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Evaluation of Water Quality in the Vicinity of Industrial Area, Vizianagaram Dt.(A.P.)

A.V.L.N.S.H.Hariharan¹, S. Ravi Kiran²

Professor, Department of Chemistry, GITAM Institute of Science, GITAM UNIVERSITY, Visakhapatnam, India ¹

Research Scholar, Department of Chemistry, GITAM Institute of Science, GITAM UNIVERSITY,
Visakhapatnam, India²

ABSTRACT: Analysis of heavy metals in ground water samples have been carried out from eight sampling stations for a period of one year during different seasons (October 2019 to September 2020) in the proximity of industries, in some areas of Dt.(A.P.). The parameters such as pH, temperature, iron, copper, chromium, lead and zinc have been analyzed. It is observed that all the concentration of these metals are well below the permissible limits except Cr and Cu (S₃ and S₄ stations) are slightly in excess when compared with standards for drinking water.

KEY WORDS: Heavy metals - Water quality- Pollution- industries - Vizianagaram Dt.

I. INTRODUCTION

Heavy metals [such as chromium (Cr), cadmium (Cd), copper (Cu), iron (Fe), manganese (Mn), mercury (Hg), lead (Pb) and zinc (Zn)] are major pollutants in marine, ground, industrial and even in treated wastewaters [3, 4, 5]. Pollution due to toxic heavy metals has been tremendously increasing with industrial progress [1, 2]. It is clearly evidenced that they are not biodegradable and persist for longer periods of time in the environment. These heavy metals occur in trace levels, but are very toxic at higher concentrations. In the developing countries like India food safety and quality are most important in maintaining human health. In view of these circumstances, it is aimed to take up systematic studies on the determination of heavy metals in the vicinity of different places belonging Vizianagaram District.A.P.

II. MATERIALS AND METHODS

Analysis of heavy metals has been carried out during monsoon winter and summer seasons for the ground water samples belonging to different locations in Vizianagaram Dt. S₁-Kothapeta,S₂-Collector office ,S₃ – Jonna valasa Jn. S₄- Nellimarla, S₅ –Gajularega S₆ –Thota palem and S₇ –Babametta . Samples collected in 1lt. sterilized bottles were preserved with 2 mL nitric acid to prevent the precipitation of metals and were concentrated by Subjecting to nitric acid digestion. They were analyzed on 12th of each month during Sep 2012 to April 2013.

All the chemicals and reagents used were of analytical grade.D.D water was used for the preparation of solutions. Heavy metal analysis was done using Atomic absorption spectrophotometer type- AAS – SVL Spectronics – 205 Model Mercury Analyser – SVL Spectronics – 101 Model Spectrophotometer – Systronics. The pH of water samples was determined by a pH-meter and conductivity was measured by a conductivity meter (Systronics).The results obtained were compared with WHO (1996) and Indian standards (1998) for drinking water.

III. RESULTS AND DISCUSSION

The results obtained on the analysis of heavy metal concentration from different sampling stations are presented in Tables – 1 to 3.

Toxicity of metals in water has been found to be reduced at higher levels of pH and alkalinity. The pH values of the present investigation were within the prescribed limits as per the standards (7.0 – 8.5).

The analysis of water samples for various metals such as Cd, Fe, Pb, Ni and Zn except Cr and Cu (S₃ and S₄ stations) revealed that lower concentrations are reported from these sampling points under study.

Cadmium (Cd)

Cadmium used for dye and paint, batteries, ceramic industries, wooden industries and plastic production. The metal is said to be released to the environment by human activities, such as tobacco smoking, mining, smelting, waste batteries, e-waste, paint pigment production, incinerations and refining of non-ferrous metals, fossil fuel combustion. It is also used in electro-plating, semiconductors, rectifiers solder for aluminum etc. waste incineration industries that are engaged in extraction, refining electroplating and welding of Cd containing materials.

Cigarette smoking can cause significant increases in the concentrations of cadmium in the kidney, the main target organ for cadmium toxicity. Values of cadmium are found to range between BDL to 0.09ppm.

Chromium (Cr)

Out of the two stable forms of chromium, trivalent chromium Cr (III) is found to be essential to human beings and animals. It also plays vital role in insulin metabolism as the glucose tolerance factor (GTF). On the other hand Cr(VI) is more toxic than Cr(III). It is also responsible for chrome ulcer and kidney damage [6]. Maximum concentration of Cr(VI) permitted in domestic water supplies is 0.05 ppm. Sources of contamination of chromium in the environment are Chlor-alkali, electroplating, leather textiles, metal finishing, mining and metallurgical industries. The ash from thermal plants of burning of coal as fuel in various industries contain significant amount of chromium which seeps through earth and affects the fertility of land. Total chromium content of the present study varied between BDL to 0.31 ppm whereas hexavalent chromium was observed between BDL and 0.22ppm.

Copper (Cu)

Copper is both essential and potentially toxic element. Large doses of copper irritate stomach. When present in excess limit (>1.0ppm) imparts undesirable taste to drinking water. The values obtained are found within the permissible levels recommended by Indian standards BDL to 0.076ppm [4].

Iron (Fe)

Iron deficiency is quite common among people throughout the world. However iron exposure results in siderosis (mottling of lungs) [7]. Standards of iron in drinking water is 0.3ppm. In the present study iron content varies between BDL to 0.23 ppm.

Lead (Pb)

Lead exposure occurs through gasoline additives, soil, drinking water system, cosmetics, folk remedies, and battery/plastic recycling industry. The toxicity of lead is attributed to the fact that it interferes with the normal function of enzymes. Symptoms include hallucinations, headache, numbness, arthritis, and vertigo [7]. Lead concentrations were found to vary between BDL and 0.007 ppm.

Nickel (Ni)

Major man-made sources of release of nickel are the combustion of coal and heavy fuel oil. Nickel is an important cause of contact allergy, partly due to its use in jewelry. The main uses of nickel and its compounds are in stainless steel, nickel containing alloys with anti-corrosion properties and electroplating. Other industrial applications include automotive, aerospace, electronics, consumer products, chemicals and batteries [8]. Results of the present study indicate that its value ranged between BDL to 0.068 ppm. None of the samples exceeded the relevant prescribed limits for lead in drinking water.

Zinc (Zn)

Drinking water contains certain amounts of zinc, which may be higher when it is stored in metal tanks. Low intake of zinc results in growth retardation, immaturity and anemia. Industrial sources or toxic waste sites may cause the zinc amounts in to reach levels that can cause health problems [9]. More than 50% of metallic zinc goes into galvanizing steel, but is also important in the preparation of certain alloys.

The low concentration of zinc in drinking water could be due to the fact that pH of water samples was slightly alkaline and its solubility is a function of decreasing pH. Zn content varied between BDL to 0.42 ppm.

IV. CONCLUSION

It can be concluded from the present study that the concentration of metals are found lower than (except Cr and Cu from S₃ and S₄ stations) (Spec IS: 10500, 1996) specifications for drinking water. However, it is recommended that a



real assessment of the water and its quality has to be checked periodically keeping in view of its demand for human consumption.

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Table –1
Physico – Chemical Parameters of Water Samples Collected in rainy season

Station No.	Temperature (°C)	pH	Total Cr	Cr(VI)	Cd	Cu	Fe	Pb	Ni	Zn
S1	26.79	7.85	0.020	0.042	0.006	0.031	0.072	0.003	0.004	0.25
S2	26.75	7.52	0.041	BDL	0.005	0.005	0.039	BDL	0.001	0.12
S3	27.61	7.74	0.03	0.015	0.002	0.008	0.056	0.002	BDL	0.18
S4	27.45	7.58	BDL	BDL	BDL	0.006	BDL	0.006	0.0021	BDL
S5	27.62	7.72	0.072	0.040	0.033	0.004	0.11	0.002	0.005	0.35
S6	27.58	8.05	0.013	BDL	0.002	BDL	0.18	0.003	0.008	0.052
S7	27.52	8.03	0.052	0.035	0.026	BDL	0.069	BDL	BDL	0.034
S8	27.45	8.11	0.035	0.022	0.035	0.012	0.15	0.004	0.012	0.006

BDL= Below Detectable Limit

Table-2
Physico – Chemical Parameters of Water Samples Collected in winter season

Station No.	Temperature (°C)	pH	Total Cr	Cr(VI)	Cd	Cu	Fe	Pb	Ni	Zn
S1	27.05	7.38	0.058	0.035	BDL	0.012	0.042	0.007	0.003	0.035
S2	27.60	6.82	0.014	0.004	0.002	BDL	0.038	0.003	BDL	0.026
S3	27.22	7.15	0.046	0.022	0.007	0.001	0.042	BDL	BDL	0.14
S4	27.28	7.27	0.032	0.003	BDL	0.002	BDL	BDL	0.012	BDL
S5	27.15	7.46	0.027	0.017	BDL	0.034	0.003	0.001	BDL	0.42
S6	27.25	7.52	0.050	0.030	0.032	0.003	0.004	0.002	0.007	0.019
S7	27.50	7.18	0.032	0.014	BDL	BDL	0.018	BDL	BDL	0.014
S8	27.28	7.24	0.047	BDL	0.008	0.002	0.19	BDL	0.016	0.011



Table –3
Physico – Chemical Parameters of Water Samples Collected in summer season

Station No.	Temperature (°C)	pH	Total Cr	Cr(VI)	Cd	Cu	Fe	Pb	Ni	Zn
S1	28.12	7.67	0.023	0.018	0.005	0.026	BDL	0.005	0.068	0.36
S2	28.15	7.46	0.042	0.022	0.002	BDL	0.062	0.002	0.001	0.25
S3	28.23	7.78	0.080	0.046	0.006	0.061	0.059	0.001	BDL	0.28
S4	27.96	7.57	0.024	BDL	0.002	0.003	0.059	BDL	BDL	0.052
S5	27.75	7.35	0.31	0.22	BDL	0.076	BDL	0.005	0.011	BDL
S6	27.68	7.98	0.036	0.019	0.009	0.004	0.008	0.004	BDL	0.11
S7	28.12	6.87	0.018	0.008	0.007	BDL	0.005	0.002	0.002	0.043
S8	27.95	7.56	0.037	0.022	0.004	0.008	0.23	0.003	0.075	BDL



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