SCREENING OF BIOLOGICAL & PHYSICO-CHEMICAL PARAMETERS OF GROUND WATER AROUND VADODARA CITY

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Abstract: Contaminated groundwater is common problem in drinking water systems. Water system arerequired safe and purified for drinking water.coliform bacteria are organisms commonly found in water, soil and plants. In this study, Six water samples of ground water were collected from different areas of Vadodara. In these Six samples two samples were higher MPN number. The MPN test was used for screening method to detect coliform contamination. The primary water quality analysis for physico -chemical parameters indicate variation of samples. All samples pH values were varying between 6.28 to 8.71 which signifies the basic range of pH. The turbidity values of water sample were between 0.7 NTU to 2.4 NTU. TDS higher concentration observed in between 112 mg/liter to 522 mg/liter. pH , Alkalinity , Calcium , Magnesium , Nitratewere below the permissible limit but the water sample concentration of Chloride and Turbidity were higher than the permissible limit. Therefore the primary indication was threatful in case of drinking water quality.

Keywords:- **Ground Water, MPN, Physico –Chemical Parameters, TDS, Turbidity, pH**

1. INTRODUCTION

Life comes out in water and it is Groundwater, the water that present at a lower layer of Earth's surface in soil pore spaces and in the small particle of rock formations.Ground Water is capable of being renewed natural resources, which is replenished yearly by the precipitation.

Ground Water quality plays important role in ground water protection and quality conservation. Hence, it is very important to evaluate the ground water quality not only for its present use but also from the viewpoint of a potential source of water for future use .(AkhileshJinwal*et al*., 2007) India is facing a serious problem of natural resources insuffinciency , especially that of water in view of population growth and economic development. Better quality of water is described by its physical, chemical and biological characteristics. But some asoociation is possible among these parameters and the significant one would be useful to indicate quality of water (Khan, Arar*et al*., 2016)

I. LOCATION

The study area is Vadodara city of Gujarat,India.Vadodara is located at 22.30^{0}N, 73.19^{0}E in western India at an elevation of 39metres (128ft). It is the 18th-largest city in India with an area of 235 square km².The city sits on the banks of the Vishwamitri River, in central Gujarat. The city is situated on the fertile plain between the Mahi and Narmada Rivers.

This study aims to investigate the current status of Physico-chemical parameters in the ground water of Vadodara. The samples were collected from different areas of Vadodara city. Samples were collected from hand –pumps and bore wells.

Figure No:-1.1 LOCATION OF STUDY

Figure No:-1.2 Map Of Different Sampling sites

2 Material & method

The selected study area was vadodara city. In this study , total 21 ground water sample were collected from different areas of all over vadodara city. Sample were collected in sterilized sampled bottles for biological test sample were collected fromthe bore or hand pump was sterilized under flame by spirit lamp before collected of sample. The sample bottles were labelled with its details to avoid the errors . Samples were stored in an icebox and brought lab for checking both physical & chemical & biological parameters.pH , TDS ,Turbidity , alkalinity , sulphate , nitrate , chlorine, calcium, magnesium, coliform, Bacteria.all these parameters are carried out for the collected ground water samples.

- **pH:**

performed by **Electrometric Method .**Around70 -80 ml of water sample is taken in 100 ml beaker. In water sample, the pH and temperature electrodes were immersed.Recorded the pH of water sample to the nearest coefficient or 0.01 unit & temp. to the nearest ^{o}C.

- **TDS (Total Dissolved Solids)**

performed by **Gravimetric Method.** The given BIS limit for TDS is max. 500 ppm. Filter the Sample through 0.45 micron filter paper.100 ml of Sample was taken and Evaporated at 98^{o}C in drying oven. Weigh petridish once it cools in Desicator.

- **Turbidity**

performed by **Nephelometric Method**Before starting the procedure turbidity meter was calibrate using distilled water &std turbidity suspension. Pour the sample in the turbidity meter tube.Reading of the sample is recorded from the instrument.

- **Alkalinity**

performed by **Indicator Method**20 ml of sample was pipette out and 2-3 drops of phenolphathalien indicator was added for the sample which had pH over 8.3.Titrated with 0.02N H_2SO_4.Recorded the volume of std. acid use after phenolphathelien alkalinity

Calculation : -Phenolphathalien alkalinity (as mg/ L of caco3) = A x N x 50,000 / V
Total alkalinity [as mg/ L caco3] = (A + B) x N x 50000 / V

- **Chloride**

performed by **Argentometric Method.** 100 ml of sample was taken.For highly coloured sample, 3 ml aluminium hydroxide suspension was used. mixed settled and filtered. pH range of 7-10 was adjusted in sample with the help of H_2SO_4 or NaOH1 ml of potassium chromate indicator solutions was added.Titrated against 0.0141 N std silver mitrate solution and pinkish yellow colour was observed as end point Standardize the silver nitrate solution and established reagent blank value by titration method.

Calculation:-Chloride , mg/L = (V1 – V2)x N x 35450/V3

- **Sulphate**

performed by **Turbidity Method.** Sample was filtered through 0.45 micron filter, to remove the turbidity.20 ml of water sample was taken in 100 ml conical flask.1 ml of 1: 9 hydrochloric acid was added 1 ml of conditioning reagent was added.Mixed it for 30 seconds and waited for 10 minutes for conditioning reagent to settled out.Absorbance at 420 nm was measured.Ploted a standard graph of sulphate concentration against absorbance.

- **Calcium**

performed by **EDTA Titrimetric Method**100 ml of sample was taken .1 ml NaOH was added to raised the pH between 12 – 13.gm of patton and reeder's reagent – sodium sulphate mixture indicator was addedTitrated with 0.01 M EDTA solution and got pure blue colour as end point

Calculation :- mg / L = A x B x 1000 / V

- **Magnesium**

performed by **Volumetric Method**100 ml of sample was taken.1 gmofpatton&reeder 's reagent – sodium sulphate mixture indicatorTitrated against 0.01 M EDTA solution for the purplecolour end point. Record the Volume as V_1 Another 500 ml sample taken , Add 2 ml potassium cyanide & Add 25 ml Triethanolamine Solution. Add 3-4 drops of EBT indicator.Titrate with 0.01 M EDTA solution till pure blue colour.

Calculation :- mg / L = A x B x 1000 / V

- **Nitrate**

performed by **Chromotropic Acid Method**1 ml of standard nitrate solution was pipette out into the 10 ml volumetric flaskdrop of sulphite urea solution reagent was added and flask was placed in cold water tray (10 – 20^{o}c)ml of antimony reagent & 1 ml of chromotropic acid was added and placed in cooling both for 3 minutesHolded for 45 minutes at room temperature and adjusted the volume to 10 ml withconcentration H_2SO_4Final mixing was performed avoided gas bubbles Absorbance was measured at 410 mmMitrate free water was used in the refrence cell of the spectrophotometer .

- **MPN Test**

MPN test was performed by setting up the nine tube using double strength of lactose broth.The MPN method uses a test tube full of media with a small inverted durham' s tube inside which captures co2 gas realeased from the growth of coliform bacteria.According to the size fo the water samples tubes were prepared i.e. 0.1 ml, 1 ml and 10 ml respectively.0.1 ml of water sample was added in (1,2,3) tube and 1 ml of water sample into tube 4,5,6 and 10 ml of sample in 7,8,9.Incubated all the tubes at 35oc for 24 hours for gas production.MPN no. was determined by the standard methods given by APHA, 1998.

3 RESULTS AND DISCUSSION

Table No:- 3.1 Permissible Limit of Physico-Chemical parameters

PARAMETERS	PERMISSIBLE LIMIT	Unit	PARAMETERS	PERMISSIBLE LIMIT	Unit
pH	6 to 8.5	-	Chloride	250	mg/litre
TDS	500	mg/litre	Calcium	75	mg/litre
Turbidity	1	NTU	Magnesium	30	mg/litre
Alkalinity	200	mg/litre	Nitrate	45	mg/litre
Chloride	250	mg/litre	Sulphate	200	mg/litre

Table 3.2: Chemical parameters of ground water

SAMPLE NUMBER	pH	TDS	Turbidity	MPN Test	ALKALINITY	CHLORIDE	SULPHATE	CALCIUM	NITRATE
S1	7.19	473	0.7	3	91	2.49	64.46	65	14.58
S2	6.28	354	0	3	88	29.99	4.61	66.5	2.98
S3	8.11	317	0.7	3	88	7.49	20	49.69	0.6
S4	7.51	475	1	7	110	349.89	238	27.25	1.8
S5	7.91	112	1	20	74	24.49	31	20.04	10.6
S6	7.24	478	2.4	3	114	124.96	66	19.23	1.6
S7	8.23	435	0.4	1	89	9.99	58	20.84	4.5
S8	7.42	205	0.2	1	73	13.99	76	24.84	8.2
S9	8.14	538	0.6	9	93	10.99	125	26.45	3
S10	8.63	132	1	3	65	13.49	275	16.83	0.5
S11	7.55	262	0.2	1	63	21.99	80	19.23	1.2
S12	8.27	460	0.7	9	64	38.98	35	22.44	1.8
S13	7.93	399	0	15	68	16.49	49	23.24	0.3
S14	7.82	108	0.1	1	78	20.99	64	26.45	3.2
S15	8.27	660	0	1	76	19.99	49	28.05	0.8
S16	8.16	639	0.3	9	83	26.49	74	32.86	1.4
S17	7.96	442	0.4	3	125	289.91	77	30.46	44
S18	8.28	105	0.1	3	194	220.91	105	44.88	50
S19	8.57	471	0.2	3	70	14.95	80	69.36	3.4
S20	8.33	105	0.3	1	76	24.24	74	66.53	1.3
S21	8.14	510	0	1	106	14.45	65	59.31	0.8

4 CONCLUSION

Water system are required safe and purified for drinking water.The study analysis of collected ground water samples of different areas shows that values of pH , Alkalinity , Calcium , Magnesium , Nitrate were consistently below the permissible limit. Where concentration of Sulphate , Chloride , Turbidity , TDS were exceed permissible limit of water in two samples. But in other water samples concentration of Sulphate , Chloride , Turbidity and TDS were below the permissible limit.Many samples of ground water had unacceptable coliform contamination so it is recommended that in regular period of time disinfection of ground water sources should be done.

5 INFERENCE

Groundwater is used for drinking purpose and apart from that it is also used for different purposes like Agricultural , municipal , industrial. For Physico – Chemical parameters BIS methods were used. BIS standards were used for detecting the quality of water resources and for the effectiveness of water analysis .Poorquality of ground wateraffects public health.Less MPN number indicates that water is safe for drinking purpose. Less numbers indicates that collected water samples contains few coliform bacteria so that chances of disease were less.

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