June the temperature starts rising and sometimes it reaches 450 C. The annual rainfall in the district was between 800 mm. and 1200 mm and in 2011 the rainfall was 1034 mm. On the average there are 49-55 rainy days (days with rain fall of 2.5 mm or more) in a year in the district July and September the relative humidity are high being over 70 %. During the Post-Mansoon and winter season the humidity is high in the morning. By summer, the relative humidity become very low i.e. less than 25 %.Anonymous (2011).lt having 42 wards with some extension areas of the city five sites are selected for the study as mentioned in Fig.:-1 Map View. The average boring depth of the city is 45-60 meter

2.2 Sampling and sampling sites:

A fluorinated plastic bottle of capacity 2 litre has been used to collect the sample, before sampling evacuation of the stored water in the pipelines has been made to take the fresh ground water sample the selected sampling sites are populated and urban areas of the city depicted in the Fig.: 1 A map view of Darbhanga city as site I to V. The sampling has been carried out in the month of April year 2011.

Figure 1: A map view of study site Darbhanga city.

2.3 Methodology:

pH was measured with the help of pH meter (Model no. 101 E) of Electronic India, standardized with pH buffer 4,7 and 9.2. TDS was estimated by evaporation method at 180°C, Alkalinity, Hardness, D.O., Chloride, CO2 and all parameters were analyzed by standard procedure mentioned in APHA (1995). The elemental analysis carried out by digital flame photometer.

2.4 Statistical analysis:

The data were subjected to one way ANOVA analysis of variance using SPSS vet. 10 software Ducan's multiple range test performed to test the significance difference among the treatments.

3.RESULT:

Table 1: Reading of water quality parameters at different sites in Darbhanga city.

Parameters	S1	S2	S3	S4	S5	ICMR
pH	7.4±.00^{c}	7.2±.00^{c}	6.8±.12^{d}	8±.11^{b}	8.3±00^{a}	7.0–8.5
T.D.S.	200±6.5^{c}	175±2.5^{d}	145±2.8^{e}	225±2.5^{b}	2.45±7.6^{a}	500
T.H.	256±.1^{c}	235±11^{d}	240±4.04^{d}	266±1.15^{b}	304±3.015^{a}	300
Cal. Hard.	108±.11^{c}	99±.7^{d}	106±2.3^{c}	140±.35^{b}	8±3.5^{a}	–
D.O.	3.4±005^{e}	4.1±006^{b}	3.6±.00^{d}	4±.00^{c}	5±.00^{a}	4–6
Cl	78±.30^{e}	100±1.5^{b}	83±1.1^{d}	91±.57^{c}	106±.17^{a}	200
Alk.	120±.10^{b}	140±7.5^{a}	110±5.77^{b}	140±.17^{a}	149±1.7^{a}	200
Co_2	7.42±.009^{c}	7.84±.003^{a}	7.92±.002^{a}	7.05±.002^{d}	7.67±.00^{b}	–
Na	23±.17^{b}	28±.005^{b}	25±.00^{b}	42±6.7^{a}	46±2.3^{a}	–
K	4±.00^{c}	4±.00^{d}	6±.00^{c}	8±.00^{b}	10±.00^{a}	75

Different letters in each group shows significant difference at P<O.05 levels.(Mean ± stand. error)
S1- Laxmisagar, S2-Mirzapur, S3-Donar, S4-Bhatiyarisarai, S5-Subhankarpur.

4. DISCUSSION:

The value of pH range among 6.8 to 8.3. It is in the prescribed limit of ICMR. A little bit increase in pH level may depress the effectiveness of the disinfectants like chiorinations thereby requiring the additional chiorines. The value of total dissolved solid ranges from 145-245 mg/I all the values of total dissolved solid is in the prescribed limit of ICMR it is due to high dissolved salts of Ca, Mg and Fe it requires specific cation and anion analysis. Total hardness ranges from 235-304 mg/I, total hardness is with in the prescribed limit of ICMR except the site-S which is 304 it fall in hard water category it means it contains appreciable amount of Calcium and Magnesium ions. Calcium hardness ranges from 99-158 mg/I. Dissolved Oxygen ranges from 3.4-5 mg/I, D.O. indicating the nearly pure symptoms. Chloride content is 78-106. Chloride content is also in the limit of ICMR. Alkalinity ranges from 110-149 mg/I. Alkalinity is the cause of carbonate and bicarbonate ion and its salts. It is in the prescribed limit of ICMR. Cabon dioxide content is from 7.02-7.92 ppm. According to Henry's law the gaseous dissolution has been determined by partial pressure of gases, soluble salt content and ambient temperature. Increase in CO2 content may be by high dissolved salt contents. One more possibility is there that is the degradation of DOC (dissolved organic carbon).Higher DOC on post disinfectant application causes some DBPs (Disinfection byproducts) like THM (Trihalomethanes), HAA (Haloaceticacids) etc. Some of them are potential carcinogens, and a short-term exposure can lead to dizziness, headaches, as well as to problems associated with the central nervous system. so it is more relevant for those areas where OM contaminations are high with high use of disinfectants. Quality of ground water under study is nearly fit for drinking purpose, but it is recommended that ground water analysis should be carried out from time to time to monitor the rate and kind of contamination along with analysis of DBPs to corroborate the present study

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