RESEARCH FRONT

ISSN
(Print) 2320 – 6446, (Online) 2320 – 8341

PHYSICO-CHEMICAL CHARACTERISTICS OF GROUND WATER SAMPLES FROM KOLHAPUR CITY, MAHARASHTRA

S. B. Ghorpade
Department of Environmental Science, Balwant College, Vita (415311)
U. H. Shah
Department of Zoology, Balwant College, Vita (415311)

ABSTRACT

The present investigation was undertaken to study physico-chemical characteristics of ten bore wells from different places from Kolhapur city during post monsoon period of 2011.The parameters such as pH ,TDS (Total dissolved solid),total alkalinity, total hardness, chloride, nitrate, and phosphate have been studied.100% of bore wells (10 out of 10)were with total hardness exceeding the permissible limits. Chloride content in all water samples was within the permissible limits. Nitrate in all samples except B.W.2 (Devkarpanad 37.5mg/L) was within permissible limit. Bore wells having higher total hardness concentration than the permissible limit hence it is concluded that the water is not suitable for drinking purpose.

KEYWORDS : Bore wells, physico-chemical, Kolhapur.

INTRODUCTION

Rapid urbanization, especially in developing countries like India, has affected the availability and quality of ground water due to its overexploitation and improper waste disposal, especially in urban areas. According to WHO organization about 80% of all the disease in human being are caused by water. Once the ground water is contaminated, its quality cannot be restored by preventing the pollutants from the source.

The water has an important bearing on life of humans and other organisms. Ground water exists as an invisible form and is present the dark pores and fissures of sands and rocks of upper portion of the earth's crust (Kumar et al; 2010). Kolhapur having great heritage and one of the tourist centers in Maharashtra the rainfall is sufficient, but there is short fall of water during summer time. Majority of people are using bore well water for domestic purpose as well as for drinking.

The physico-chemical characteristics of water bodies have been studied by several researchers from time to time (Misha and Tipathi, 2003, Zafar and Sultana, 2008) From Kolhapur bore well water quality parameters are not yet documented.

MATERIALS AND METHODS

The ground water samples were collected from 10 locations selected of Kolhapur city. The samples were collected monthly for years from sep.2011 to feb.2012 detect noticeable changes in the quality of the ground water. At each sampling station various physical chemical parameters of bore wells water such as pH were recorded. The sample were collected in BOD bottles and analyzed in laboratory for all remaining parameters as described by APHA (2005) and Trivedi & Goel (1986).

RESULTS AND DISCUSSION

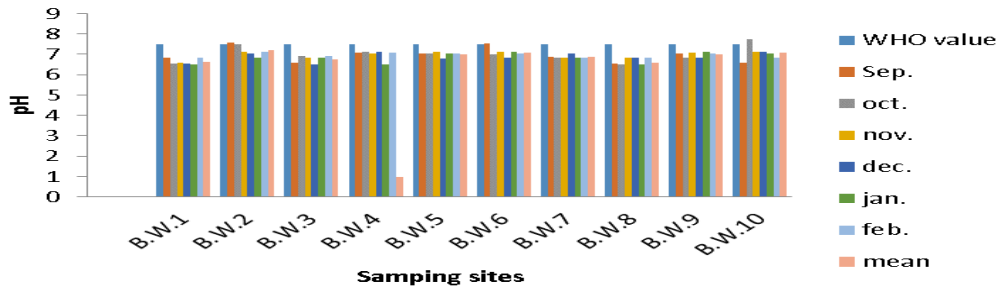
The physico-chemical analysis of the ground water quality. Were with the different variation as Table no.1 to Table no.7

ISSN
(Print) 2320 – 6446, (Online) 2320 – 8341

Table 1 : The pH values of bore well waterfromKolhapur city.

Sites	Months							
	WHO Limit	Sept	Oct	Nov	Dec	Jan	Feb	Mean
B.W.1	7.5	6.82	6.53	6.59	6.54	6.52	6.85	6.64
B.W.2	7.5	7.56	7.50	7.10	7.04	6.84	7.12	7.19
B.W.3	7.5	6.58	6.90	6.83	6.52	6.81	6.93	6.76
B.W.4	7.5	7.07	7.12	7.04	7.12	6.52	7.06	6.98
B.W.5	7.5	7.03	7.03	7.12	6.80	7.03	7.05	7.01
B.W.6	7.5	7.52	7.0	7.12	6.8	7.10	7.02	7.09
B.W.7	7.5	6.87	6.81	6.84	7.05	6.84	6.85	6.87
B.W.8	7.5	6.55	6.5	6.83	6.82	6.52	6.83	6.67
B.W.9	7.5	7.04	6.81	7.09	6.83	7.13	7.04	6.99
B.W.10	7.5	6.58	7.72	7.13	7.13	7.05	6.83	7.07

Fig. 1
The pH values of bore well water from Kolhapur city

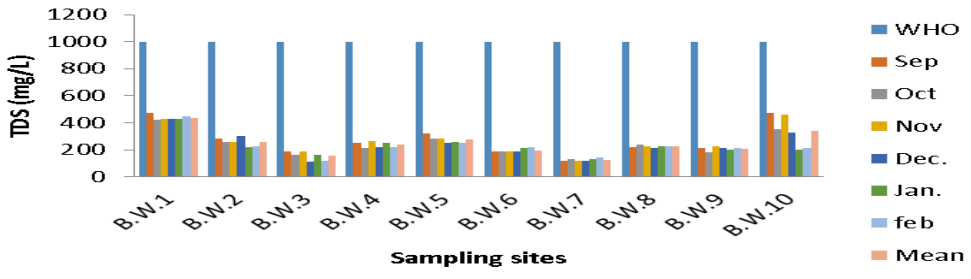


pH : pH recorded in ground water samples between 6.55 and 7.72 .The water with low pH value below 4 will produce sour test and high value about gives bitter to the test to the water. The pH values of all the samples in the limit. The limit of WHO standard for pH 6.5-9.5.The observed pH of all ten sampling sites indicates good water quality with reference to pH.

Table 2 : TDS (mg/lit) values of bore well water from Kolhapur city

Sites	Months							
	WHO limit	Sep	Oct	Nov	Dec	Jan	Feb	Mean
B.W.1	1000	470	420	430	425	430	450	437.5
B.W.2	1000	280	255	260	300	220	225	256.67
B.W.3	1000	190	160	185	110	160	120	154.17
B.W.4	1000	250	210	265	220	250	220	235.84
B.W.5	1000	320	280	280	250	260	250	27333
B.W.6	1000	190	185	185	190	210	220	196.67
B.W.7	1000	120	130	120	120	130	140	126.67
B.W.8	1000	220	240	225	210	225	225	224.17
B.W.9	1000	210	180	225	210	200	210	205.83
B.W.10	1000	470	350	460	328	200	210	336.33

Fig. 2
TDS (mg/L) values of bore well water from Kolhapur city



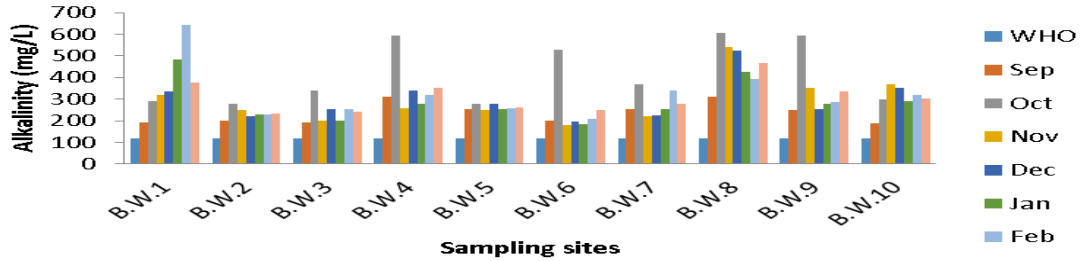
ISSN
(Print) 2320 – 6446, (Online) 2320 – 8341

Total dissolved solids (TDS) : High concentration of TDS in ground water may affect person, are suffering from kidney and heart diseases. The limit of WHO standard for total dissolved solid is 1000mg/L. The given table no.2 observed TDS value ranges from minimum value 120mg/lit.at the site B.W.3 (Jarag Nagar) in the month feb.2012 to maximum value 470mg/L. at the site B.W.1(Near Narke Wada) and B.W.10 (Juna Budhvar Peth) in the month sep.2011

Table 3 : TheAlkalinity (mg/L)of bore well water from Kolhapur city.

Sites	Months							
	WHO Limit	Sep	Oct	Nov	Dec	Jan	Feb	Mean
B.W.1	120	192	292	320	335	485	645	378.17
B.W.2	120	200	280	248	220	229	228	234.17
B.W.3	120	192	340	200	252	200	252	239.33
B.W.4	120	312	592	256	340	280	320	350
B.W.5	120	252	280	248	280	254	256	261.67
B.W.6	120	200	528	180	195	185	210	249.67
B.W.7	120	252	368	220	225	252	340	276.17
B.W.8	120	312	608	540	525	425	395	467.5
B.W.9	120	248	592	352	252	280	285	334.83
B.W.10	120	188	300	368	350	290	320	302.67

Fig. 3
The Alkalinity (mg/L) of bore well water from Kolhapur city.

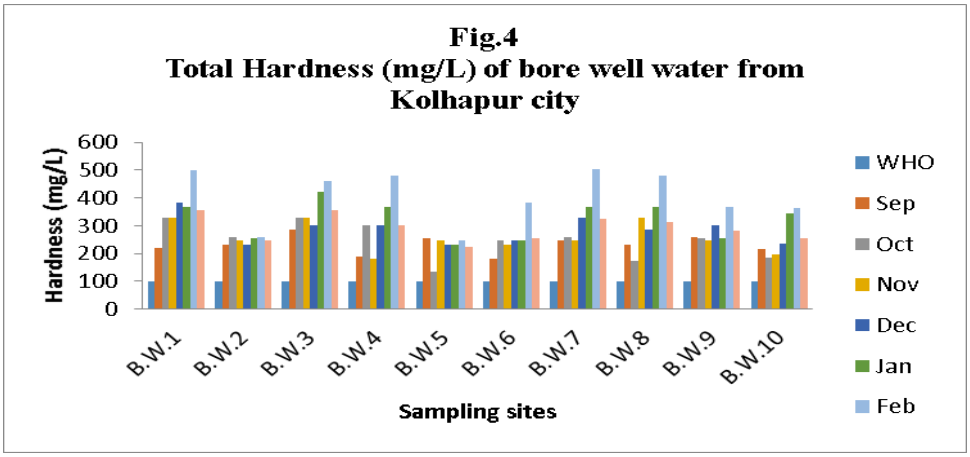


Alkalinity : The alkalinity content ranged between 180mg/L and 645mg/L. (Table no.3). According WHO upper limit of alkalinity is 120mg/L. The entire water sample showed grater values of alkalinity tan the desirable limit. So, from alkalinity point of view quality of water samples of all regions is poor. The same result observed in the study of ground water quality in Atpadithashil Maharashtra. (Shah & Patil, 2007)

Table 4: Total Hardness (mg/L) of bore well water from Kolhapur city

Sites	Months							
	WHO limit	Sept	Ot	Nov	Dec	Jan	Feb	Mean
B.W.1	100	220	328	328	384	368	500	354.66
B.W.2	100	232	260	248	232	256	260	248
B.W.3	100	288	328	328	300	420	460	354
B.W.4	100	188	300	180	300	368	480	302.66
B.W.5	100	256	136	248	232	232	248	225.33
B.W.6	100	180	248	232	248	248	384	256.66
B.W.7	100	248	260	248	328	368	504	326
B.W.8	100	232	172	328	288	368	480	311.33
B.W.9	100	260	256	248	300	256	368	281.33
B.W.10	100	216	184	196	234	344	365	256.50

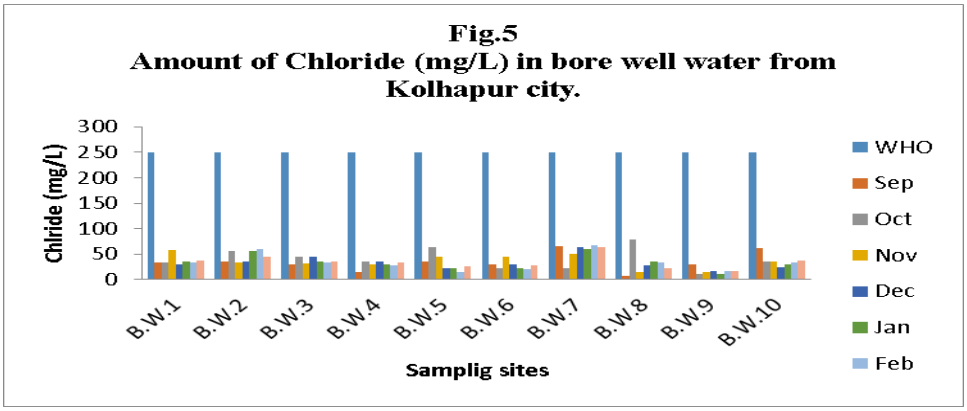
ISSN
(Print) 2320 – 6446, (Online) 2320 – 8341



Total Hardness : Hardness in water is due to natural accumulation of salts of mainly calcium and magnesium. According WHO standard upper limit hardness is 100 mg/L. The total hardness of ground water at Kolhapur city sampling sites ranges from 136mg/L to 504mg/L. The site B.W.7 (Sonya Maruti Chawk) was with higher values of hardness than that of the permissible limit of WHO standard. The other all site shows hardness values within the limit. The same result was observed in the study of physico- chemical characteristics of Bore well water in Arsikeretaluka, Hassan, India (Mahesha et.al.2004)

Table 5 : Amount of Chloride (mg/L)in bore well water from Kolhapur city.

Sites	Months							
	WHO limit	Sept	Ot	Nov	Dec	Jan	Feb	Mean
B.W.1	250	34.03	34.00	8.06	30.03	36.06	34.03	37.707
B.W.2	250	36.03	44.04	34.03	36.06	56.06	60.04	44.38
B.W.3	250	30.03	36.03	32.04	44.04	36.06	34.03	35.38
B.W.4	250	14.00	64.07	30.03	36.03	30.03	28.03	33.70
B.W.5	250	36.03	22.02	44.04	22.02	22.02	14.01	6.69
B.W.6	250	30.03	22.02	44.7	30.03	22.02	20.02	28.14
B.W.7	250	66.03	78.08	50.05	64.07	60.04	68.07	64.40
B.W.8	250	8.00	14.04	14.01	28.03	36.03	34.03	22.36
B.W.9	250	30.03	12.01	14.0	16.01	12.01	16.01	16.68
B.W.10	250	61.98	35.98	35.99	24.89	29.45	32.77	36.83



Chloride : The chloride content ranged between 86 mg/L to 66mg/L (Table No.5).The maximum limit of WHOstandard for chloride is 250mg/L Chloride level in all sampling site

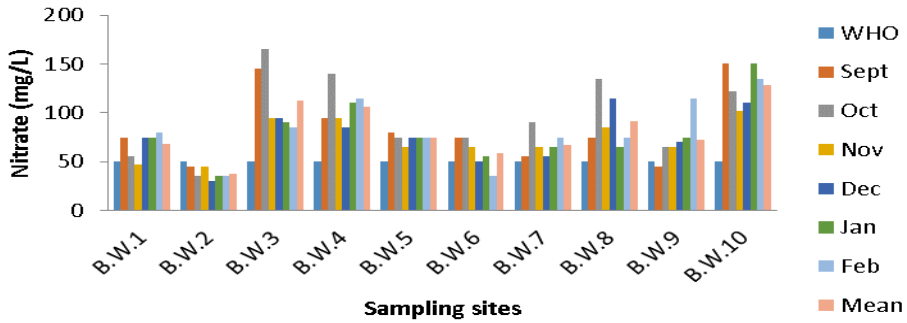
ISSN
(Print) 2320 – 6446, (Online) 2320 – 8341

was desirable limit in the water. The same results was observed in the physic-chemical analysis of bore well water samples of Telungupalayam area in coimbathoredistrict,Tamilnadu,India (Shyamala et.al.2008)

Table 6 : Amount of Nitrate (mg/L)in bore wellsfrom the Kolhapur city.

Sites	Months							
	WHO limit	Sept	Ot	Nov	Dec	Jan	Feb	Mean
B.W.1	50	75	55	47	75	75	80	67.83
B.W.2	50	45	35	45	30	35	35	37.5
B.W.3	50	145	165	95	95	90	85	112.5
B.W.4	50	95	140	95	85	110	115	106.67
B.W.5	50	80	75	65	75	75	75	74.17
B.W.6	50	75	75	65	50	55	35	59.17
B.W.7	50	55	90	65	55	65	75	67.5
B.W.8	50	75	135	85	115	65	75	91.67
B.W.9	50	45	65	65	70	75	115	72.5
B.W.10	50	151	122	102	110	151	135	128.5

Fig. 6
Amount of Nitrate (mg/L) in bore wells from the Kolhapur city



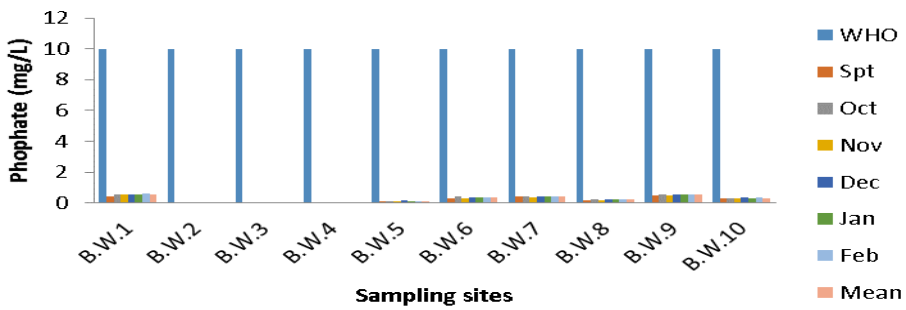
Nitrate : High level of nitrate in bore well water might causes children or blue baby disease in infants developing blue-grey skin. According to WHO the upper limit of nitrate in potable water is 50mg/L. The nitrate concentration of ground water in study area ranges from 30mg/L to 165mg/L The mean value of nitrate except B.W.2 (Devkarpanand) was 37.5mg/L which was in permissible limit.

Table 7 : The amount of phosphate (mg/L) of bore well water from Kolhapur city.

Sites	Months							
	WHO limit	Sept	Ot	Nov	Dec	Jan	Feb	Mean
B.W.1	10	0.408	0.570	0.560	0.567	0.570	0.585	0.543
B.W.2	10	0.045	0.065	0.055	0.060	0.065	0.065	0.059
B.W.3	10	0.055	0.063	0.065	0.045	0.040	0.065	0.055
B.W.4	10	0.060	0.061	0.065	0.063	0.061	0.060	0.061
B.W.5	10	0.110	0.112	0.120	0.135	0.125	0.127	0.121
B.W.6	10	0.290	0.391	0.280	0.340	0.345	0.360	0.334
B.W.7	10	0.390	0.408	0.380	0.391	0.400	0.410	0.397
B.W.8	10	0.175	0.207	0.190	0.205	0.210	0.210	0.199
B.W.9	10	0.480	0.568	0.510	0.520	0.535	0.565	0.530
B.W.10	10	0.290	0.295	0.310	0.327	0.310	0.330	0.310

ISSN
(Print) 2320 – 6446, (Online) 2320 – 8341

Fig. 7
The phosphate (mg/L) of bore well water from Kolhapur city.



Phosphate : Phosphate is an essential nutrient for growth and development of flora in any ecosystem. The mean value of phosphate recorded at different sampling sites in Kolhapur city are observed Table No.7 The upper limit of phosphate 10 mg/L according toWHO all the water samples at study sites showed lower values of phosphate than the WHO limit . Phosphate in small quantities is not harmful to the organism.

CONCLUSTION

Total Hardness of 100% sampling sites exceeds the permissible limit of WHO (2nd Ed., 1993) and makes the water unfit for human consumption. It can be used for drinking only after pretreatment like filtering, boiling, reverse osmosis & electro- dialysis.Nitrate content in water of the study is higher than the permissible limit due to sewage contamination. At some sites, the ground water samples contain high concentration of alkalinity, nitrate, and hardness, TDS than the permissible limits.The analysis reveals that the ground water of the area needs some treatment before consumption and it also needs to protect from the contamination of water.

REFERANCES

1. **APHA**(American Public Health Association) Standard method for examination of water and wastewater, NW, DC 200036, 2004, 2005
2. **Kumar , T.J.R., Balasubramanian, A., Kumar, R.S. and Manoharan K. (2010).** Groundwater hydro geochemical characterization of chitter sub-division, Tambaraparani river, Triunelveli District, Tamilnadu. *Nature Environment and Pollution Technology*. 9(1):133-140
3. **Mahesha, Nagaraja Naik and Rajendra Prasad N. R. (2004).** Physico- chemical charactristics of bore well water in ArsikereTaluk, Hassan, India, Indian *J.Environmetal protection*, 12
4. **Mishra, B.P. and Tripathi, B.B. (2003).**Seasonal variation in some physic-chemical parameters of river Ganga water as influenced by sewage discharge. *Indian J. Ecol*.30:27-32
5. **Shah Mayur C., Shilpkar PrateekG., Acharya Pradip B. (2007**). Ground water quality of GandhinagarTaluk, Gujarat, India, *e-Journal of chemistry* 5:435-446.
6. **Shah U.H. and Patil A.E. (2013).** Studies on the physico- chemical characteristics of ground water samples from Atpadi Tahasil of Sangli District, Maharashtra *The Ecoscan* 4:159-162
7. **Shyamala R., Shanihi M. LalithaP. (2008).** Physicochemical Analysis of Bore well water samples of Telunupalayam Area in Coimbatore District,Tamilnadu, India, *e-Journal of Chemistry*, 5, (4): 924-929.
8. **Trivdi, R.K. and Goel, P.K. (1986).** Chemical and biological methods for water pollution studies. Environmental publication, Karad , India.
9. **WHO** (World Health Organization) guidelines for drinking water quality, 2nd Ed., 1993 1:188.