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PHYSICO-CHEMICAL ANALYSIS OF DRINKING WATER QUALITY OF SARDIHA PANCHAYAT, SAHARSA, BIHAR

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ABSTRACT

Sardiha is an important panchayat in Saharsa District. The present work describes a report on the physico-chemical studies of drinking water of Sardiha, Saharsa, Bihar and its some interior area. Because of the geographical isolation and flood affected, people residing in the interior area, mostly do not have access to safe drinking water. In the absence of fresh water supply, the people are forced to take water from any source that lies in the village. In most of the interior area, tube wells water is used for drinking purposes and other domestic purposes. Tube wells water is the underground water and is generally of good quality. Physico-chemical studies such as temperature, pH, dissolved oxygen, total dissolved solids, chlorides, total alkalinity, calcium hardness, iron, fluoride and nitrate of tube wells water was carried out from different sampling stations and compared with the standards values prescribed by BIS, ICMR, WHO and APHA. Results show that the amounts of iron present in drinking tube wells water is above the prescribed limit whereas other parameters are within the prescribed limits. Alkalinity of one tube well water is much higher, which is not fit for irrigation purposes.

Key words: Physico-chemical Studies, Tube well, Water quality, Sardiha

INTRODUCTION

At present man is facing the most severe ecological crisis of pollution of environment as well as of water. Water pollution is a phenomenon that is characterized by the deterioration of the quality of water as a result of various human activities. 70% of India's water is polluted by conventional standards[1]. The water quality of Saharsa district is very poor due to high iron concentration. Also, bacteriological quality of water is doubtful due to low water level. Iron is not directly related to health hazard but high content of iron in drinking water affects taste, colour and odour and promotes iron bacteria and may cause gastric trouble in children, constipation, abortion in women, diabetes

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particularly in women, dysentery, diarrhea, untimely oldness, damage of liver, untimely graying of hair and other complications. Blood dysentery and jaundice may break out in epidemic form under high iron concentration.

EXPERIMENTAL

Water samples collected from different places were analyzed as per standard method led down by APHA-AWWA-WPCP[2]. All the chemicals used were of AnalaR grade. Samples for analysis were collected in sterilized bottles using the standard procedure for grab or catch samples in accordance with the standard methods[3]. The samples were collected from eight different places.

RESULTS AND DISCUSSION

The chemical examination of water samples was carried out for the temperature, pH, BOD, COD, TDS, chloride, calcium, magnesium, nitrate, phosphate, sulphate and fluoride. The analytical results of various tube wells have been shown in Table 1.

Temperature of water sample is 300.6 K. The various chemical and biological reactions in water depend on the temperature to a great extent. The variation of water temperature was directly related to atmospheric temperature, which is having more effect directly or indirectly on all life processes.

A pH range of 6.5 to 8.5 is normally accepted as per guide line suggested by WHO. The pH value of water sample in the study area ranged from 6.56 to 8.48. It is apparent form the data for pH that the water is always associated with some kind of alkalinity. High pH is normally associated with a high photosynthetic activity of water[4].

Total dissolved solids (TDS) values should be less than 500 mg/L for drinking water as suggested by WHO and Indian Standards. All the values obtained lie in the range suggested by WHO and Indian Standards[5]. High values of total alkalinity viz. 422 mg/L were observed in water samples from tube well's of T_3. Such waters may cause excessive encrustation in distribution pipes as these water have a positive saturation index. High values associated with water bodies make them apparently polluted. Waters with such high values of alkalinity are not fit for irrigation purposes.

Table 1. Physico-chemical parameters of undergraound water in Sardiha village of Saharsa district

Parameters / Samples	T1	T2	T3	T4	T5	T6	T7	T8
pH	7.61	6.73	7.72	8.48	8.14	7.84	7.34	6.56
Total alkalinity (mg/L)	325.00	405.00	422.00	369.00	388.00	388.00	339.00	413.00
Total hardness (mg/L)	113.00	989.00	410.00	359.00	298.00	132.00	274.00	516.00
Calcium hardness (mg/L)	61.24	106.90	189.93	74.21	62.74	191.01	82.39	69.74
Chloride (mg/L)	34.96	28.27	4.36	29.11	33.92	6.67	86.32	55.74
Total dissolved solids (TDS) (mg/L)	400.00	374.00	345.00	320.00	470.00	345.00	440.00	490.00
Fluoride (mg/L)	0.87	1.09	0.94	1.02	0.99	0.87	1.40	0.89
Iron (ppm)	0.41	4.56	0.14	0.49	2.43	0.39	9.58	0.12
Tube wells of	T1 - P. N. Singh		T3 - Navratna Pustkalay		T5 - South tola		T7 - Thakur Bari	
	T2 - West tola		T4 - Late R. N. Singh		T6 - D. D. High School		T8 - Balthi Chowk	

The main source of water for drinking is tube wells in the study area and water is found at low level at 10-15 feet and iron is maximum in this area, which is evident from the fact that water imparts yellow colour to pots, cloths and floors and forms scum, when allowed to settle for some time.

As per I. S. Code, the desirable limit of iron content in drinking water is 0.3 ppm. In absence of alternate sources, it means that beyond 0.3 ppm iron content in water is not to be allowed for drinking purpose in any case. According to I. S. Code (1991), beyond this limit (0.3 ppm) taste and appearance are affected and promotes iron bacteria. At T_2, T_5 and T_7, the ground water contains as high as 9.58 ppm (at T_7) iron. At this place, treating this water to produce I. S. grade water requires a very long and equally complicated series of operations. Again, apart from these microbial and ananoleptic problems, excess iron causes several complications. If it happens to be permanently deposited within different organs, it hampers their smooth functioning. For general use, the brown colour and turbidity due to iron make the water psychologically unacceptable, despite the fact that iron is most beneficial for human health[6].

The higher values of fluoride has been reported in some samples and the dental flurosis[7] may occur in those cases, where water content fluoride is more than 1.00 mg/L.

The chloride content of water samples are within the limit i.e. 500 mg/L (for drinking water). These amounts will not impart any taste to water.

Calcium is an essential element for human nutrition. Although, insufficient amount may induce adverse physiological effect. Concentrations, as high as 1800 mg/L is proved to be harmless. The maximum values viz. 191.01 mg/L of Ca^{2+} was recorded in tube well water at D. D. High School (T_6).

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