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A Case Study on Physico-Chemical Parameters of Ground Water in Balrampur District, Uttar Pradesh (India)

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Abstract

Groundwater were gathered from different territories in Uttar Pradesh's Balrampur and examined for 10 parameters of water quality, viz. PH, EC, TDS, Complete Hardness, Calcium, Magnesium, Sodium, Potassium, Nitrates and Chloride. It was discovered that the greater part of the inspected area has indicated that they are in permissible limit prescribed by WHO. The pH ranges from 6.90 to 8.50, showing that the qualities are inside the reach endorsed by WHO. Low pH doesn't cause unfriendly responses. Calcium and magnesium substance in water are 67 to 96 mg/l and 24 to 55 mg/l respectively. Nitrate fixations in ground water went from 28 mg to 56 mg/l. TDS values range from 265 mg/l to 375 mg/l. which is with the limit prescribed by WHO

Keywords: Ground water quality, Chloride, Total hardness, Balrampur, TDS, Electrical Conductivity, Nitrates

INTRODUCTION

Much of the water on earth is salt water (97 percent). Just 3 per cent of the fresh water available for use is fresh water, 2.2 per cent is surface water and 0.8 per cent is present in the form of ground water [1]. It is used for residential, agricultural and irrigation purposes. Groundwater contamination is one of the major issues, with effluents from different factories being discharged into open pits or unlined canals without any treatment that pollutes ground water sources [2]. It is also tainted by other human activities [3-6]

Different physico-synthetic boundaries, for example, pH, alkalinity, absolute hardness, all out broke down solids, calcium, magnesium, nitrate, sulfate have a significant task to carry out in surveying the movability of drinking water.

The objective of the present study is to determine the physico-chemical parameters of ground water in the Balrampur District in order to determine if the quality of ground water is suitable for drinking purposes.

MATERIALS AND METHODS

Balrampur is in nearness to Shravasti, where Lord Gautam Buddha is considered to have indicated his heavenly powers in the profound change of Angulimala, the acclaimed dacoit who wore a neckband (mala) of fingers (anguli). Balrampur was the seat of Balrampur Estate, the Taluqdari of Oudh, in the Mughal time frame.

Ground water samples were obtained at 8 separate sampling points. Samples for analysis were obtained in 500 ml bottles of polyethylene. The pH was calculated at the site. Samples were analysed using the standard procedure APHA 1995[7];

Table 1: WHO standard of desirable and permissible limits of various water quality parameters.

S. NO	PARAMETERS	WHO	
		highest desirable limit	maximum permissible limit
1.	pH	7.0-8.5	6.5- 9.2
2.	Electrical conductivity (µ S/cm)	750	1500
3.	Total Dissolved Solids (Mg/L)	500	1500
4.	Total Hardness (Mg/L)	100	500
5.	calcium (mg/l)	75	200
6.	Magnesium (mg/l)	30	150
7.	Sodium (mg/l)	50	200
8.	Potassium (mg/l)	100	200
9.	Chloride (mg/l)	250	600
10.	Nitrate (mg/l)	--	50

Table 2: - Water quality parameters of drinking water in Balrampur District

Parameters	**Station 1**	**Station 2**	**Station 3**	**Station 4**	**Station 5**	**Station 6**	**Station 7**	**Station 8**
pH	6.90	7.12	7.33	7.07	8.90	8.50	7.95	8.25
Total dissolved solid (mg/l)	290	265	295	340	351	375	285	359
Dissolved oxygen (mg/l)	3.70	4.80	1.90	3.00	2.60	3.25	3.65	4.95
Total Acidity (mg/l)	150	185	145	190	250	208	185	275
Total hardness (mg/l)	185	175	285	253	210	265	256	295
Calcium (mg/l)	70	80	80	67	89	96	81	93
Magnesium (mg/l)	26	24	33	31	40	46	55	55
Chloride (mg/l)	140	153	210	195	130	230	175	245
Sulphate (mg/l)	95	100	145	175	110	165	125	128
Nitrate (mg/l)	41	28	45	45	39	52	21	56

RESULTS AND DISCUSSION

Most biological and chemical reactions are regulated by the pH of the water system [8]. The pH values range from 6.90 to 8.90 which indicates that most of the sample are within the desirable limit of WHO.

The TDS ranges between 265 to 375 mg/l which is well inside the attractive furthest reaches of WHO. High TDS value induces human gastrointestinal discomfort, but long-term use of high TDS water can cause kidney stones and heart disease [9].

In water quality assessment DO is an important parameter. The presence of DO gives the flavor of drinking water. The DO values likewise demonstrate the degree of tainting in water bodies [10]]. The value of DO ranges from 1.90 to 4.95 mg/l. The acidity values range from 145 to 275 mg/l

The capacity to precipitate soap is known as water hardness. The overall hardness is the sum of the hardness of calcium and magnesium. Presence of minerals [11] is the primary cause of hardness. The hardness esteems range from 175 mg/l to 295 mg/l, which is inside the WHO admissible breaking point.

Calcium contained somewhere in the range of 69 and 96 mg/l, which shows that solitary two examples are underneath the alluring WHO limit and the rest of the example arrives at as far as possible however is inside the cutoff points endorsed by WHO. The presence of calcium is the product of lime stone deposits, gypsum. Calcium plays a significant role in maintaining healthy bone growth [12].

Magnesium in the reach 24 to 55 mg/l shows that solitary two examples are beneath the attractive WHO limit and most of the examples arrives at as far as possible yet inside the suitable WHO limit. Magnesium is significant for the development of chlorophyll and is a restricting variable for the development of phytoplankton [13].

The concentration of chloride is somewhere in the range of 130 and 245 mg/l, which is inside the attractive furthest reaches of the WHO. The high concentration of chloride may affect the metabolism of the body and increase the electrical conductivity of water [14].

Sulfate is an essential nutrient for plants and animals at lower concentrations, but may cause adverse effects at higher concentrations. Sulfate fluctuates from 95 to 175 mg/l, which is within the desirable WHO limit.

Nitrate ranges from 21 to 56 mg/l, which is within the limits prescribed by WHO. Excessive nitrate concentrations cause blue baby disease in infants and stimulate algal aquatic growth.

CONCLUSIONS

Water quality parameters viz, pH, TDS, total hardness, calcium, magnesium chloride, nitrate and sulphate are within the limits prescribed by WHO for drinking water. Physicochemical parameters of ground water suggested that water is suitable for pisciculture, irrigation and drinking purposes.

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