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PHYSICO-CHEMICAL ANALYSIS OF SOME GROUND WATER SAMPLES IN GHANSAWANGI TALUKA, DIST- JALNA (MH),INDIA

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ABSTRACT The area under investigation received scanty rain fall in last few years. Ghansawangi is facing acute shortage of drinking water supply, and now a day's these area residents mainly depend on ground water as an alternative source for potable water. Ghansawangi is a newly declared Taluka. It is fast growing in these days and hence water quality and pollution studies have become an important for citizeans. An attempt has been made to evaluate the ground water quality of Ghansawangi Taluka and to assess their suitability for domestic and drinking purposes. many fluctuation of water quality parameters was observed during the study across the sampling station

KEYWORDS : Physicochemical analysis,, Ground water, water bodies, Dug Well

INTRODUCTION

Ground water is a key source of drinking water that is essential to life on earth over the last two decades, issues of ground water pollution has become health threat by contamination through urban development without adequate attention to sewage and wastes disposal and rapid industrialization, without provision for proper sewage treatment, disposal of wastes and effluents. It has originated from disposal on land ,water bodies, leaching of heavy metal ions from mineral rocks to a shallow sandy aquifer, which affect ground water hydrology and cause damage to soil, plants and animals including human beings. The degradation of ground water quality is a major and severe problem that lies all over the world, especially in Maharashtra. The states like Maharashtra and Andhra Pradesh have a shortage of water especially for domestic and drinking purposes.

The water present on the surface of the earth is put to multifarous use. Water bodies from a sources of man's domestic, agricultural and industrial use ,H.A. Hawks, .(1982) After being used water containing the residuals of the activities is allowed to flow down into the stream or river. These waste waters are loaded with organic and inorganic pollutants, which are not only harmful to plants and animals but also to the metal structures in the water body namely pipelines, bridges, boats etc. R.M. Harrison, (1982). The rural and agricultural lands are increasingly converted into industrial, urban and suburban areas. As a result the increase in population and industries with the subsequent rise in demands for drinking water places an intolerable burden on the natural resources these factors alter the physical environment and bring about changes. In the recent past, many studies have reported that the water bodies are getting contaminated increasingly due to domestic as well as industrial waste waters in many parts of our country B.L. Gupta,(1969).,D.S. Bhargawa, (1985).Disposal of waste in the open space and abandoned dug wells have thus cause the pollution of ground water in some parts of India ,C. Manas, (1976) G.C. Chaterji, A.G. Biswas and S. Niyogi,(1964) and S.E. Wadia, Tech. (1977) The survey of literature reveals that no work has been reported on the water quality of Ghansawangi Taluka and hence this work is undertaken.

MATERIALS AND METHODS:

Twenty ground water samples were collected from the study area. Were collected in the study area, randomly selected from study area in the month Jan 2020 with all precautions and preserved as per the recommended procedures ,American Society for Testing and Materials, (1972).For sampling, bore wells, pump were permitted to flow for more than 10 min and required quantity of water was collected in pre-cleaned polythene containers and immediately preserved.

The chemical analysis of water samples was carried out by the standard procedures. Immediately after collection of samples, the visual parameters such as colour, odour, clarity, presence of suspended matters were recorded in the field itself. the values of physico-chemical or water quality parameters (WQP's) of ground waters such as temperature (T), pH, electrical conductivity (EC), by R.A. Robinson, and R.H. Stokes,(1959) method. Total dissolved solids (TDS),by C.S. Howard,(1933). method. The total alkalinity (TA), as given by Shell-Eitra(2000).The Total hardness (TH), determined by complexometric titrationm methods. chloride, were determined by argento metric titration method. sulphate, calcium, magnesium, by complexometric method using EDTA as a complexing agent, Sodium, &potassium, by flame photomete,)Systronics Medi flame, Model 127, India(. Dissloved oxygen (DO), by Wrinklers metho,Turbidity (TUB), by using turbid meter, while fluoride (F') by Fluoride-Ion-Electrode (IRON) and ORION 407 A Ion Meter.

RESULTS AND DISCUSSION:

Twenty ground water samples were selected from the study area which are used for domestic, drinking and agricultural use.

TABLE – 1
Table-1.Drinking water standards

WQPS	USPH	WHO	EPA	ICMR	BIS
pH	-	7.0-8.5	-	7.0-8.5	6.5-8.5
TDS	500	500	-	500	500
TH	600	100	-	300	300
CI-	250	200	350	250	250
SO42-	230	200	250	200	200
Ca2+	-	75	-	75	75
Mg2+	-	30	-	50	30
TA	-	-	-	200	200
EC	-	-	-	-	750-2250
Na+	-	-	20	-	-
K+	-	-	-	-	12
DO	-	02-May	-	500	4
Turbidity	-	5	-	5	5
Fluoride	-	1	-	1	1

Concentrations are in ppm except turbidity in NTU.

Table-2

Water Quality Parameter (WQP)	Khadkawadi (GU1)	Chincholiwadi (GU2)	Chincholi (GU3)	Ramgaon (GU4)	Bahiregaon (GU5)
Temperature (T)	25°C	26°C	27°C	26°C	25°C
pH	7.22	7.76	7.23	8.00	7.12
Electrical conductivity (EC)	1260.00	325.00	720.00	426.00	396.00
Total dissolved solids (TDS)	819.00	211.20	468.00	277.00	257.50
Total alkalinity (TA)	470.00	540.00	480.00	862.00	409.00
Total hardness (TH)	2800.00	570.00	1120.00	867.00	850.00
Chloride (Cl^-)	1740.00	145.00	330.00	395.00	395.00
Sulphate SO_4^{2-}	259.00	260.00	2550.00	1575.00	1590.00
Calcium (Ca^{2+})	584.00	115.00	240.00	200.00	198.00
Magnesium (Mg^{2+})	322.00	70.00	126.00	89.00	93.00
Sodium (Na^+)	53.00	28.00	32.00	23.00	21.00
Potassium (K^+)	42.00	35.00	22.00	8.20	3.00
Dissolved oxygen (DO)	5.02	5.50	6.00	5.10	5.91
Turbidity (TUB)	2.50	1.60	1.80	2.00	1.90
Fluoride (F^-)	0.11	0.23	0.38	0.22	0.10

Units : All the parameters are given in ppm excluding pH, EC-μmhos/cm, Temperature-°C and Turbidity NTU.

Table-3

Parameter (WQP)	(GU6)	(GU7)	(GU8)	(GU9)	(GU10)
Temperature (T)	25°C	27°C	28°C	24°C	25°C
pH	7.21	7.10	7.20	7.31	7.50
Electrical conductivity (EC)	393.00	440.00	650.00	450.00	331.00
Total dissolved solids (TDS)	255.50	286.00	422.50	292.50	215.10
Total alkalinity (TA)	550.00	550.00	180.00	350.00	570.00
Total hardness (TH)	350.00	532.00	195.00	370.00	482.00
Chloride (Cl^-)	36.00	336.00	195.00	28.00	78.00
Sulphate SO_4^{2-}	39.00	2490.00	410.00	31.00	88.00
Calcium (Ca^{2+})	89.00	245.00	39.00	75.00	98.00
Magnesium (Mg^{2+})	70.00	128.00	25.00	130.00	186.00
Sodium (Na^+)	20.00	37.00	30.00	45.00	47.00
Potassium (K^+)	22.00	23.00	3.00	4.00	3.00
Dissolved oxygen (DO)	5.30	5.61	5.80	4.90	4.96
Turbidity (TUB)	2.80	2.10	1.80	2.80	2.60
Fluoride (F^-)	0.28	0.31	0.39	0.41	0.21

Units : All the parameters are given in ppm excluding pH, EC-μmhos/cm, Temperature-°C and Turbidity NTU.

Table-4

Water Quality Parameter (WQP)	Bhaygavan (GU11)	Rahera (GU12)	Tanwade (GU13)	Devhivara (GU14)	Ghansawangi (GU15)
Temperature (T)	27°C	25°C	27°C	26°C	28°C
pH	7.30	7.61	7.31	7.52	7.32
Electrical conductivity (EC)	360.00	422.00	720.00	433.00	449.00
Total dissolved solids (TDS)	234.00	274.30	468.00	281.50	291.80
Total alkalinity (TA)	580.00	380.00	490.00	360.00	350.00
Total hardness (TH)	480.00	490.00	850.00	380.00	386.00
Chloride (Cl^-)	248.00	309.00	380.00	272.00	353.00
Sulphate SO_4^{2-}	345.00	249.00	321.00	320.00	280.00
Calcium (Ca^{2+})	144.00	103.00	335.00	125.00	111.30
Magnesium (Mg^{2+})	33.62	53.00	5.67	5.10	25.18
Sodium (Na^+)	60.00	20.00	46.00	105.00	129.00
Potassium (K^+)	52.00	36.00	11.10	57.00	49.00
Dissolved oxygen (DO)	5.34	5.36	5.24	5.29	5.31
Turbidity (TUB)	2.50	2.50	2.70	2.00	1.80
Fluoride (F^-)	0.33	0.35	0.34	0.10	0.15

Units : All the parameters are given in ppm excluding pH, EC-0mhos/cm, Temperature-°C and Turbidity NTU.

Table-5

Water Quality Parameter (WQP)	Ghansawangi (GU16)	Ghansawangi (GU17)	Sindakhed (GU18)	Ghonsi Khurd (GU19)	Devnagar Tanda (GU20)
Temperature (T)	26°C	25°C	26°C	26°C	26°C
pH	7.90	7.01	7.61	7.25	7.19
Electrical conductivity (EC)	428.00	444.00	1610.00	730.00	329.00
Total dissolved solids (TDS)	278.20	288.60	1046.50	474.50	213.80
Total alkalinity (TA)	600.00	326.00	870.00	140.00	140.00
Total hardness (TH)	872.00	360.00	755.00	490.00	145.00
Chloride (Cl^-)	390.00	37.00	202.00	82.00	47.03
Sulphate SO_4^{2-}	158.00	46.00	370.00	82.00	72.01
Calcium (Ca^{2+})	197.00	92.00	141.00	99.20	31.26
Magnesium (Mg^{2+})	93.00	27.00	30.00	101.00	16.70
Sodium (Na^+)	26.00	52.00	38.00	73.00	26.00
Potassium (K^+)	12.00	22.00	19.20	1.70	7.12
Dissolved oxygen (DO)	5.46	5.21	5.00	5.21	6.00
Turbidity (TUB)	1.90	2.00	2.50	1.60	1.90
Fluoride (F^-)	0.26	0.36	0.28	0.21	0.28

Units : All the parameters are given in ppm excluding pH, EC-μmhos/cm, Temperature-°C and Turbidity NTU.

Table no.2 TO 5. Studies on various Ground water parameter during the month of jan2020 in Ghansawangi tq.

a)Temperature: The heat released by the decomposition of organic matter and respiration may slightly raised the temperature in polluted aquatic bodies. The increase in temperature alters the concentration of DO, Free Co_2 and other gases dissolved in water M. B. Ubale,(1994)A rise in temperature of the water leads to the speeding up of the chemical reactions in water, reduces the solubility of gases and amplifies the taste and odour. At elevated temperature metabolic activity of the organism increases requiring more oxygen but at the same time the solubility of oxygen decreases thus accentuating the trace. D. Kelein, (1959) In the presence study temperature of the ground water vary from 24to 28°C.

b) pH : pH act as index to determine the extent of pollution. The concentration of H^+ increases due to the biological activities and addition of chemical substances. The pH of ground water obtained in range from 7.01 to 8.00. The wider variation in pH value is obtained at certain station depending on the nature of waste discharged. The observed pH is greater than 7 indicating that carbonate species exist in the form of HCO_3 ion. The results clearly indicates that the water samples are slightly alkaline all water samples were found to be within the permissible limits (6.5 to 8.5) as prescribed by BIS (1991) and WHO, (1984 and 1996).

c) Electrical Conductivity: The conductance is the measure of the concentration of mineral constituent present in water. The higher values of conductivity may be related to the presence of considerable amounts of soluble inorganic substances in waste water. In the present work conductivity of ground water samples are in the range from 325 to 1610 mhos/cm .Conductivity values of sample No. GU1, GU18 are very high, this is due to more dissolved solid salts present in these two samples. Normally Electrical conductivity of potable water is 1.5 mhos/cm, based on EC studies, all the water samples are found to be well above the permissible limit (300 mhos/cm) as per BIS,(1991).

d) Total Dissolved Solids: It develops a particular taste to the water and at higher concentration reduces its potability, plants are also severely affected by higher values of TDS in irrigation water. In the present work, TDS of ground water samples are in the range 211.20 to 1046.50 ppm. The observed variation in result may be due to weathering of soil and rock, it is also due to the total dissolved solid contain in water which decreases, ability to dissolved the minerals. The standard permissible limit is 500 ppm as per WHO, (1984 and 1996). The samples samples GU1 and GU18 are above permissible limit. There is no firm evidence suggesting drinking hard water that it would cause any adverse effect on health P.B. Doctor, C.V. Desai(1998).

e) Total alkalinity:It is a measure of its capacity to neutralize acids along with the carbonates and bicarbonates, many salts of weak acids such as silicates, phosphates and borates etc. also cause alkalinity. Barrate (1953) and Vyass, (1969) have suggested that the total alkalinity value 60 ppm. or more indicates hard water. The alkalinity values are found to be in the range 110-862 ppm. The acceptable limit for total alkalinity (TA) in drinking water is 200 ppm. All samples are above permissible limit, 200 ppm. Prescribed by BIS,(1983) and ICMR, (1975) except samples GU8, GU19. The higher alkalinity of a ground water is owing to the presence of bicarbonates trace amount of carbonate P Zuddas and F. Podda, (2005). and hydroxide saltsN. Manivaskam, (1983).

f) Total hardness: As per BIS, (1991) standard desirable limit of hardness is 300 ppm. Water hardness is traditional measure of the capacity of water to react with soap, hard water required a considerable amount of soap to produce leather. The hardness values of surface water obtained in the present study area ranges from 145.00 to 2800.00 ppm. All the water samples in study area are very hard (>180 ppm). All the water samples can be used for drinking purposes in absence of other source (TH<600) except sample No. GU1-GU5, GU13, GU16, Gu18,

g) Chloride: Chlorine in the form of chloride ions is one of the major inorganic ions present in the natural water. beyond 250 ppm it gives a peculiar taste to the water rendering its inaccessibility for drinking purpose R.K. Trivedi and P.K. Goel, (1986). Chloride contents are found to be ranging from 28.00 to 1740.00 ppm. Low value of chlorides content sampling sites GU2, GU6, GU8-GU10, GU11, GU17- are below permissible limit, 250 ppm (1991) and all other sampling sites shown to have chloride well above this limit which may be due to the absence of proper drainage system in the study area.

h) Sulphate: The recommended upper limit for sulphate ion in water intended for human consumption is 250 ppm and according to BIS, (1991). it is 200 ppm. beyond this limit, sulphate causes gastrointestinal irritation and can have laxative effect in presence of magnesium and sodium N. Manivaskam, (1983). High amount of sulphate imparts a bitter taste to the water. The sulphate ions are found to be in the concentration range 31.00 to 2550.00 ppm,The sulphate ions are found to be above 200 ppm concentration in almost all samples except GU6, GU9, GU10, GU17, Gu19.

i) Calcium : Calcium ion is one of the important component of the plant tissue and participate in various cellular function. In the present investigation calcium concentration varies from 31.26 to 584.00 ppm .According to BIS, (1991) and WHO (1984 & 1996) the highest desirable value for calcium is 75 ppm. All samples are above the permisible limit except GU8, GU9, GU20. High content of calcium may be due to leaching of soil deposit of limestone, dolomite, gypsum, silicious sand into ground waters.

j)Magnesium: Magnesium is an essential mineral for the living body and is relatively nontoxic in concentration normally encountered in nature. The BIS, (1991) has recommended a limit of 30 ppm for magnesium. In the present work magnesium in ground water varies from 5.10 ppm to 322.00 ppm .Higher values of magnesium may be due to the leaching of soil deposit of limestone, dolomite, gypsum, gypsiferous materials and silicious sands in ground water.

k) Sodium : The Excessive amount of sodium in drinking water harmful to person suffering from cardiac, renal and circulatory diseases. Sodium when present as sodium chloride in concentration more than 500 ppm makes the water unpotable and causes appetite disturbance. Sodium content, in the analysed water samples, is in the range 20 to 249 ppm. All the values are well above permissible limit (20 ppm) except GU6 and GU12. Sodium content more than 50 ppm make the water unsuitable for drinking purpose. In the study area sample GU2-GU10, GU12, GU13, GU16, GU18, GU20, are suitable whereas GU1, GU11, GU14, GU15, GU17, GU19, are not suitable for drinking purpose.

l) Potassium: potassium is an essential nutrition element, but in excessive amount it acts as a cathartic. It is reported that foaming may be caused in boilers by more than 50 ppm of potassium and sodium in the water. Potassium content in the study area is in the range from 1.70 to 57.00 ppm .

m) Dissolved oxygen: It is essential to the life of fish and other aquatic organisms. N. Manivaskam, (1983) During present work dissolved oxygen ranges from 4.8 to 6.0 ppm

n)Turbidity: Turbidity is an important parameter for characterising water quality. In most of the water, turbidity is due to colloidal and extremely fine dispersion. Suspended matters such as clay, silt, finely divided organic, inorganic matter, plankton and other microscopic organisms also contribute to turbidity. In the present work turbidity values were found to be ranging from 1.6 to 2.8 NTU. These values are well below the permissible limit, 5 NTU as per WHO , (1984) & (1996).

o) Fluoride: Fluoride in high concentration is not a common constituent of surface waters, but they may occur in detrimental concentrations in ground waters. 1 to 1.5 ppm it is an effective preventive of dental curies. Above this amount, fluoride may cause dental fluorosis and skeletal fluorosis N. Manivaskam, (1983(such water should be defluoridated to reduce the fluoride concentrating to the acceptable levels. In the present analysis, fluoride ranges from 0.10 to 0.43 ppm. The values obtained are well below permissible limit, 1 ppm, prescribed by BIS (1991(and Indian Council of Medical Research ICMR,(1975)

CONCLUSIONS

Hence, From the above discussion, it is concluded that ground water samples are not potable without pretreatment. The study area is getting contaminated by natural and anthropogenic sources. Hence it is proposed to recommend to the Government to take necessary actions against the activities, which will degrade the ground water quality for the safe and healthy human society and to provide potable water to all human beings.

REFERENCES:

[1] American Society for Testing and Materials, (1972). Annual Book of-ASTM Standard, Part-23, ASTM-Phifadelphia.
[2] BIS,(1983). Standards for Water for Drinking and Other Purposes, Beauru of Indian Standards, India.
[3] BIS(1991). Bureau of Indian standards Specifications for drinking water, IS, 10500, New Delhi, India.
[4] B.L. Gupta,(1969). Proc. Symp. on Ground water Studies in Arid and Semi-arid Regions, Roorkee, 415
[5] B.K. Handa, (1981):Tech. Report, CGWB, Ministry of Irrigation, 1.
[6] B.K. Handa, (1981): Tech. Report, CGWB, Ministry of Irrigation, 1.
[7] C.S. Howard,(1933).Determination of Total Dissolved Solid in Water Analysis, Introduction Engineering Chemistry, Anal. Ed., 5 4.
[8] C. Manas, (1976): Ind. Chem. Manual,14(3), 13.
[9] D.S. Bhargawa, (1985):Env. Pollution, Series-A, 37, 355.

[10] D. Kelein,(1959): River Pollution Chemical Analysis, Butter Worth Scientific Publication, London, U.K.
[11] G.C. Chaterji, A.G. Biswas and S. Niyogi,(1964): Bull. Geol. Surv. India, Sr. B. 21, 28.
[12] H.A. Hawks, (1982): Effect of Pollutants in Aquatic Environment, University of Lancaster.
[13] ICMR (1975): 'Manual of Standards of Quality for Drinking Water Supplies', Spl. Rep. S.No. 44, ICMR, New Delhi (India).
[14] K.V.J.R. Krupanidhi, (1984):J.G.S.I., 25 (5), 301
[15] L.N. Vyass and H.D. Kumar, (1969): Hydrobiologia, 31, 421-434.
[16] M.N.Vishwanathan, J.C.V. Sastri and V.S.Devivasigamani, (1977):J. Myasor University, Section-B,27, 147.
[17] M. B. Ubale, (1994): Ph.D. Thesis, Dr. BabasahebAmbedkar Marathwada University, Aurangabad .
[18] N. Manivasakam, (1985):"Physico-chemical examination of water sewage and industrial effluents",Pragati Prakashan Publications, Meerut
[19] N.J. Pawar, S.S. Thigale and K.B. Powar, (1982):Proc. Int. Symp. on Hydrological aspects of Mountainous Watersheds, Roorkee, X-1,
[20] N.J. Pawar, (1985):Ph.D. Thesis, University of Poona, Pune.
[21] N. Manivaskam, (1983): 'Physico-Chemical Examination of Water and Waste Water and Industrial Effluents', Pragati Prakashan, Meerut, India.
[22] P.B. Doctor, C.V. Desai, (1998): N.M. Kulkarni and P.K. Ruparelia, Indian J. Environ. Hlth. 40 (1), 7-14
[23] P.H. Barret, (1953): Am. Fish. Soc., 82, 708-718.
[24] P Zuddas and F. Podda, (2005): App. Geochem, 20, 507-517.
[25] R.A. Robinson, and R.H. Stokes, (1959): Electrolytic Solutions Second Edn., Academic Press, New York.
[26] R.M. Harrison,(1982): Pollution Causes, Effects and Control, The Royal Society Chemistry, London, 126.
[27] R. Kundra and S. Purthy, (1979): Sugar Industry and Pollution in Ecology and Development by Deshbandhu and Veena Bhardwaj, Indian Env. Soc. New Delhi.
[28] R.K. Trivedi and P.K. Goel, (1986): 'Chemical and Biological Methodes for Water Pollution', Enviro Media Publication, Karad, India, 1 - 3
[29] Shell-Eitra, (2000): Encyclopedia of Industrial Ami Chemical Analysis 19, 1123.
[30] S.E. Wadia, Tech. (1977): Papers on Water Pollution Control Methods and Design, Pune, 4.
[31] WHO (1984 and 1996): World Health Organization,Guidelines for Drinking Water Quality, Recomendations of WHO; Geneva 1, 1-130 .