GROUND WATER QUALITY (PHYSICO-CHEMICAL) ANALYSIS OF GADCHANDUR AREA, CHANDRAPUR, MAHARASHTRA.

Pidurkar RS[1], Lanjewar MR[2] and Lanjewar RB[3]
[1]Sardar Patel Mahavidyalaya, Chandrapur, India
[2]Department of Chemistry, R.T.M. Nagpur University, Nagpur, India
[3]Department of Chemistry, Dharampeth M.P.Deo Memorial Science College, Nagpur, India
rb_lanjewar@rediffmail.com

ABSTRACT
The present study was carried out with a view to have an understanding about the pollution status of ground water from Gadchandur area (Chandrapur district) particularly water quality in vicinity of industrial area. Evaluation of physico-chemical parameters was carried out. Fifteen samples were collected from various selected sites. The analysis of physico-chemical parameters using standard methods and their comparison with standard values suggested that most of the parameters were within the permissible limit. The present paper accounts ground water quality of various sites of Gadchandur area in Chandrapur district.
Keywords: Ground water, physico-chemical parameters, TDS, DO, APHA

INTRODUCTION
Water plays an important role in human life and its elemental composition is important to life processes as it provides all the essential nutrients to living organism[1]**.** Due to tremendous increase in pollution, technological advancement and industrial growth, the lack of safe drinking water emerge as major problem for significant proportion of global population. World health organization estimated 8 millions deaths per year due to drinking of contaminated water on earth[2]. Cement is a very important product for housing and infrastructure. Environmental degradation due to pollution by cement plants is increasing rapidly. Cement industries are among the most polluting industries and affect the vegetation as well as water quality[3]. Some of the cement plants have made good efforts in controlling pollution level. But most of the cement plants are still producing fugitive emissions from various sources in cement plants. Extensive mining activities in cement plants may contaminate the ground water.

Rapid growth in cement production is leading to deterioration of water quality[4]. The present work is carried out in vicinity of Gadchandur area in Chandrapur district in order to study the ground water quality. Gadchandur is situated on Eastern side of Maharashtra state and shares the state border of Andhra Pradesh, lies between degree of 19043'N 79010'E, the adjoining districts are Garhchiroli on eastern side, on Southern side Adilabad district of Andhra Pradesh, on western side Yavatmal District. The Gadchandur area falls under the Penganga basin and Wardha river basin.

MATERIALS AND METHODS
Study area : The Physico-chemical parameters of ground water of 15 stations in Gadchandur area were studied. The water samples were collected from bore wells located in this area. Ultratech, Ambuja and Manikgarh cement factories are located near this area. The samples were collected in clean polythene bottles without air bubbles, the bottles were rinsed using double distilled water before sampling and tightly sealed after collection and labeled. Analysis of pH, Total dissolved solids, fluoride, iron, nitrate, sulphate, dissolved oxygen, alkalinity, chlorides, total hardness and turbidity was carried out in laboratory and data is reported in Table No. 1.

RESULTS AND DISCUSSION

The samples collected from Gadchandur area were analyzed. The analysis of water samples includes determination of physico-chemical parameters which were analysed in winter [February 2017] season have been shown in Table 1 and 2.

Temperature: Temperatures of groundwater samples were measured in-situ. The water temperature was recorded between 28.4^0C to 30.2^0C. The water temperature has close relation to the variation of atmospheric temperature[5]. The ground water quality may change due to change in subsurface temperature[6]. Water temperature above 30^0C is unfit for public use[7]. Temperature of W6, W10 and W13 were found to be above 30^0C.

pH: pH of water the major ecological factor and is most important in controlling the activities and distribution of aquatic flora and fauna[8]. On an average, pH values of most of the water samples were well within the range given in the WHO recommendations. This shows that all water samples except sample no. W5 and W12 were slightly alkaline.

Total Dissolved Solids: The average value of TDS in water samples ranges from 293ppm to 1046ppm. The observations show that the TDS of samples except W2, W7, W8, W10, W11, W12, W14 and W15 are beyond desirable limit.

Turbidity: Turbidity in water may be caused by suspended matter such as clay, slit, finely divided organic and inorganic matter, soluble coloured organic compounds, planktons and other microscopic constituents[9]. Turbidity of W2, W4, W5, W7, W8, W9, W10, W11, W13, W14 and W15 were below desirable limit while W1, W3 and W12 were beyond desirable limit .

Table 1: Physicochemical parameters of fifteen water samples of Gadchandur area.

Sr. No.	Site Code	Temp. (^{0}C)	pH	TDS (ppm)	Turbidity (NTU)	Alkalinity (ppm)	Cl^- (ppm)	F^- (ppm)	Fe (ppm)
1	(Thutra) W1	29.3	7.00	484	18	292	56	0.87	0.126
2	(Gopalpur) W2	28.4	7.41	697	0	256	84	1.42	0.082
3	(Manoli) W3	29.8	7.35	310	8.67	280	70	0.49	0.113
4	(Bailampur) W4	28.8	7.25	293	0.33	252	32	0.28	0.132
5	(Gadchandur)W5	28.7	6.82	500	0.29	304	80	0.83	0.055
6	(Pimpalgaon)W6	30.1	7.13	425	1.44	260	46	0.99	0.153
7	(Bibi) W7	28.9	7.17	702	0.23	320	144	0.61	0.116
8	(Nanda) W8	28.8	7.02	589	0.44	288	102	0.98	0.128
9	(Awalpur) W9	29.2	7.42	496	0.27	368	62	0.88	0.093
10	(Hirapur) W10	30.1	7.17	614	0	392	102	1.10	0.141
11	(Nokari) W11	29.6	7.21	600	0.22	260	62	1.06	0.130
12	(Palgaon) W12	28.9	6.57	1046	16.27	260	224	0.95	1.931
13	(Hardona) W13	30.2	7.23	472	0.45	280	50	1.07	0.12

									2
14	(Uparwahi)W14	29.3	7.13	532	0	264	456	0.36	0.202
15	(Mangi) W15	29.4	7.18	682	0.93	312	56	0.55	0.165
BIS/ WHO		----	6.5–8.5	500	1 –5	200	250	0.5-1.5	0.300

Alkalinity: Alkalinity of natural water may be attributed to the presence of salts of weak acids such as bicarbonates, phosphates, silicates and borates[10] which induce buffer capacity and lowering of pH. Alkalinity of different sites in Gadchandur area varied from 252ppm to 392ppm. Alkalinity of all samples were more than desirable limit.

Chlorides: In potable water, the salty taste is produced by chloride concentration and it is variable and dependent on chemical composition of water. Increased level of chlorides in water indicates water pollution[11]. In this study, chloride was found in range of 32ppm to 456ppm. High concentration of chloride may indicate high concentration of pollutant. The values observed in present study were in the range of permissible limit except W14.

Table.2. **Physicochemical parameters of fifteen water samples of Gadchandur area.**

Sample No.	**Site code**	**Total Hardness (**ppm)	**NO_3^- (**ppm**)**	**SO_4^{2-} (**ppm**)**	**Dissolved oxygen (**ppm**)**
1	W1	452	26.0	52	4.2
2	W2	512	26.58	155	3.8
3	W3	300	26.58	25	4.2
4	W4	340	8.86	18	3.4
5	W5	380	1.68	127	3.6
6	W6	400	24.80	38	4.4
7	W7	624	25.56	68	4.0
8	W8	512	25.42	58	4.6
9	W9	360	19.13	35	4.2
10	W10	448	24.58	55	4.2
11	W11	580	23.25	145	3.8
12	W12	768	24.67	328	3.6
13	W13	408	24.67	48	4.2
14	W14	456	23.87	74	4.0
15	W15	504	24.23	52	3.8
BIS/WHO desirable limit		300	45	200	4 – 6

Fluorides: The values of fluoride content of most of the sampling sites were within the permissible limit. It does not cause any dental carries and danger of fluorosis. Low or high level of fluoride in water may cause the human health problem[12]. Sample No. W4 and W14 have very low fluoride content which may cause dental carries. Hence it is also unfit for drinking.

Iron: Iron was found ranging from 0ppm to 1.93ppm in water samples from study area. Fe content for most of the samples was within the limit which indicates that water is fit for drinking.

Hardness: Hardness is the property of water which prevents the lather formation with soap and increases the boiling points of water[13]. This soap consuming capacity is mainly due to presence of calcium and magnesium ions in the water. Total hardness of different sites in Gadchandur area varied from 300ppm to 768ppm which shows that water is unsafe for

drinking purpose except sample W3. The result shows that all the samples were moderately hard except sample W3 as per WHO's limit.

Nitrates: Nitrate is the more stable oxidized form of combined nitrogen in most environmental media. Most nitrogenous materials in natural waters tend to be converted to nitrate, and, therefore, all sources of combined nitrogen (particularly organic nitrogen and ammonia) should be considered as potential nitrate sources. Drinking water containing more than 45ppm NO_3^- can cause blue baby or methamoglobinemia in infants and gastric carcinomas[14-15]. NO_3^- content of all the samples from study area were found to be below desirable limit.

Sulphates: Water containing high level of sulphates particularly magnesium sulphate and sodium sulphate may have a laxative effect on a person using the water for the first time. In groundwater samples of study area, so_4^{2-} concentration ranged from 18ppm to 328ppm. The concentrations of so_4^{2-} in most of the samples were lower than the desirable limit (200ppm) accepted for drinking purpose. Sample no. W12 having so_4^{2-} content higher than desirable limit is unfit for drinking.

Dissolved Oxygen: In natural and waste water, DO level depends on the physical, chemical and biological activities of the water body. The analysis of DO plays key role in water pollution control activities and waste treatment process control[16]. DO values of water samples in the study area are ranged from 3.4ppm to 4.6ppm. Some samples shows less amount of DO than BIS values.

CONCLUSION

The results revealed that majority of the sampling stations had permissible range of concentrations of salts while some of them are highly polluted. The parameters in most of the water samples are in normal range and indicated better quality of water. It is advisable that people from this area can use bore well water for domestic purpose.

REFERENCES

1. Friis, F. B. **(1982)**. Water – the major nutrient, Acta Paediatrica, 71, pp. 11 – 16.
2. Hart, S. L. **(1997)**. Beyond Greening. Strategies for a sustainable world, Harvard Business Review, Jan-Feb. : pp. 66 – 76.
3. Senthil, K. P., Sobana, K., Kavitha, K. K. & Jegadeesan, M. **(2015)**. A study on the effect of cement dust pollution on certain physical and biological parameters of Sessamum indicum plant, Asian journal of plant science and research, 5(1), pp. 1 – 3.
4. Siddiqui, N. A., Shukla, R. N. & Ziauddin, A. **(2011)**. Impact of cement industry on the ground water quality. Journal of industrial pollution control, 27(2), pp. 1 – 5.
5. Sunkad, B.N. & Patil, H.S. **(2004)**. Water quality assessment of fort lake of Belgaum. J. Environ Biol., 25, pp. 99 - 102.
6. Saito, T. & Komatsu, T. **(2016)**. Temperature change affected ground water quality in a confined marine aquifer during long term heating and cooling, Water research, 94, pp. 120 – 127.
7. Zajic, J. C. **(1971)**. Water pollution Disposal and Re-use, 1, Marel Dekkar, Inc., New York.
8. Weisse, T. & Stadlar, P. **(2006)**. Effexct of pH on growth, cell volume and production of freshwater ciliates and implications for their distribution. American society of limnologyand Oceanography, Inc., 51(4), pp. 1708 – 1715.
9. WHO **(1984)**. Health criteria and other supporting information 101 : 2.
10. Dara, S. S. (2011). A Text Book of Experiments in Engineering Chemistry, S. Chand Publisher, New Delhi.
11. Hunt, M., Herron, E. & Green, L. **(2012)**. Chlorides in fresh water, URIWW.
12. Francisca, M. M., Patrick, C. K., & Peter, G. N. **(2017)** Assessment of impact of groundwater fluoride on human health : A case study of Makindu district in Kenya. Journal of earth science and climatic change, 8(4), pp. 1 – 6.
13. Patil, V. T. & Patil, R. R. **(2010)**. Physico-chemical analysis of selected groundwater samples of Amalner Town

in Jalgaon District, Maharashtra, India. E- Journal of Chemistry, 7(1), pp. 111 - 116.

14. Hopps, H. C. & Feder, G. L. **(1986).** Chemical qualities of water that contribute to human health in a positive way. Total Environ., 54, pp. 207-216.
15. Jalali, M. **(2005)**. Nitrate pollution in groundwater in Toyserkan, Western Iran. Environmental Earth Sciences, 62(5), pp. 907 - 913.
16. De, A. K. **(2012)**. Environmental Chemistry, Seventh Edition, New Age International, New Delhi.