



Research Paper

STUDY OF PHYSICOCHEMICAL PARAMETERS OF SOME WATER SAMPLES OF BHAMRAGAD TAHSIL, DIST-GADCHIROLI (M.S.), INDIA

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Abstract

Water is one of the most important natural resource. The study of its suspended composition is necessary to know the quality of water. People facing so many health related problems in remote areadue to unhealthy drinking water. Therefore present study undertaken to assess the physico-chemical properties of tube well water in 2019 at the Bhamragad tahsil. The quality of water were analysed by using various parameters such as Temperature, Turbidity, pH, TDS, Cl⁻, F⁻, Fe, Mg and Nitrate. Result of each parameter were compared with World Health Organization (WHO) and Indian standard (IS) values. Some of the samples vary from standard values given by WHO but fulfill the IS criteria. Which are safe for drinking. But in Nine sample EC is more than standard value and Fluroide ion concentration is less than standard value near about all samples so water treatment is necessary for drinking purpose .One sample having exceed the limit in nitrate value this water sample is unhealthy for drinking. Correlation coefficient of parameters showed Positive and Negative relationship.

Key words: Bhamragad tahsil, Natural resources, Physico-Chemical Parameters, Correlation matrix.

INTRODUCTION

Bhamragad taluka is located in the Gadchiroli district of Maharashtra state, India. It is on the latitude 90°15' 0.00' N and longitude is 80°20 ' 60-00 E. It is on the bank of a confluence of three rivers. The Indravati river, Purla kota and Pamul Gautami. It is famous for dense forest, Lok Biradari Project of Dr. Prakash Amte and Nelagunda water fall. Bhamragad is a rural area most of the population are madia gond . They are not aware about safe drinking water criteria. Water is important for natural ecosystems and

human development. It is important for various activities such as drinking, cooking, industry, agriculture and recreation. In the human body, it is also used to transport, dissolve organic matter and add nutrients while carrying waste materials [Jaylaxmi et al 2011]. Safe drinking water is a right of every human-being so it is urgent need to analyse water to know its quality. Therefore present work was undertaken.

MATERIAL AND METHODS

Collection of samples :-

From four villages of Bhamraghad tahsil i.e. Malampodure, Nelgunda, Laheri and Nargunda 25 bore water samples were collected in April 2019 at morning time. The water samples were immediately brought to laboratory for analysis of various parameters.

METHODOLOGY :-

Temperature was measured by thermometer immediately after collection of samples. Turbidity was measured by turbidity meter. pH, EC, TDS were determined by using digital pH meter, conductometer and TDS meter respectively. Total hardness was measured by EDTA titration method. Phenol disulphonic acid method was used for the quantitative estimation of Nitrate [Jaylaxmi et al, 2011; R. A. Bloomfield et al, 2011]. Chloride, Fluoride and Iron were estimated by standard laboratory methods.

RESULT AND DISCUSSION

Temperature:- Temperature of water is changed accordingly to its surrounding composition of soil and season. The variation is mainly related with the temperature of atmospheric and weather condition [Adebowale et al., 2008] but recommended temperature by [WHO 1993] is 25°C. All the samples were within the recommended range except one sample S-19 with 28°C.

Turbidity:- Turbidity is one of most important water quality parameter. Changes in environment brightness also caused some temporary changes in turbidity values, but no long term increase or decrease in turbidity level [Tempori et al., 2020]. Turbidity permissible range is upto 2.5 and turbidity of sample S-12 was found to be 2.64 means it slight exceeds beyond the range.

pH:- The strength of Hydrogen i.e. pH describes the concentration of the Hydrogen ions in a solution which is an indicator of acidity or basicity of the solution. Acidic water with a pH of less than 6.5 is more likely to be contaminated with pollutants, making it unsafe to drink. pH permissible limit 6.5 to 8.5 [WHO, 1993] and [IS 1991] and all the samples

were within the range. pH of all the samples tested here are neutral to slightly alkaline range.

Electrical Conductivity:-Electrical conductivity of water depicts its pollution status. Value of EC depends upon concentration of impurities, mobility and temperature of the solution¹⁴. Contamination in water will lead to the change in the value of EC. According to [WHO 1993], the maximum allowable level of conductivity is 1000 μ S/cm. Sample no.8,9,10,11,13,14,15,19 and 25 show higher values of conductivity.

TDS:-It refers to total dissolved salts that may be organic or inorganic present in water. You can test water quality levels using a digital TDS PPM meter (S. Sharma et al., 2017). According to WHO upto 500 mg/L but according to IS maximum permissible limit is 2000mg/l but highest value is 807mg/L and lowest is 374. Amount of solutes were high due to decrease in the water level in the river [Gautam and Bhattarai et al., 2008]. In analysis all samples fulfill permissible limit.

Alkalinity:-The acceptable range of alkalinity for drinking water is 200 to 600 mg/L. Highest value is 406 and lowest value is 108. The value of alkalinity for all the samples were in acceptable range.

Chloride ions:-Chloride usually originates from water soluble Chloride salts present in minerals [P. Tirkey et al., 2017]. Human activities are mainly responsible for the Chloride ions found in water than natural activities. In present study the concentration of chloride varies from 38 to 92 mg/l. Chloride ions present in permissible limit. [WHO 1919].

Fluoride ions:- Fluoride content in water prevents dental cavities and bone damage if it is present in low concentration. Excess intake of fluoride through drinking water causes fluorosis on human being [G. Murhekar, 2011]. In water sample range of Fluoride is 0.92 to 0.02. In present study some samples were found concentration of Fluoride less than permissible limit 1-1.5mg/l according to [WHO 1993], it causes tooth decay in people.

Nitrate:-Natural processes can cause low levels of Nitrate in drinking water. Contamination of nitrate generally comes through fertilizers. It is found in sewage and wastes from human and/or farm animals and generally gets into drinking water from these activities [S. Sharma 2017]. Permissible value for nitrate contents according to [WHO 1993] is 45. In this investigation all samples within permissible value except S-14 with 46mg/L.

TH:-WHO and ICMR given permissible range is 300 to 600 mg/L. In present study all samples were found to be present in prescribed range. Mineral contents of water are the factors which are responsible for hardness.

Fe:-High Fe content can change the colour of water and imparts slightly reddish colour to it. Fe is an essential trace element in living organisms. Drinking water with good range of Fe would contribute to the daily intake. In this study the observed values of Fe were in the range 0.001 to 0.52 which is acceptable given by [WHO,1993]

Correlation matrix of various physicochemical parameters:-

Correlation matrix was prepared to find out the interdependency relation of two parameters. When two parameters are associated with each other at greater extent, correlation can be predicted more accurately. Different physicochemical parameters show strong positive and negative correlation among each other. A correlation matrix of eleven parameters, which has been studied here, was constructed and shown in table no.3.

Temperature shows extremely weak correlation with all the parameters which has been observed in this study. Temperature shows negative correlation with pH up to -0.24. EC shows significant positive correlation up to 0.7196 with total dissolved salts. Moderate positive correlation up to 0.5923 has also been seen between EC and chloride ions. TDS value shows moderate to significant positive correlation with Nitrate, alkalinity, chloride ions and EC up to 0.5931, 0.6006, 0.6316 and 0.7196 respectively. Alkalinity has the highest correlation of 0.606 with TDS and shows negative correlation of -0.029 with Fluoride ions. Chloride content of water samples has moderate range of correlation up to 0.5923 with EC and lower range with other parameters. Fluoride ions show the negative correlation with parameters like turbidity, pH, EC, TDS, Alkalinity, Chloride ions and show weak correlation with the remaining parameters. Turbidity, Nitrate, Fe and total hardness shows weak correlation with all the parameters.

Observation Table

Table No. 1
Inventory of water samples of Bhamragad Taluka

Sr. NO.	Sample No.	Name of Village	Collection Site
1	S1	Mallampoddur	JitendraBhandekar
2	S2	Mallampoddur	Anganwadi old
3	S3	Mallampoddur	MarotiKothare
4	S4	Mallampoddur	SmashanBhumi
5	S5	Mallampoddur	RamjiBodiWadde
6	S6	Mallampoddur	RajuGaraWadde
7	S7	Mallampoddur	Zp School
8	S8	Nelgunda	Malabai Shankar Atram
9	S9	Nelgunda	JayrampochoyaPendam
10	S10	Nelgunda	Masu Doge Wadde
11	S11	Nelgunda	KoluKareTelami
12	S12	Nelgunda	MaluSaybiWarse
13	S13	Nelgunda	Gotul

14	S14	Laheri	ZP school
15	S15	Laheri	DiwakarJuware
16	S16	Laheri	Ramesh Wadde
17	S17	Laheri	MasuPungati
18	S18	Laheri	Kullewadde
19	S19	Laheri	SudhakarKowase
20	S20	Laheri	Prakash Sarkar
21	S21	Laheri	KrishiGodown
22	S22	Nargunda	ChinnaMuhanda
23	S23	Nargunda	BirjuPungati
24	S24	Nargunda	DalsuGota
25	S25	Nargunda	SamajMandir

Table No. 2

Physicochemical Parameters of water sample

Sr. No	Sample No.	Parameters										
		Temp	Tur (NTU)	PH	EC	TDS (mg/L)	Alkalinity (mg/L)	Cl ⁻ (mg/L)	F ⁻ (mg/L)	Nitrate (mg/L)	TH (mg/L)	Fe (mg/L)
1	S1	21	0.92	7.34	822	548	252	63	0.5	41	534	0.52
2	S2	23	0.34	7.94	804	536	344	38	0.5	41	433	0.28
3	S3	20	0.78	7.51	850	566	406	70	0.4	32	428	0.03
4	S4	25	0.38	7.26	786	524	282	66	0.4	33	448	0.52
5	S5	19	0.84	8.12	678	398	156	72	0.1	30	292	0.01
6	S6	18	0.56	8.14	708	416	258	68	0.1	28	268	0.05
7	S7	19	0.92	7.64	890	524	352	67	0.1	34	254	0.02
8	S8	24	0.72	7.19	1066	592	242	92	0.02	34	258	0.02
9	S9	21	0.64	7.22	1122	623	265	98	0.02	40	260	0.02
10	S10	15	1.24	7.98	1080	600	256	82	0.02	38	262	0.03
11	S11	16	2.15	7.65	1198	666	248	84	0.02	30	334	0.03
12	S12	21	2.64	7.21	912	507	238	65	0.02	32	204	0.02
13	S13	23	1.98	7.42	1068	593	234	63	0.02	38	296	0.02

14	S14	23	0.29	7.6	1018	566	360	86	0.31	46	120	0.51
15	S15	26	0.83	7.11	1044	580	275	90	0.43	22	215	0.2
16	S16	25	0.1	7.2	814	452	170	92	0.92	36	190	0.1
17	S17	20	0.4	7.1	674	374	165	22	0.4	28	187	0.001
18	S18	19	0.1	7.15	694	385	170	25	0.2	24	190	0.02
19	S19	28	0.5	8.1	1452	807	347	92	0.29	40	368	0.01
20	S20	22	0.89	7.5	742	412	108	38	0.4	22	280	0.2
21	S21	23	0.3	7.2	946	526	290	76	0.41	38	160	0.3
22	S22	19	0.43	8.15	680	666	288	74	0.28	44	304	0.06
23	S23	26	0.74	7.51	716	684	286	82	0.24	40	316	0.12
24	S24	18	0.83	7.26	998	616	284	66	0.32	41	266	0.32
25	S25	27	1.65	7.56	1134	630	280	78	0.24	44	272	0.24

Table No. 3
Correlation matrix of various physicochemical parameters

	Tem.	Tur.	pH	EC	TDS	Alkalinity	Cl ⁻	F ⁻	Nitrate	TH	Fe
Tem	1										
Tur.	-0.1833	1									
pH	-0.24	-0.014	1								
EC	0.2532	0.3541	0.0199	1							
TDS	0.2948	0.2232	0.2297	0.7196	1						
Alkalinity	0.1578	-0.066	0.2431	0.3707	0.6006	1					
Cl ⁻	0.2641	0.1145	0.1168	0.5923	0.6316	0.3641	1				
F ⁻	0.40435	-0.55	-0.237	-0.286	-0.2015	-0.029	-0.128	1			
Nitrate	0.1967	-0.039	0.2425	0.3112	0.5981	0.5328	0.3916	0.0422	1		
TH	0.0475	0.0584	0.27098	-0.021	0.2828	0.2819	-0.064	0.1166	0.1586	1	
Fe	0.2864	-0.244	-0.2005	-0.069	0.0151	0.2261	-0.021	0.4606	0.3384	0.2565	1

CONCLUSION

In this study Physico-Chemical parameters of different water samples from Bhamragad tahsil were analysed to assess water quality by using standard methods. Present study concluded that the some samples exceeded limit of prescribed range parameters given by WHO but are within the limits of IS. Some of the samples values more than standard values they can be purify by water treatment. Fluoride concentration adjust by adding fluoride in water before drinking. All the water samples except one (sample no.14) were recommended for drinking purpose .

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