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PHYSICO-CHEMICAL ANALYSIS OF GROUNDWATER COLLECTED FROM MOTH BLOCK OF JHANSI DISTRICT, U.P., INDIA

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ABSTRACT

Due to human and industrial activities the groundwater is contaminated. This is the serious problem now a day. Thus the analysis of the water quality is very important to preserve and prefect the natural ecosystem. The assessment of the groundwater quality was carried out in the different village of Moth block of Jhansi district, central India. In Physico-chemical analysis, various quality parameters are measured including pH, turbidity, total hardness, Iron, Chloride, Fluoride and Nitrate concentration present in groundwater. Also all parameters were compared with WHO standards of water quality. The study of physico-chemical characteristics of this groundwater sample suggests that the evaluation of water quality parameters as well as water quality management practices should be carried out periodically to protect the water resources.

INTRODUCTION

Water is an essential and vital component for our life support system. In tropical regions ground water plays an important role with context to fluctuating and increasing contamination of surface water resources. Ground water has unique features which render it particularly suitable for public water supply. It has excellent natural quality, usually free from pathogens, color and turbidity and can be consumed directly without treatment (Saleem e*t al.,* 2012). Although statistics, the WHO reports that approximately 36% of urban and 65% of rural Indian were without access to safe drinking water (Nidhi, *et al.,* 2011).Fresh water is one of the most important resources crucial for the survival of all the living beings. Human and ecological use of ground water depends upon ambient water quality. Human alteration of the landscape has an extensive influence on watershed hydrology (Claessens, *et al.,* 2006). The consequences of urbanization and industrialization leads to spoil the water for agricultural purposes ground water is explored in rural especially in those areas where other sources of water like dam and river or a canal is not considerable. During last decade, this is observed that ground water get polluted drastically because of increased human activities. Consequently number of cases of water borne diseases has been seen which a cause of health hazards. An understanding of water chemistry is the bases of the knowledge of the multidimensional aspect of aquatic environmental chemistry which involves the source, composition, reactions and transportation of water. The quality of water is of vital concern for the mankind since it is directly linked with human welfare (Yadav *et al.,* 2010) .The present work is an attempt to measure the water quality of Moth block, Jhansi district, Uttar Pradesh, India.

Experimental Section

Study Area

Moth block is located in the Bundelkhand region of central India Jhansi district in the southwestern part of the Uttar Pradsh Lie between 25’7’ and 25’ 57’ north latitude and 78’10’ and 79’25’ east longitudes. Total geographical area of the district is 5024 sq km block headquarter is at Jhansi and there are four number of Tehsils namely Jhansi, Moth Gauratha and Mauranipur. As per 2011 census, district population was 1744907 souls of which 932800 were males and812107 females.

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Table 1. Physico-chemicals analysis of ground water of moth block

S.No.	Sites / Parameters	Bhujod (H.P.)	Silari (H.P.)	Silari (W)	Poonchh (H.P.)	Erach (H.P.)	Aamkhera (H.P.)	Kumhrar (H.P.)	Saujna (H.P.)	Shajhanpur (H.P.)	Budhawali (H.P.)	Basowai (H.P.)	Khilli (H.P.)	Bamhroli (H.P.)
	Temp.	32.45	31	24.75	30.92	33.15	31.2	31.4	31.2	29.8	30.2	30.9	28.3	26.2
1	Max-min	36.8-28	34-28	27-22	34-27	36-29	35-27	35-26	34-27	32-26	33-27	34-28	32-25	28-24
	SD	3.7	2.5	1.9	3.0	2.8	3.6	4.6	3.2	2.5	2.9	2.3	3.1	2.1
	pH	7.4	7.3	7.4	7.6	6.5	7.7	7.5	7.3	7.5	7.2	7.3	7.2	7.8
2	Max-min	7.6-7	7.5-7	7.8-7	8-7.2	6.9-6.3	8-7.5	7.8-7.4	7.5-7	7.8-7.3	7.5-7	7.8-7	7.5-7.1	8-7.6
	SD	.7	.12	.33	.34	.25	.22	.17	.25	.20	.20	.34	.17	.19
	Fluoride	.5	.77	1.27	.42	.7	1.07	1.2	.77	.52	.55	1.37	.57	.8
3	Max-Min	.7-.4	.9-.6	1.4-1.2	.5-.3	.8-.6	1.5-.7	1.7-.5	1.5-.5	.6--.4	.7-.4	1.5-1.2	.7-.5	.9-.7
	SD	.14	.12	.09	009	.08	.35	.53	.48	.09	.12	.15	.09	.08
	Iron	1.5	.7	.42	.6	.47	.57	.42	.92	1.62	.62	.52	.7	1.9
4	Max-Min	1.7-1.3	.8-.6	.5-.4	.7-.5	.5-.4	.6-.5	.5-.4	.8-.7	1.1-1	.7-.5	.6-.4	.8-.5	1.3-1.0
	SD	.16	.08	.05	.08	.085	.05	.05	.05	.05	.05	.09	.14	.14
	TH	650	787.5	318	275	243	306	193	281	443	231	393	450	462
5	Max-min	750-550	825-750	375-300	325-200	275-200	350-250	250-150	325-200	475-400	250-200	375-300	475-400	500-400
	SD	91	32	37	54	31	42	42	55	37	23	31	35	47
	Nitrate	71.55	72.87	13.3	45.3	15.3	11.3	9.7	40.9	48.17	68.75	65.12	14.5	17.5
6	Max-min	75-70	80-65	15-8	45-45	15-15	15-9	10-8	42-40	52-45	70-65	65-65	15-12	20-14
	SD	2.6	6.2	3.6	2.4	.15	2.8	1.1	1.09	3.6	2.5	.25	1.3	3.3
	Turbidity	5.4	5	4.25	3.3	4.6	4.6	4.2	3.3	3.5	3.6	4.1	5.7	5.4
7	Max-min	5.5-5.3	5.2-5	4.5-4	3.5-3.1	5.4-4	5.1-3.6	4.3-4.1	3.6-3.0	3.6-3.4	3.9-3.1	4.3-4	5.2-5.0	5.5-5.4
	SD	.09	.09	.2	.18	.68	.69	.08	.25	.08	.35	.15	.09	.05
	Chloride	42.5	60	30	42	27	30	57	22	24	32	35	37.5	110
8	Max-Min	50 -30	70-40	30-30	50-20	50-20	40-20	40-20	60-50	30-20	40-30	40-20	50-30	120-100
	SD	9.5	14.14	.01	12	15	9.5	8.1	5.0	5	5	10	9.5	8.1

SD- Standard Deviation, Max- Maximum, Min- Minimum, H.P.- Hand Pump, W- well

Water Sampling

Samples were collected at the monthly variation from February 2011 to June 2011. Sixty five samples ensure maximum representation of diverse environments of the area. For sampling, Plastics bottles were used. Sampling was carried out directly without adding any preservatives in clean bottles to avoid any contamination and brought to the laboratory. Collected water samples were brought to the laboratory and stored in cold room at 1-4 ^{0}C temperature in order to avoid any major chemical alteration for various physico-chemical analysis (APHA-2005).

Analytical design

Physical and chemical properties of water have been done according to using Hi-Media (WT 023) Kit and their specific range for water analysis.

RESULTS AND DISCUSSION

Temperature

Water temperature is important because most of the physical chemical and biological characteristics of a surface and groundwater are directly affected by temperature such as the amount of gas, including oxygen that can be dissolved in the water. In present study, average temperature was recorded 33-26 ^{0}C.

pH

pH of solution is taken as negative logarithm of H_2 ions for many practical practices. Value range of pH from 7 t0 14 is alkaline, from 0 to 7 is acidic and 7 is neutral. Mainly drinking water pH lies from 6.4 to 8.5.

The pH scale commonly ranges from 0 to 14. Most of the water is slightly alkaline due to presence of carbonates and bicarbonate. The pH value of sample varied between 6.5 to 7.9 and were found within the prescribed limit by WHO.

Turbidity

Suspension of particles in water interfering with passage of light is called turbidity. Turbidity is caused by wide variety of Suspended particles. Turbidity can be measured either by its effect on the transmission of light which is termed as Turbiditymetry or by its effect on the scattering of light which is termed as Nephelometry. The turbidity value varied between 5 to 3 NTU.

Total hardness

As per IS: 10500-2012 Desirable limit and Permissible limit for hardness is lies between 200 to 600 mg/l respectively. The effect of hardness is scale in utensils and hot water system in boilers etc. soap scum's sources are dissolved calcium and magnesium from soil and aquifer minerals containing limestone or dolomite. The treatment of hard water is softener ion exchanger and reverse osmosis process. The degree of hardness of drinking water has been classified in terms of the equivalent $CaCO_3$ concentration as follows: Soft -0-60mg/l, Medium - 60-120 mg/l, Hard - 120-180 mg/l, Very hard - >180 mg/l. The hardness value of these groundwater samples was shown from the range of 243 to 787 mg/L.

Chloride

All type of natural and raw water contains chlorides. It comes from activities carried out in agricultural area, industrial activities and from chloride stones. Its concentration is high because of human activities. As per IS: 10500-2012 Desirable limit for chloride is 250 and 1000 mg/l in Permissible limit. The Chloride value varied between 22 to 110 mg/l.

Fluoride

Fluoride occurs as fluorspar (fluorite), rock phosphate, triphite, phosphorite crystals etc, in nature. Among factors which control the concentration of fluoride are the climate of the area and the presence of accessory minerals in the rock minerals assemblage through which the ground water is circulating. As per IS: 10500-2012 Desirable limit for fluoride is 1 and 1.5 mg/l in permissible limit. The Fluoride value of sample varied between 0.5 to 1.3 and were found within the prescribed limit by WHO.

Iron

The main sources of iron in ground water are naturally as a mineral from sediment and rocks or from corroding metal. The range of iron have been found in between 0.3 to 1.7 ppm in moth block. long term consumption of drinking water with high concentration of iron may leads to liver diseases. The Iron value varied between .4 to 1.9 mg/l.

Nitrate

Nitrate is present in raw water and mainly it is a form of N_2 compound (of its oxidizing state). Nitrate is produced from chemical and fertilizer factories, matters of animals, decline vegetables, domestic and industrial discharge. As per IS: 10500-2012 Desirable limit for nitrate is max.45 and no relaxation in permissible limit. The Nitrate value varied between 9 to 72 mg/l.

Conclusion

This study shows that ground water is the only source for people in the study area, and the results of the chemical analyses of ground water indicate considerable variation. Most of the water samples do not comply with ICMR standards for drinking purpose. The water quality in the investigated area is found to be suitable for drinking only in few locations, while as out prior treatments. It must be noted that a regular chemical analysis must be done to insure that the quality of water in this area is not contaminated, in addition to research for new walls in the area in order to get additional water for the resident people.

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