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Ground Water Quality in and Around Gajuwaka Area, Visakhapatnam, Andhra Pradesh, India

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ABSTRACT

Now-a-days natural resources decreasing drastically due to improper usage and human life styles. Urbanization and over exploration of ground water resources may causes water scarcity and increasing of mineral content may disturb the purity of ground water. Our present study, focused on ground water quality in and around Gajuwaka area, Visakhapatnam, AP, India. Important parameters like pH, Electrical Conductivity, Total Dissolved Solids, Chlorides, Sulphates, Total Hardness, Total Alkalinity, Nitrate and Dissolved Oxygen. Most of the parameters were exceeded the ground water quality of Bureau of Indian Standards (BIS) and World Health Organization (WHO) during the study. Poor water quality was found and extent of pollution occurred may be due to over exploitation of ground water, urbanization and anthropogenic activities.

1. Introduction

In our country a large section of population is dependent on ground water without any treatment. The ground water is generally believed to be free from contamination and thus considered safe for drinking purpose. Contamination of drinking water may occur by percolation of toxic through the soil to ground water (**1**). Due to continuous population growth demand for fresh water increases rapidly. The growing urbanization and rapid industrialization have resulted in increase of the discharge of polluted water in environment. In rural areas due to lack of awareness and maintenance most of the families carry out the routine activities (cloth washing, utensil washing, bathing, cattle drinking) near to ground water source, which is one of the reason leading to its contamination. Hence there is need to assess the ground water quality in the rural areas.

But lack of sanitation, improper waste and surface water contamination and 40% or more of the disease out breaks were attributed to polluted ground water consumption (**2).** Both the rural and urban areas in India face the most significant environmental problem and threat. Water sources are often linked by water resource management. Water resource management needs to deal with both the aspects of water that is quality and quantity. The main reason for such difficulty is that water quality is not exclusively a physical, chemical and microbiological term. It includes the social aspects also, which require human judgments in terms of its acceptability. In order to address this issue, the physic-chemical characteristics of drinking waters in and around Gajuwaka Industrial Area have been analyzed and discussed. A total of 9 water quality parameters namely pH, TDS, EC, Alkalinity, Total Hardness, DO, Cl^-, NO_2^- and SO^{2-}_4were analyzed by following standard analytical methods of **(3).**

2. Materials and methods

2.1 . Water sampling

Gajuwaka is the most industrialized area in Visakhapatnam, Andhra Pradesh (Figure 1), where zinc smelter, heavy plates and vessels, fertilizer and oil refinery are the dominant industrial units in addition to other small-scale industries. The population in the area has increased more than three-fold within a span of two decades, because of the rapid growth in industrial activity. A channel originating from the west side receives industrial waste discharges of Hindustan Zinc Limited, Coromandal Fertilizers, Hindustan Petroleum Corporation Limited and A.P. Petrochemicals Limited. Groundwater is the primary source of drinking water and its quality is getting degraded due to increasing industrialization. The present study is focused on monitoring the ground water quality of selected sites of Gajuwaka area by examining the various physico-chemical parameters.

The time between sampling and analysis was tried to be kept at minimum. Samples in clean glass or polythene bottles at a low temperature (putting ice in the box e.g.4^oC) and in the dark were carried to the laboratory. pH and DO tests were carried out immediately after sampling at the spot as they may change during the storage and transport.

3. Study Area

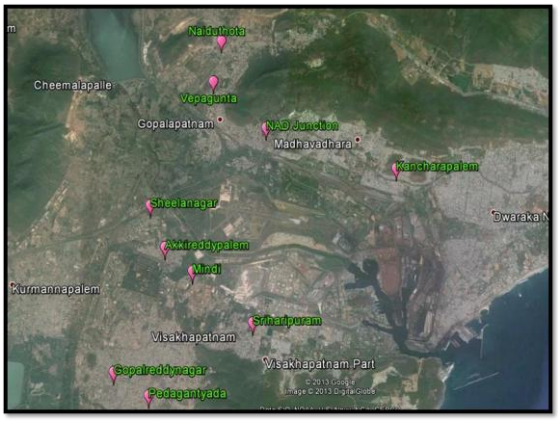


Figure.1: Showing sampling locations

Table. 1: List of villages & water sample collected

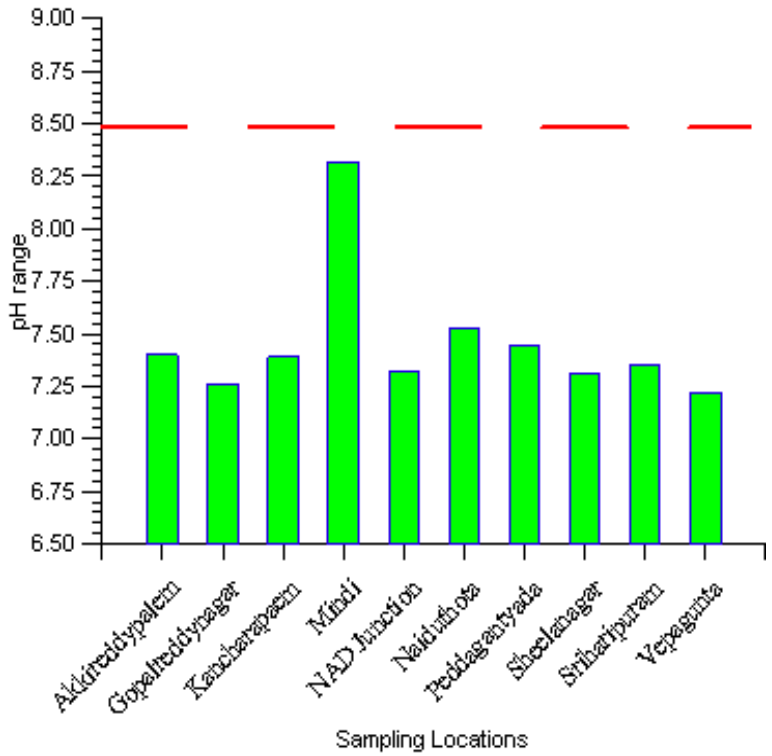
Name of Sampling Area	Sample code	Name of Sampling Area	Sample code
Peddagantyada	S_1	Sheelanagar	S_6
Gopalreddynagar	S_2	NAD Junction	S_7
Mindi	S_3	Kancharapaem	S_8
Akkireddypalem	S_4	Naiduthota	S_9
Sriharipuram	S_5	Vepagunta	S_{10}

4. Results and Discussion

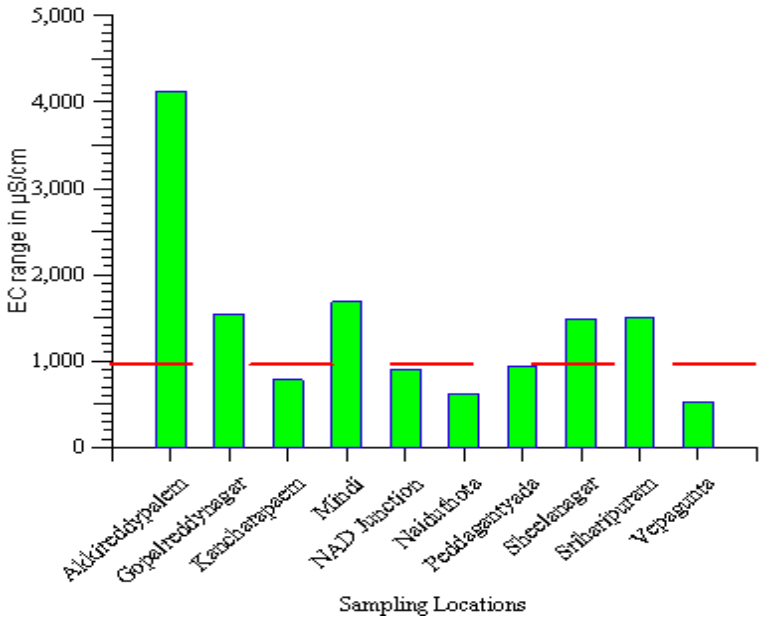
The concentration of pH ranges from 6.5 – 8.5 for ground water according to Bureau of Indian Standards (4). In the present study, all the sampling locations were recorded below the permissible level and average value is 7.45 in the present study area. If pH is above 7, this will indicate that water is probably hard and contains calcium and magnesium (**5).** The measurement of electrical conductivity is directly related to the concentration of ionized substance in water and may also be related to problems of excessive hardness and/or other mineral contamination **(6).** The permissible value of electrical conductivity is 500 mg/L as per BIS standards and present study shows that the all the sampling locations were exceeded water quality permissible level () and its indicating the presence of high amount of dissolved inorganic substances in ionized form **(7)**. Conductivity is not a problem in itself and just above certain level does not mean that the water will cause illness (8).

Table. 2: Physico-chemical data of groundwater samples

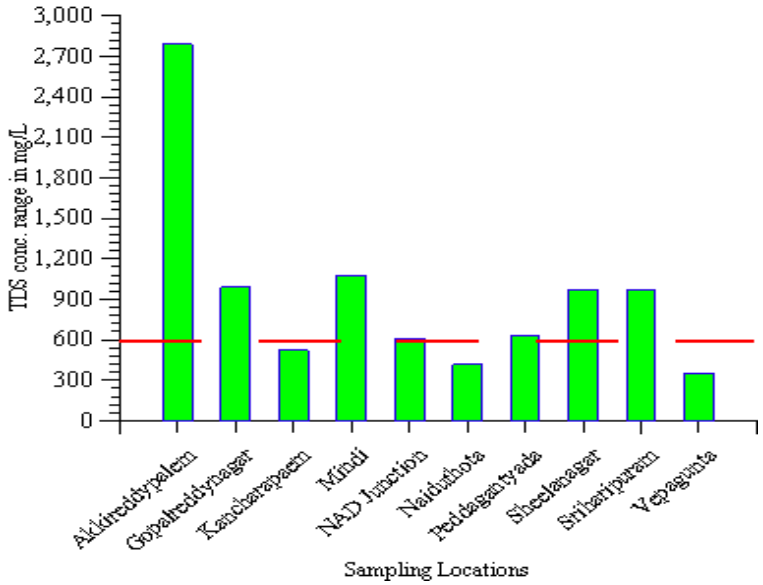
Location	pH	EC	TDS	Chlo	Sulp	TH	TA	Nit	DO
Peddagantyada	7.44	940	630	285	55	313	64	12	5
Gopalreddynagar	7.26	1546	993	449	22	154	78	10	6.5
Mindi	8.32	1689	1080	490	29	289	65	12	6.1
Akkireddypalem	7.40	4128	2789	756	124	395	134	9	5.3
Sriharipuram	7.35	1502	974	436	68	296	160	10	4.4
Sheelanagar	7.31	1485	970	431	68	353	128	5	4.9
NAD Junction	7.32	909	610	150	40	164	120	10	4.5
Kancharapaem	7.39	781	524	186	41	278	121	11	5
Naiduthota	7.53	625	418	55	34	187	140	13	4.1
Vepagunta	7.22	523	350	84	22	158	108	11	5.5
Min	**7.22**	**523**	**350**	**55**	**22**	**154**	**64**	**5**	**4.1**
Max	**8.32**	**4128**	**2789**	**756**	**124**	**395**	**160**	**13**	**6.5**
Mean	**7.45**	**1413**	**934**	**332**	**50**	**259**	**112**	**10**	**5.1**
IS Standards 15000	**6.5- 8.5**	**750**	**500**	**250**	**200**	**300**	**200**	**45**	**> 5**



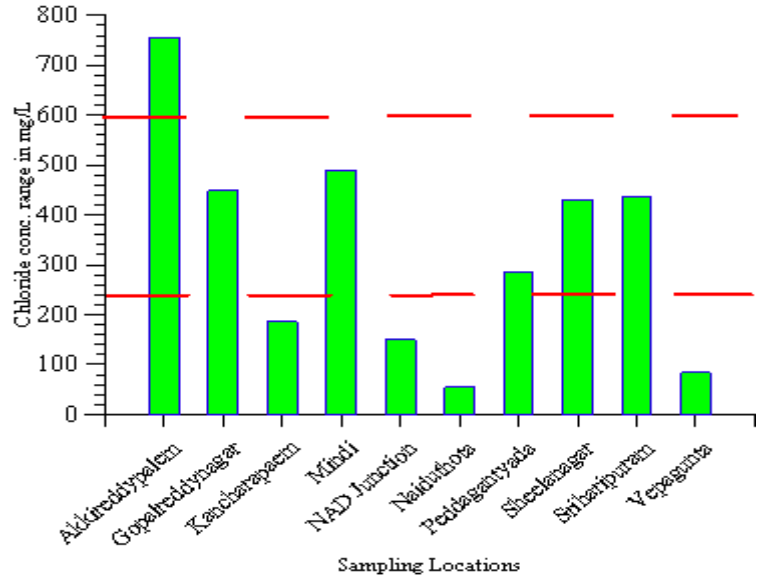
Graph. 1: pH range during the study



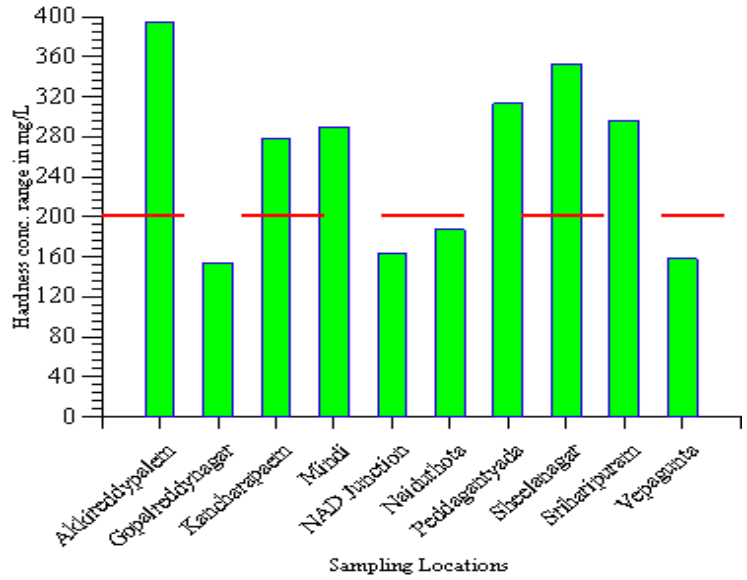
Graph. 2: EC range during the study



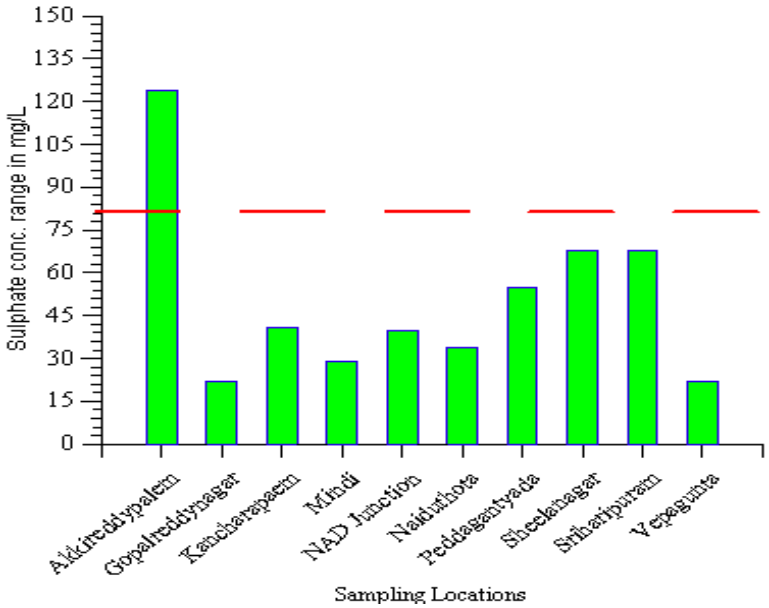
Graph. 3: TDC concentration range during the study



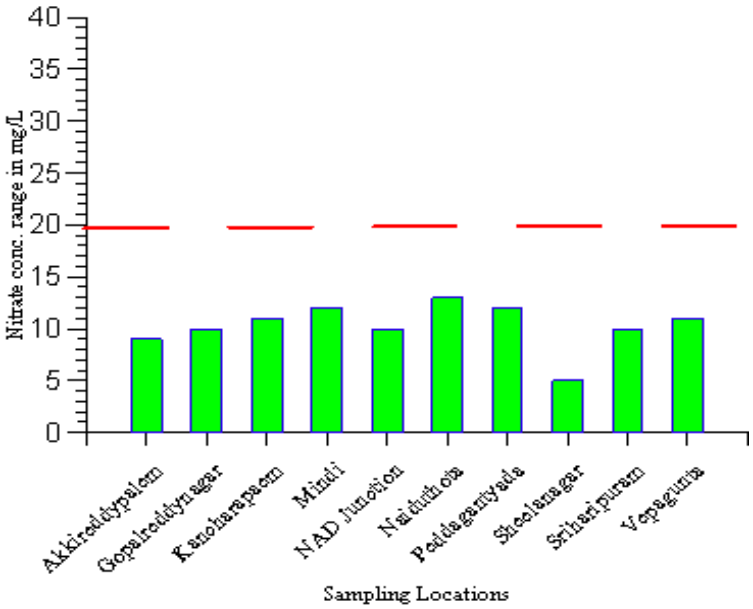
Graph. 4: Chloride concentration range during the study



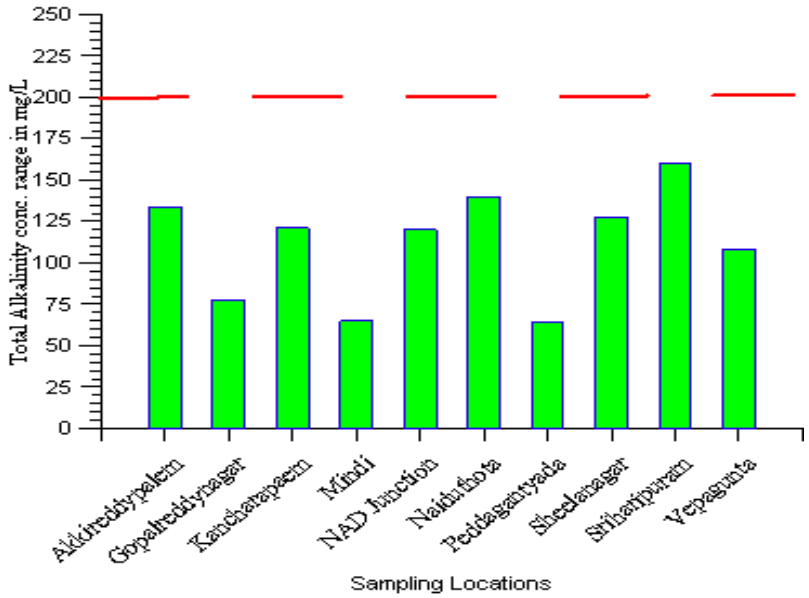
Graph. 5: TH concentration range during the study



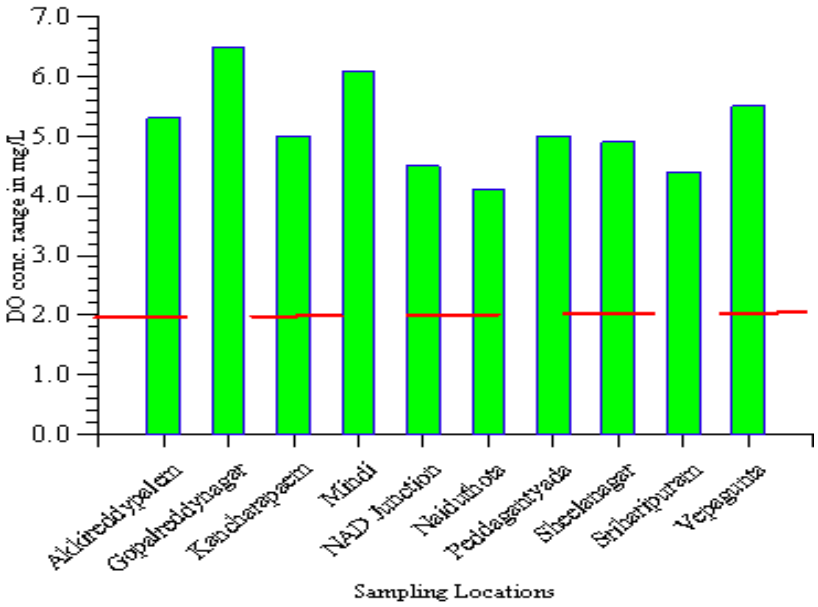
Graph. 6: Sulphate concentration range during the study



Graph. 7: Nitrate concentration range during the study



Graph. 8: Total Alkalinity concentration range during the study



Graph. 9: DO concentration range during the study

Total Dissolved Solid (TDS) represents the total amounts of ions as well as quality of water and all the sampling locations were exceeded to the ground water permissible level (**4**) and maximum Value is recorded at Akkireddy Palem ((2789 mg/L). The palatability of drinking water with a TDS level less than 600 mg/L is generally considered to be good. Drinking water supplies with TDS levels greater than 1200 mg/L are unpalatable to most consumers (**9**).

The principal natural source of chloride in ground water is seawater trapped within the rock matrix**.** Chloride is present in all-natural waters, usually in relatively small amounts; however, chloride also can be derived from human sources **(10).** Chloride levels were exceeded to permissible level of 250 mg/L (BIS Standards) except two sampling locations and maximum value recorded at Akkireddypalem (756 mg/L) while minimum value recorded at Naiduthota (55 mg/L). Hardness is one of the important properties of Ground water from utility point of view for different purposes. Total Hardness is total amount of calcium and magnesium ions and all the sampling locations in study area were recorded below the permissible level is 500mg/L (**4**) in our present study.

Alkalinity is the cause of carbonate and bicarbonate ion and its salts (**11**). The average concentration of Total Alkalinity in the present study is 112 mg/L and all the sampling locations were recorded below the permissible level of 200 mg/L as per BIS Standards. Nitrates, chemical compounds commonly used as fertilizer, can be a significant threat to ground water quality. On-site residential septic tanks can also be a source of nitrates (**12).** All the sampling locations in the present study, the nitrates concentration were below the permissible level i.e., 20mg/L (**4**) but the results indicating the slightly increase. While nitrate is a common nitrogenous compound due to natural processes of the nitrogen cycle, anthropogenic sources have greatly increased the nitrate concentration, particularly in groundwater. DO is a very important parameter of water quality and an index of physical and biological process going on in

water (11). In the present study, all the sampling locations were exceeded to the permissible level 2.0 mg/L (4).

5. Conclusion

The evolution of water quality in ground water of Gajuwaka industrial areas. A study was carried out by taking certain important parameters like pH, Electrical Conductivity, Total Dissolved Solids, Total Alkalinity, Nitrate, Chloride and Dissolved Oxygen. In this present study, it was found that the maximum parameters were at the level of pollution as per compared to BIS standards. To control the total amount of pollutant discharge. Local governments and various sector control the total industrial and urban domestic sewage discharge in an active way in connection with the industrial restructuring.

References

1. Sargaonkar, A. and V. Deshpande, Environmental Monitoring and Assessment, (89): 43-67., 2003. http://dx.doi.org/10.1023/A:1025886025137
2. Narain Rai, J.P. and Sharma, H.C. (1995). Bacterial contamination of ground water in rural areas of North-West (U.P.). Indian}. Env. Hlth., 37(1): 37-47.
3. APHA, (2005). Standard methods for the examination of water and waste water 19th edition. American Public Health Association and Water Pollution Control Federation, Washington D.C
4. BIS Tolerance limits for Inland surface water IS: 2296-1982 and BIS standard 2006.
5. David .C, (2004). Small Water Supplies. Cromwell Press, Trowbridge, Wiltshire. India.
6. Akaahan, Terngu J., Oluma, Hyacinth O. A. and Sha. Ato, Rufus. (2010); Physico-chemical and Bacteriological Quality of Water from Shallow Wells in Two Rural Communities in Benue State, Nigeria; Pak. J. Anal. Environ. Chem. Vol. 11, No. 1 (2010) 73.78.
7. Jain, C. K., A. Bandyopadhyay and A. Bhadra (2010); Assessment of ground water quality for drinking purpose, District Nainital, Uttarakhand, India; Environ Monit Assess (2010) 166:663–676.
8. Jayalakshmi, V., N. Lakshmi and M.A. Singara Charya (2011); Assessment of Physico-Chemical Parameters of Water and Waste Waters in and Around Vijayawada; International Journal of Research in Pharmaceutical and Biomedical Sciences, ISSN: 2229-3701.
9. WHO 2008, Guidelines for drinking water quality, World Health Organization, Geneva.
10. U.S. Environmental Protection Agency (1996).
11. Parihar S.S., Kumar Ajit, Kumar Ajay, Gupta R.N., Pathak Manoj, Shrivastav Archana and Pandey A.C. (2012); Physico-Chemical and Microbiological Analysis of Underground Water in and Around Gwalior City, MP, India. Research Journal of Recent Sciences. Vol. 1(6), 62-65, June (2012).
12. Murhekar Gopalkrushna H. (2011); Assessment of Physico-Chemical Status of Ground Water Samples in Akot city. Research Journal of Chemical Sciences. Vol. 1(4), 117-124, July (2011).

