Available online www.jocpr.com

Journal of Chemical and Pharmaceutical Research, 2013, 5(4):201-207

Research Article

ISSN : 0975-7384
CODEN(USA) : JCPRC5

Evaluation of ground water quality in Neyyattinkara Taluk, Kerala

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ABSTRACT

Ground water samples were collected from ten different wells around Neyyattinkara Taluk, Kerala. Parameters like pH, EC, TDS, Sulphate and Free carbon-di-oxide were measured for a period of four months from March 2012 to June 2012 using standard methods. The parameters like pH, EC, Sulphate and Free carbon-di-oxide were within the permissible limits recommended by WHO.In some sites TDS exceeded excessive limit. Water is the life line for all the creatures. A good quality, unpolluted and safe drinking water is the right of citizen, which will ensure better quality of life for the citizens of Neyyattinkara; Taluk.It is suggested to boil the drinking water before consumption.

Key words: Water, pH, EC, TDS, Sulphate.

INTRODUCTION

Most of earth's surface is in the oceans and seas. The high salt content makes it unsuitable for drinking purpose. Only 1% of available is fresh water (river, lakes, streams, ground water) for domestic, agricultural and industrial uses. Water is the most precious natural resources expected to be free from pollutants. Safe drinking water is essential for life. Access to safe drinking water has improved over the last decades in almost every part of the world but approximately one billion people still lack access to safe water and over 2.5 billion lack accesses to adequate sanitation. Approximately 70% of the fresh water used by human goes to agriculture.

A world water development report by the U.N had categorized India as one among the worst countries with poor quality of H_2O, as well as its ability and commitments to improve the situation. Water is essential to plants and animal life, it is our best solvent it carries off our wastes and it modifies our climate. Water has high density. It is approximately 8.50 times denser than air. Water is essential for the survival of any form of life. Water accounts for about 70% of the weight of a human body. Water pollution is a state of deviation from the pure condition, where by its normal function and properties are affected.

The physical pollution of water brings about changes in water to regard to its colour, odour, density, taste, turbidity and thermal properties. Colour change is not harmful unless it is associated with a toxic chemical but it may affect the quality of sunlight that penetrates to a given depth inhibiting plants and animal metabolism. Unpleasant early or muddy taste and odour are produced by industrial effluents containing Fe, Mn, and free chlorine.

The chemical pollution of H_2O is due to the presence of inorganic and organic chemicals such as acids, alkalis, toxic inorganic compounds, dissolved inorganic compounds and suspended organic compounds. Water is also polluted due to the presence of heavy metals [1].Today clean H_2O has become a precious commodity and its quality is threatened by numerous sources of pollution which are as follows. Sewage and Domestic Wastes, industrial effluents, agricultural discharges, fertilizers, detergents, toxic metals, siltation, thermal pollutants, and radioactive materials.Flouride is used to destroy the microbes present in drinking water [2]. The objective of the present study was to analyze water samples from ten different wells in Neyyattinkara, Taluk.

DESCRIPTION OF THE STUDY AREA

STATION 1: VELLARADA
This site is located at about 16Km from Neyyattinkara. It is situated in the western direction.

STATION 2: PANACHAMOODU
This site is located at about 14 Km from Neyyattinkara. It is also situated in the western direction.

STATION 3: THEKKUPARA
This site is located at about 25 Km from Neyyattinkara. It is situated in the eastern direction.

STATION 4: PARASSALA
This site is located at about 13 Km from Neyyattinkara. It is situated in the northern direction.

STATION 5: KARAKKONAM
This site is located at about 10 Km from Neyyattinkara. It is situated in the western direction.

STATION 6: KANNUMAMOODU
This site is located at about 12 Km from Neyyattinkara. It is situated at the western direction.

STATION 7: KUNNATHUKAL
This site is located at about 9 Km from Neyyattinkara. It is located at the northern direction.

STATION 8: THANIMOODU
This site is located at about 13.5 Km from Neyyattinkara. It is located at the western direction.

STATION 9: PALLIVILA
This site is located at about 14 Km from Neyyattinkara. It is located at the eastern direction.

STATION 10: PANCHAKUZHI
This site is located at about 14.5 Km from Neyyattinkara. It is located at the eastern direction.

EXPERIMENTAL SECTION

Ground water samples were collected for a period of four months from March 2012 to June 2012. The sample was collected from the bore well after drawing water for ten minutes by pumping out. After the collection, the bottles were tightly closed, marked and labeled. The samples were brought to the laboratory for the chemical analysis. The sampling was done once in 15 days in the same sites.

The pH of the water sample was instrumentally determined using a digital pH meter. The conductivity was measured using a condtivitybridge.TDS, Sulphate and Free carbon-di-oxide content were analyzed by the general procedures explained in APHA (1998) [3].

RESULTS AND DISCUSSION

The present investigation deals with the evaluation of water from ten different wells in Neyyattinkara Taluk, Kerala. Experimental results of the samples analyzed in all the ten different locations covering from March 2012 to June 2012 were tabulated parameter wise, location wise. The parameters are discussed below.

The pH value of H_2O is an important index of acidity and alkalinity of water. Analytical values of pH recorded at the sampling stations during March to June 2012. is provided in Table 1 and fig. I. The maximum value of pH is 8.51 and minimum value is 6.02. Higher pH values above 8.5 produces bitter taste. It also hastens the scale formation in water heating apparatus. High pH induces the foundation of frihaloinethanes which may cause cancer in human beings.

TABLE : 1 VARIATION OF pH AT DIFFERENT STATIONS

site No	01.03.12	15.03.12	01.04.12	15.04.12	01.05.12	15.05.12	01.06.12.	15.06.12
1	7.54	8.51	8.18	7.18	6.4	6.4	7.24	7.05
2	7.12	7.97	7.13	7.32	6.26	6.16	6.89	6.62
3	6.21	6.49	6.25	6.26	6.23	6.27	6.22	7.29
4	6.14	6.1	8.37	6.11	6.98	6.78	6.93	7.25
5	6.02	6.5	8.41	6.71	7.32	7.12	7.67	7.16
6	8.09	6.95	6.72	6.41	7.62	7.42	7.15	6.49
7	7.16	7.26	7.33	6.95	7.28	7.17	6.16	6.16
8	7.03	6.82	6.59	7.26	6.19	6.21	7.02	6.17
9	7.04	7.18	7.23	7.19	6.96	6.82	7.26	7.55
10	6.82	6.48	7.28	6.82	7.7	7.06	7.28	7.39

Fig. I VARIATION OF pH AT DIFFERENT STATIONS.

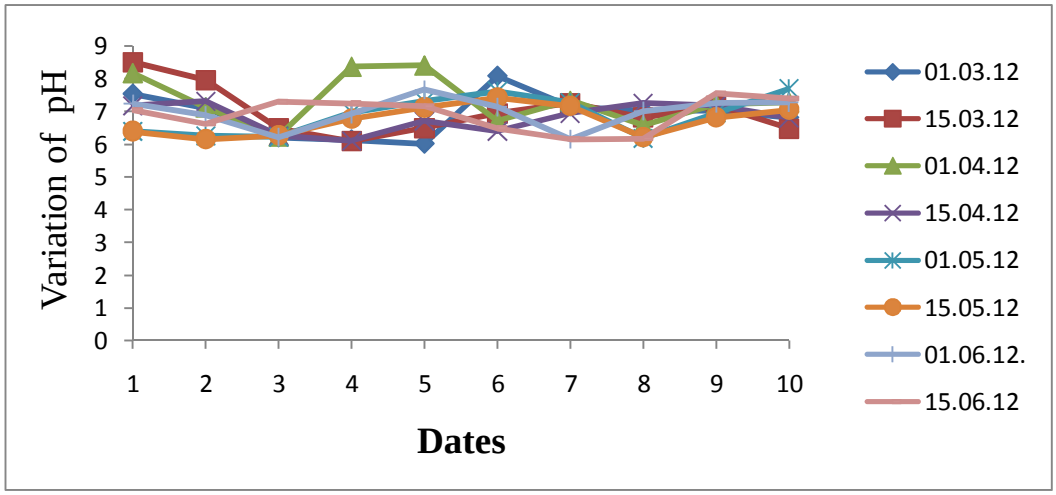


TABLE : 2 VARIATIONS OF EC AT DIFFERENT STATIONS

Unit : ds/m

site No	01.03.12	15.03.12	01.04.12	15.04.12	01.05.12	15.05.12	01.06.12.	15.06.12
1	1.06	0.95	0.89	1.09	1.06	0.62	0.92	0.9
2	2.01	1.71	1.37	1.92	1.46	0.42	1.13	0.67
3	1.24	1.18	1.17	1.56	1.25	0.56	1.07	1.04
4	1.16	1.24	1.2	0.92	1.16	1.16	1.46	1.08
5	0.45	0.56	0.68	0.91	0.45	0.67	0.14	0.4
6	0.99	1.13	0.97	0.34	0.97	0.86	0.42	1.07
7	0.97	0.58	0.55	1.16	0.86	0.55	0.13	0.9
8	1.61	1.62	1.54	1.15	1.42	0.45	1.21	1.48
9	2.42	1.93	1.88	2.22	2.21	1.26	1.32	1.78
10	1.2	1.08	1.09	1.26	1.67	1.83	1.26	1.86

Analytical values of electrical conductivity recorded at the sampling stations during March to June 2012. is provided in Table.2 and fig.II. Solubility and conductivity are directed related. Conductivity values are indicative of soluble content of water and general nature of water quality. A measure of the total electrolytes in water can be recurred by measuring the electrical conductivity.

In the present study EC value varied from site to site as well as from season to season. Highest value of conductivity with 2.42 ds/m was determined at S_9 in the month of March and minimum value with 0.45 ds/m was determined at S_5. in the month of May the electrical conductivity increased in most of the sites during summer. This was because evaporation of H_2O. It is conductivity value is the indication of dissolved ionisable solids.

The total dissolved solids or TDS in the present study ranged from 30809 mg/lit to 1293.41 mg/lit. The maximum value of TDS is 1293.41 at station S_2 in the month of May and the minimum value of TDS is 308.09 at station S_5 in the month of March. Analytical values of total dissolved solids recorded at the sampling stations during march to June 2012 is provided in table 3 and fig.III.

Many dissolved substances are undesirable in H_2O. Dissolved minerals, gases and organic constituents may produce aesthetically displeasing colour, taste and odour. Water with higher TDS content may have reverse effect of

constipation in some people whose bodies, are not adjusted to them 'WHO' stipulates TDS permissible limit to 500 mg/lit – 1500 mg/lit.

Fig.II VARIATIONS OF EC AT DIFFERENT STATIONS

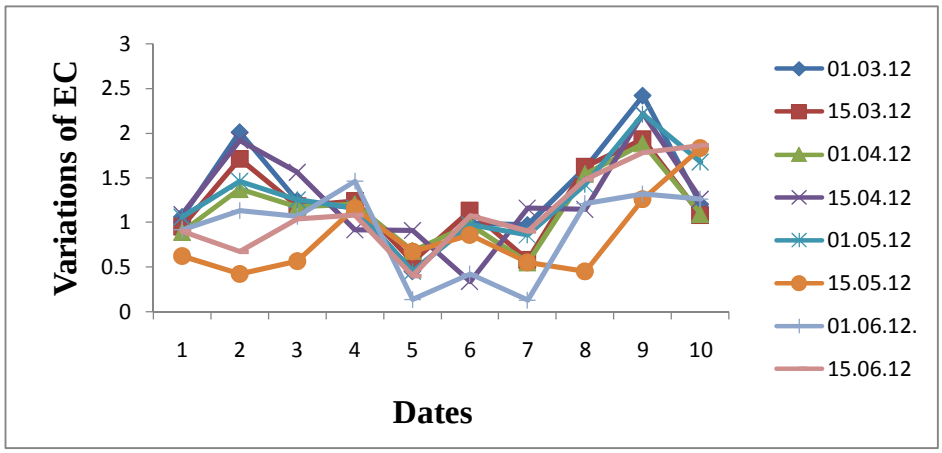
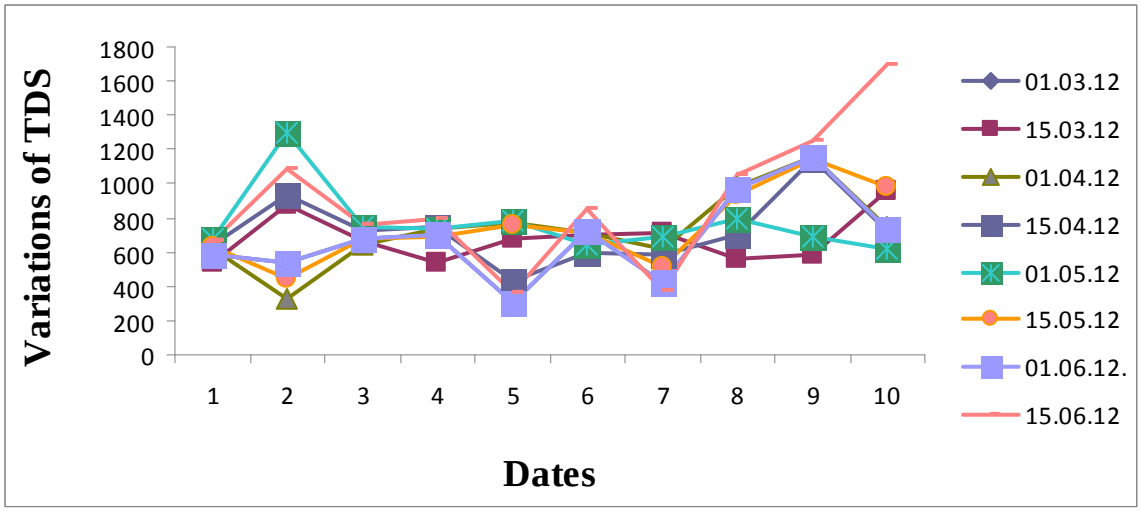


TABLE: 3 VARIATIONS OF 'TDS' AT DIFFERENT STATIONS

Unit : mg/lit

site No	01.03.12	15.03.12	01.04.12	15.04.12	01.05.12	15.05.12	01.06.12	15.06.12
1	579.12	541.11	622.53	642.21	679.41	629.26	579.92	669.87
2	541.81	876.17	324.38	938.81	1293.41	439.44	541.81	1089.22
3	679.76	662.41	643.21	726.21	752.66	672.69	679.76	765.21
4	706.81	541.82	737.72	752.82	742.14	692.46	706.81	798.61
5	308.09	679.76	773.16	434.52	786.39	757.26	309.08	361.41
6	726.41	706.81	709.12	597.23	643.29	714.67	726.41	851.84
7	418.21	718.81	616.96	583.42	692.18	516.69	418.41	377.24
8	975.16	560.08	976.72	699.61	795.65	938.47	975.16	1046.82
9	1156.19	588.68	1156.92	1148.22	687.26	1142.16	1156.19	1245.21
10	733.49	961.44	753.28	728.81	616.92	981.16	732.49	1698.22

Fig. III. VARIATIONS OF 'TDS' AT DIFFERENT STATIONS



The analytical data on sulphate content of H_2O samples at the sampling stations during the study period (March to June 12) were provided in table.4 and fig.IV.In S_4 and S_5 the sulphate was totally absent in the water samples during the entire study period. The sulphate level ranged from 23.5 ppm to 0 ppm. The maximum value is observed at station S_8 is 23.5 ppm and the minimum value at station S_4 & S_5 is 'Zero'.

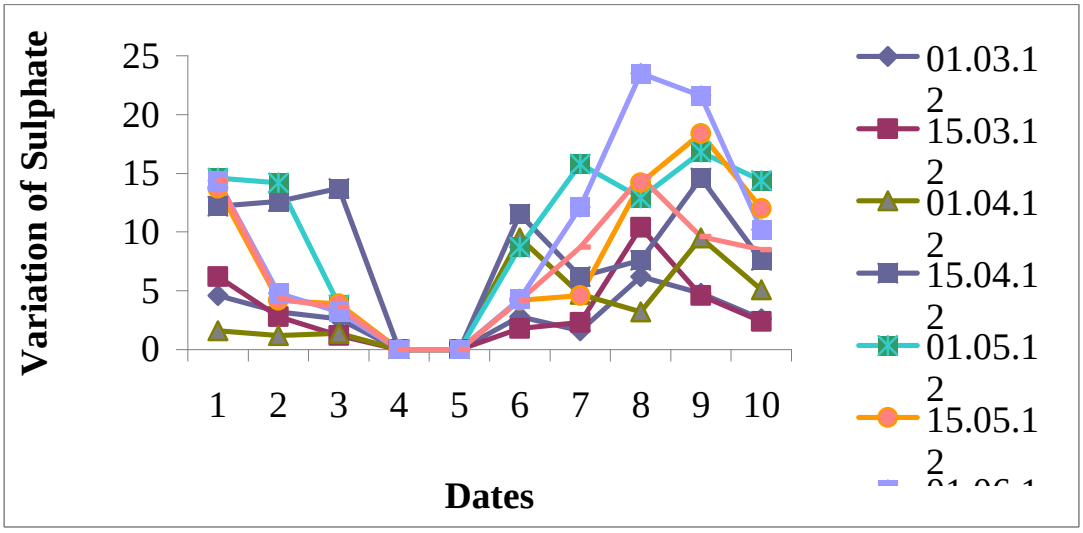
Both WHO and ICMR specifications for sulphate content for drinking purposes is 200 ppm as preferred limit and 400 ppm in the excessive limit. All the ground water samples for all the ten locations contained sulphate for less than the WHO and ICMR limits, thus making them safe for drinking.

TABLE: 4. VARIATIONS OF SULPHATE AT DIFFERENT STATIONS

Unit: ppm

site No	01.03.12	15.03.12	01.04.12	15.04.12	01.05.12	15.05.12	01.06.12	15.06.12
1	4.6	6.2	1.6	12.2	14.6	13.7	14.4	14.4
2	3.2	2.8	1.2	12.6	14.2	4.2	4.8	4.3
3	2.6	1.2	1.4	13.7	3.8	3.9	3.2	3.6
4	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0
6	2.8	1.8	9.5	11.5	8.7	4.2	4.3	4.2
7	1.6	2.3	4.7	6.2	15.8	4.6	12.1	8.7
8	6.2	10.4	3.2	7.6	12.9	14.2	23.5	14.7
9	4.8	4.6	9.5	14.6	16.8	18.4	21.6	9.6
10	2.6	2.4	5.1	7.6	14.4	12	10.2	8.5

Fig. IV. VARIATIONS OF SULPHATE AT DIFFERENT STATIONS



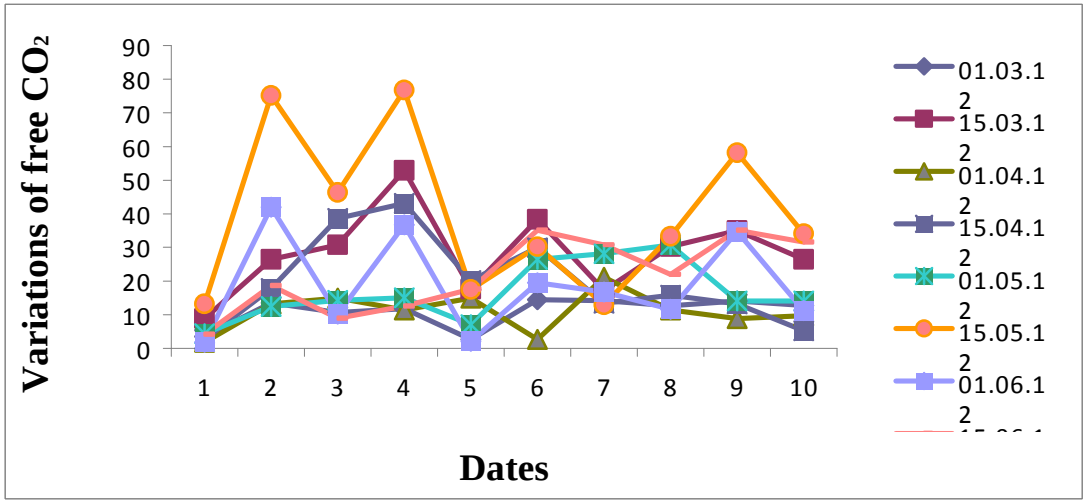
The analytical data on carbon dioxide content of water samples at the sampling stations during the study period is provided in table. 5 and fig (V). Free Co_2 is extremely a necessary constituent in agnatic environment in surface H_2O. Water acquires a considerable amount of Co_2 during decomposition of organic matters, accumulating from influencing ground water and its flora and fauna Decomposition occurs all through the year but it is slow when temperatures are low and fast when temperature high.The value of Co_2 ranged from 1.8 mg/l to 75.2 mg/l. The maximum value at station S_2 is 75.2 mg/l. The minimum value at station S_1 is 1.8 mg/l.

TABLE: 5 VARIATIONS OF FREE CARBON DIOXIDE AT DIFFERENT STATIONS

Unit: mg/l

site No	01.03.12	15.03.12	01.04.12	15.04.12	01.05.12	15.05.12	01.06.12	15.06.12
1	3.52	8.8	1.8	2.64	4.4	13.2	1.76	4.2
2	13.5	26.4	13.2	17.76	12.48	75.2	42	18.6
3	10.62	30.8	14.96	38.72	14.3	46.4	10.2	8.9
4	11.76	52.9	11.44	43.12	15.06	76.8	36.8	12.5
5	2.64	17.6	14.96	20.12	7.04	17.5	2.1	17.6
6	14.4	38.4	2.64	29.92	26.4	30.2	19.5	35.2
7	14.2	17.2	21.12	13.4	28.16	12.9	16.7	30.8
8	12.6	30.2	11.44	15.8	30.8	33.4	11.6	22
9	14.1	35.1	8.82	13.2	14.02	58.2	34.8	35.2
10	12.7	26.4	9.68	5.2	14.05	34.16	11.2	31.6

Fig.V. VARIATIONS OF FREE CARBON DIOXIDE AT DIFFERENT STATIONS



CONCLUSION

The present work deals with the evaluation of ground water quality in Neyyattinkara Tauk.The study period of the present work was from 1st March 2012 to 15th. June 2012.The samples were drawn on 1st to 15th of every month. The samples were analyzed for various physiochemical parameters. The physiochemical parameters analyzed in the present work were pH, conductivity, total dissolved solids, sulphate, and free carbon dioxide. The experimental results were tabulated location wise and parameter wise. Suitable graphical representations were provided for highlighting the parameters.

The pH values of ground water in all ten sites varied from site to site from season to season. It varied from 6.02 in the acidic range to the maximum of 8.5 in the alkaline range. The BIS specification for drinking water in respect of pH is 6.5 – 8.50 for permissible limit where as ICMR and WHO specification were 7.0 – 8.5.In most of the sites the pH values of ground water was within the permissible limits. The electrical conductivity of the water samples studied in the present work ranged from the lowest of 0.45 ds/m to the maximum of 2.42 ds/m. The constituents causing conductivity result from the dissolution of minerals and substances in the soil and atmosphere.

The total dissolved solids (TDS) in the present study ranged from 308.09 mg/lit to as high as 1293.41 mg/litThe specification of BIS and WHO for TDS in drinking water standards are 500 mg/lit as permissible limit and 1000 mg/lit as excessive limit. The water in many sites studied in the present work was far higher than the desirable limits and in some sites it exceeded the excessive limit also. High content of TDS in drinking water can change the taste of water [4].

Sulphate content ranged from 0 ppm – 23.5 ppm. Sulphate content if present beyond 500 ppm contributes to bitter taste of drinking water and beyond 1000 ppm it has a purgative effect. . In the present work the content of free carbon dioxide ranged from 1.8 mg/l to 75.2 mg/l. Though carbon dioxide has no adverse effects upon health it imparts corrosive properties. Water is the life line for all the creatures and related to their very existence. A good quality, unpolluted and safe drinking water is the right of citizen which will ensure better quality of life for the citizens of Neyyattinkara Taluk. The following suggestions are made in this regard.

It is suggested that the hygienic conditions of the environment in and around the hand pumps must be monitored on a periodical basis to ensure pollution free drinking water supplies. The quality of drinking water depends not only as the physical and chemical characteristics of water but also depends on the contamination by heavy metal [5], micro organisms such as bacteria, virus, fungus etc; microbiological studies must also be carried out to ensure pathogen free quality drinking water for the citizens. The above suggested measures if adopted earnestly will go a long way to secure safety of the environment and the right of the population for clean safe, tasty and healthy drinking water in Neyyattinkara Taluk, Kerala.

Acknowledgement
The authors are thankful to the Management and Staff of S.T.Hindu College, Nagercoil, Kanyakumari District, Tamilnadu.

REFERENCES

[1]S.Kaushik, B.K. Shau, R.K. Lawania, and R.K. Tiwai; Occurrence of heavy metals in lentic water of Gwalior. *Poll. Res***., 1999**, 18 (2): 137 -149.
[2] M.L. Davis and D.A. Cornwell, Introduction to Environmental Engineering, II^{n} Edition, MC Graw – Hill Inc.Publication, Newyork, **1991.**
[3]. APHA, Standard methods for examination of water and waste water. 20th Edn, American Public Health Association. American water works Association, Water Environment Federation Standard. Washington, DC. **1998.**
[4]. R.K.Trivedy and P.K.Goel; Chemical and Biological Methods, Water Pollution Studies, Environmental Publication, Karad**, 1986.**
[5].D.Kar, P.Sur, S.K. Mandal, T. Saha, and R.K. kole; Assessment of heavy metal pollution in surface water. *Ind.J. Environ. Sci.Tech* **2008,** 5 (1):119-124.