HYDRO-CHEMICAL ANALYSIS OF GROUND WATER IN HINGANGHAT TEHSIL, DIST- WARDHA (MS), INDIA

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ABSTRACTS

Ground water is one of the most useful water sources found in earth. The importance of the hydro chemical analysis underlies the fact that the chemistry of ground water can directly be rated with the source of water, climate and geology of the region. Contamination of such water is responsible for creating health hazards. In this paper chemical analysis of the ground water has been carried out for hinganghat tehsil in wardha district. The water sample collected from different location in hinganghat Tehsil, Wardha (India). The ground water samples were analyzed for the following Hydro-chemical parameters; pH, Electrical Conductivity (EC), Total Alkalinity (TA), Total Hardness (TH), Chloride, Nitrate, Sulphate, Dissolved Oxygen (DO) and Total Dissolved Solid (TDS). The results Obtained shown that it is free from anomalies and suitable for human and cattle consumption as well as irrigation purpose in hinganghat tehsil, Wardha districts, Maharashtra, India.

KEYWORDS: Ground water, hydro-chemical Parameter, TH, P^H, TDS, DO, EC, TA.

INTRODUCTION

"If there is no water on earth, there will be no life"
Ground water is an essential resource all over the world. The term groundwater is typically reserved for the subsurface water that happens beneath the water level in soils and geologic formation that are fully saturated.[1] Water is an essential component for survival of life on earth planet which contains minerals, important for human as well as for earth and aquatic life. It exists in three different state solid, liquid and gas. It acts as a media for both Chemical and biochemical reactions and also internal and external medium for several organisms. Water is an important component of the environment and it sustains life on the world. People depend upon water for their survival. Water is additionally a staple for photosynthesis and thus, is vital for crop production. Obviously, an optimum agricultural production depends on water and soil quality.[2]

In India, most of the population depends on ground water (well or bore water). The groundwater is believed to be comparatively much clean and free from pollution than surface water. But prolonged discharge of economic effluents, domestic sewage and solid waste dump causes the groundwater to become polluted and created health problems.[3] The safe portable water is completely essential for healthy living. Spring water is ultimate and best suited water resource for human consumption in both urban also as rural areas. The importance of spring water for existence of human society can't be overemphasized. There are several states in India where quite 90% populations are hooked in to groundwater for drinking and other purpose.[4]

Ground water is that the principal source of beverage in our country and indispensable source of our life. The problem of spring water quality is acute. Groundwater is specially, important because it accounts for 88% you look after the drinking water in rural areas.[5] Water is extremely essential for survival of all living organisms The standard of water is significant concern for mankind since it's directly linked with human welfare. The standard of public health depends to a greater extent on the standard of spring water, which should be clean and fresh.[6]

Ground water for human consumption must be free from microorganisms and chemical substance in concentration larger enough to cause environmental imbalance and disease. The composition of surface and groundwater depends on natural factors (geological, topographical, meteorological, hydrological and biological) within the catchment area and varies with seasonal difference in runoff volumes, weather and water levels.[7] Thus, the ultimate objective of the present research were to investigate the physic-chemical parameter of ground water collected from different sites in Hinganghat tehsil of Wardha districts, Maharashtra, India. The analyzed

data were compared with standard values recommended by World Health Organization (WHO).[8]

MATERIAL AND METHODS

Study Area
Hinganghat is a small city and a taluka in the state of Maharashtra, with the population exceeding 100,000 people. The city is rapidly expanding, and currently, about 76 more villages are about to enter the municipality zone. Local community is of Marathi origin and speaking Marathi language. There are a few old historic temples in the town, including Ram Mandir, Jain mandir, etc.

Hinganghat, Maharashtra, India is located at *India* country in the *Cities* place category with the coordinates of 20° 33' 2.0628" N and 78° 50' 28.1076" E. it is situated left bank to the Wanna river. The city is on the National Highway No.7 and 48 kms to west of Wardha district.

Sample Collections
Ground water sample were collected in polythene bottle of 2 lit from different location of hinganghat tehsil of wardha district, MS, India. The samples were collected from open wells, bore wells as well as from hand pump. The polythene bottle have been previously washed with 10% HNO_3 and 1:1 HCl and rinsed with same sample water taken in that bottle and labeled. Immediately add few drops of HNO_3 were added in order to prevent bacterial and fungal growth.

The sample are collected from different location during lockdown period due to COVID-19 in 2020 from June 2020 to November 2020 are GW$_1$- Hinganghat GW$_2$- Aajanti GW$_3$- Nandori GW$_4$-Alipur GW$_5$- Yenora GW$_6$- Kutki GW$_7$- Wadner GW$_8$- Pimpalgaon GW$_9$- Nandgaon GW$_{10}$- Wagholi

The results of ground water sample from different location were noted shown in table 2.

Hydro- Chemical Analysis
All the samples were analyzed for the following Hydro-chemical parameters; pH, Electrical Conductivity (EC), Total Alkalinity (TA), Total Hardness (TH), Chloride, Nitrate, Sulphate, Dissolved Oxygen (DO) and Total Dissolved Solid (TDS). The hydro-chemical analysis of ground water samples were out carried in accordance to standard analytical methods.[9]

All the chemicals used were of AR grade and double distilled water used for preparation of solutions. Details of the analysis methods are summarized in Table-1.

Table 1: Methods employed in the hydro-chemical examination of ground water samples.

Sr. No	Parameters	Methods	Units
1	Temperature	Thermometer	°C
2	pH	Digital pH – Meter	--------
3	Electrical Conductivity	Digital Conductivity meter	umhos/cm
4	Total Alkalinity	Titrimetric Method (With HCl)	mg/l
5	Total Hardness(as $CaCO_3$)	Titrimetric Method (with EDTA)	mg/l
6	TDS	Digital Conductivity meter	mg/l
7	DO	Titrimetric Method	mg/l
8	Chloride	Titrimetric Method (with $AgNO_3$)	mg/l
9	Nitrate (as NO_3^-)	Spectrophotometric Method	mg/l
10	Sulphate (as SO_4^{2-})	Turbid metric Method	mg/l

RESULT

Table 2: Hydro-Chemical Analysis of ground water quality parameter in Hinganghat tehsil, Wardha, Maharashtra, India.

Sr.No	Parameter	GW1	GW2	GW3	GW4	GW5	GW6	GW7	GW8	GW9	GW10
1	Temperature	25.3	25.8	26.1	25.4	27.1	24.5	27.6	25.2	23.4	24.1
2	pH	6.7	5.9	6.6	5.7	6.2	7.1	6.8	7.2	6.2	5.8
3	Conductivity	1105	1130	717	682	398	1205	870	1110	930	705
4	Alkalinity	650	810	450	620	190	700	490	560	670	290
5	Total Hardness	220	190	160	340	230	120	140	250	150	120
6	TDS	120	109	125	135	190	240	204	260	180	130
7	DO	2.34	1.90	2.95	2.32	1.24	2.30	2.1	3.3	4.1	2.5
8	Chloride	132	175	190	120	210	140	136	220	180	165
9	Nitrate	11.2	10.5	9.6	8.5	7.5	11.7	6.5	10.2	11.5	7.9
10	Sulphate	42.2	40.6	60	38	79	22.1	32.5	34.1	25.1	79.2

DISSCUTION

The results of hydro-chemical analysis of the ground water from different locations of hinganghat tehsil, wardha district, MS, India are presented in the table 2.

Temperature
Temperatures play a vital role in the organisms for their biological and metabolic activity. The temperature during the study period ranges in between 23.4^{o}C to 27.6^{o}C. The lowest temperature was observed for the sample from Nandgaon village which is nearer to wanna river which is on south side of hinganghat. The maximum temperature was observed for the Pimpalgaon village. This is may be due to the effluents of the surrounding area of village.

P^H
P^H of water is important for the biotic compound because most of the plant and animal species can survive a narrow range of pH from slightly acidic to slightly alkaline condition.[10] In the present study, the area of observation during hydro-chemical analysis PH ranges in between 5.9 to 7.2, which are within the permissible limit of ICMR, BIS and WHO.

All chemical and biological reactions are totally dependent upon the p^H of water system.[11] The lowest pH was observed for the sample from Aajanti village which is also nearer to wanna river and present on north side of hinganghat and maximum at Nandagaon village.

Electrical Conductivity
Electric conductivity is used to determine the concentration of ionized constituents already present in the water.[12] In present area of study ground water analysis of different location in hinganghat tehsil Electrical conductivity results are in between the ranges from 398 to 1205 umhos/cm which is within the permissible limits of BIS and WHO. The lowest EC was observed in Kutki village and maximum at wadner village.

Total Alkalinity
The natural water acquires the alkaline nature due to the presence of CO_2 in water or HCO_3 get formed by the action of limestone or chalk with water. The alkalinity provides the buffer action to resist the change in P^H of ground water.[13] In ground water, most of the alkalinity is caused due to carbonates and Bicarbonates. The alkalinity ranges in between 190 to 810 which is within the permissible limits of Who and BIS. The lowest value was found for the village kutki and maximum for the village Aajanti.

Total Hardness
Hardness is the property of water to form the lather with soap and increases the boiling point of water mainly because of calcium and magnesium ions.[14] The value of total hardness are low during the winter and rainy session which is mainly due to the dilution and high during the summer can be attributed to decrease in water volume and increase of rate of evaporation of water.

In the present area of study the total hardness is ranges in between 120 to 250 which is within the permissible limits of WHO and BIS. The maximum value was observed at Nandgaon village of hinganghat tehsil.

Total Dissolved Solid
Total dissolved solid played an vital role for drinking water and water which is used for other purposes beyond the prescribed limit, actually it imparts a peculiar taste to water and reduce its potability.[15] Total dissolved solids are composed mainly of carbonates, bicarbonates, chlorides, phosphates and nitrates of Calcium, Magnesium, Sodium, Potassium, Manganese, organic matter salt and other particles. In the present area for study the TDS value ranges from 109 to 340 mg/L, which is also within the prescribed permissible limits. Maximum TDS recorded at Alipur village and minimum at Aajanti village.

Dissolved Oxygen
Dissolved Oxygen ranges from 1.90-4.1mg/l, D.O. indicating the nearly pure symptoms.

Chloride
Chloride is negatively charge anion and which determine the total salinity of the ground water. Chloride can get into the ground water through solid waste come in contact with rain water. High chloride content in ground water can be due to excessive evaporation which in turn causes eutrophication.[16] Chloride found during the study ranges in between 165 to 229 which is within the permissible limits of BIS and WHO. The lowest value was observed for Waghuli village and higher at Nandgaon village.

Nitrate
Nitrates which are present in soils may be from soluble nitrate compounds or from run-off from inorganic fertilizers that may leach into the wells.[8] High concentration of nitrate is an responsible of organic pollution. In present area of study ground water analysis of different location Nitrates results are in between the range of 6.5 to 11.7mg/l. The lowest value was observed at Pimpalgaon village and higher at Wadner village.

CONCLUSION

The present area of study shows detailed report of hydro - chemical analysis of ground water samples of Hinganghat tehsil Wardha district, MS, India. The study is analyzed 10 parameters of 10 different locations which are essential to identify ground water quality the water parameter results are compared with the standards of BIS, ICMR and WHO. In overall ten location ground water sample parameters are showed best results which are within the limitations of BIS, ICMR and WHO standards.

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