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Eco-toxic metal analysis of some ground water samples of industrial area in Aurangabad

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ABSTRACT

In the present study eco-toxic metals (Cd, Pb,Cu,Fe, Zn and Hg.) were detected in ground water samples taken from industrial areas in Arungabad. Samples were collected in three seasons rainy (July 2007) winter (Dec. 2007) and summer (May 2008) for a period of one year. Eco-toxic metals were determined using AAS. According to standard methods (APHA- 1995). The concentration of eco-toxic metal like Cd in ground water was found above permissible limit. Zn.PbCu.Fe.and Hg. Were found bellow the permissible limits for drinking water. Eco-toxic metal contamination of ground water was found to occure due to a high degree of anthropogenic stress.

Key words: Ground water, Eco-toxic metals.

INTRODUCTION

Eco-toxic metals are probably harmful [1] and insidious pollutants because of their non-biodegradable nature and their potential to cause adverse effects in human [2] beings at certain level of exposure and absorption. They can cause biochemical effects such as inhibition of enzymes, genetic damage and hypertension. Some of the eco-toxic metals like Cd and Pb are well known carcinogens in human system. It has been observed that diseases other than cardiovascular have been associated with heavy metals in water. In view of the above findings, eco-toxic metal content in drinking water has been a cause of prime concern. Since the levels of toxic metal ions generally quite low, extremely sensitive analytical techniques are needed for their measurements. Characterization with respect to impurities, often present in ppb or lower concentrations, demands a suitable analytical technique in order to arrive at accurate values, since the behaviors of elements at trace and ultra-trace levels may be widely different from that at high concentration present study area are used for domestic, agricultural and industrial purposes, taking into account the toxicity of heavy eco-toxic metals and also measured amount of information available on the problem, the present investigation is undertaken near industrial areas in Aurangabad thrice in a year in the months of July-2007 (rainy season) December-2007 (winter season) and May-2008 (Summer season). The results obtained have been used to assess abundance and variation of metals in ground waters, in order to present and control water pollution and avoid health risks to human beings in the study region.

MATERIAL AND METHODS

Water samples have been collected in 2L polythene containers previously cleaned by soaking it in 10% nitric acid overnight washed and rinsed with distilled water on the day of sampling. At the sampling site, the containers were rinsed twice with the water being sampled, prior to the filling. One Ml of concentrated HNO3 is added to each samples. The

samples are filtered immediately upon arrival at the laboratory, using 0.45 m Millipore membrane filter and the water samples are stored in the laboratory at 4°C. An aliquot sample is taken into beaker; further, it is digested on a hot plate and reduced to a volume less than 50 ml. The digested sample is poured into a 50 ml volumetric flask and made up by distilled water, which is used before to rinse the digested sample beaker. The prepared sample was kept in the dark place and the trace metals were analyzed by using Atomic Absorption Spectrophotometer[3].

RESULT AND DISCUSSION

Cadmium

Cadmium is relatively a rare element and is uniformly distributed in the earth's crust. Cadmium is considered to be one among the environmentally hazardous metals[4], because it has high toxicity and greater capability of accumulation and retention in the body of organism including human. In man biological half-life time of cadmium is in the range 10-30 years. In the present study, the cadmium concentration is found to be in the range from 11 ppb to 16 ppb during rainy season 12 ppb to 18 ppb and 10 ppb to 30 ppb during summer, all the values are well above the permissible limit, 10 ppb, it may be because of water soluble cadmium moieties in the soil and electronic waste dumped in soil.

Lead

Significant variation of lead content has been recorded with season to season. It is found that the concentration of lead is higher in rainy season. This is indicative of an input from rain water runoff, effluents and household sewage stagnation in and around the sample sites for a long period of time due to unplanned drain systems. Further large variation in lead contents from one location to another is noted which is within permissible limits[5]. This is due to nature of respective hydrogeological units.

Copper

Copper content present in the ground water samples range from 17 ppb to 32 ppb in rainy season, 19 ppb to 37 ppb in winter season and 12 ppb to 30 ppb in summer season. It is found that all the samples are within the permissible limit[6] the fluctuations in copper content at all the sampling stations are observed because of domestic waste

Table 1: Ecotoxic Metal Analysis of some Ground Water Samples in and Around Industrial Areas in Aurangabad District of Maharashtra

Metals	S1 Season			S2 Season			S3 Season			S4 Season			S5 Season			S6 Season			S7 Season			S8 Season			S9 Season			S10 Season		
	R	W	S	R	W	S	R	W	S	R	W	S	R	W	S	R	W	S	R	W	S	R	W	S	R	W	S	R	W	S
Cd	11	12	10	15	16	10	12	13	10	11	13	10	14	16	12	15	18	12	11	13	10	16	19	13	12	14	10	12	16	10
Pb	20	23	18	40	42	33	38	39	35	42	45	39	38	40	35	46	49	42	23	26	20	29	32	26	32	35	28	38	40	37
Cu	25	26	23	20	21	12	18	20	16	18	20	16	17	19	16	26	30	24	30	37	26	27	30	23	32	35	30	18	20	16
Zn	127	130	115	99	100	82	95	98	80	110	112	109	43	44	42	80	82	78	72	74	63	77	82	71	80	85	75	69	72	62
Fe	90	93	88	236	240	220	93	95	90	117	118	116	210	215	206	97	100	98	100	102	95	88	90	80	89	91	85	110	115	105
Hg	ND	ND	ND	ND	ND	ND	1	1	1	ND	ND	ND	1	1	1	1	1	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

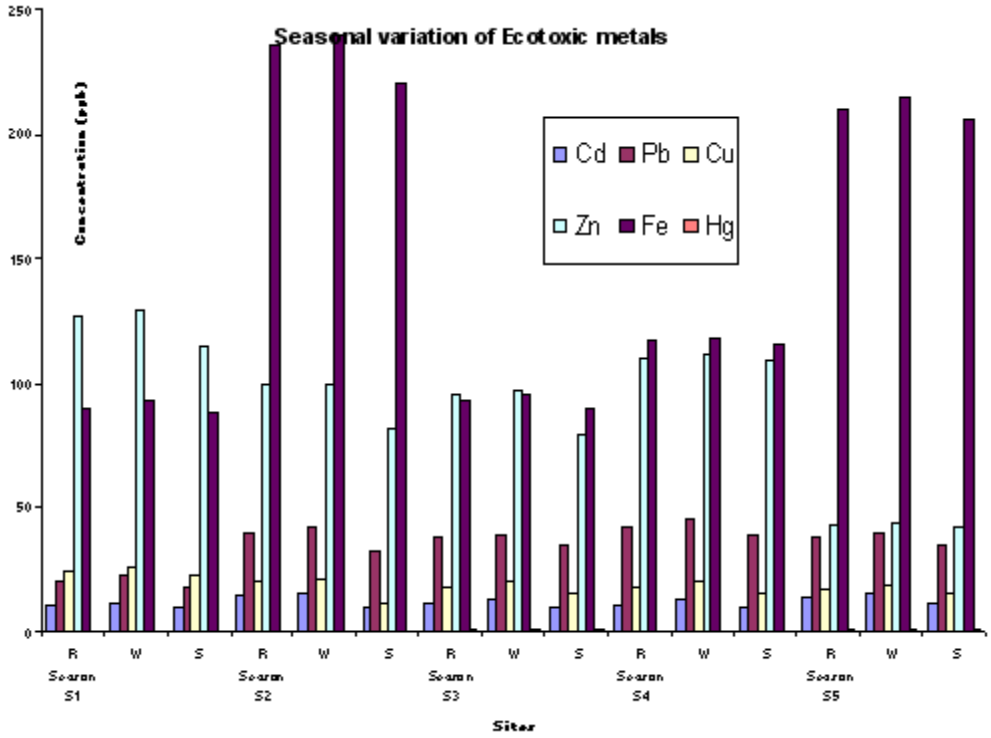
Seasonal variation of Ecotoxic metals
Cd Pb Cu
Zn Fe Hg
250
200
150
100
50
0
R W S R W S R W S R W S R W S
Season S1
Season S2
Season S3
Season S4
Season S5

Fig. 1

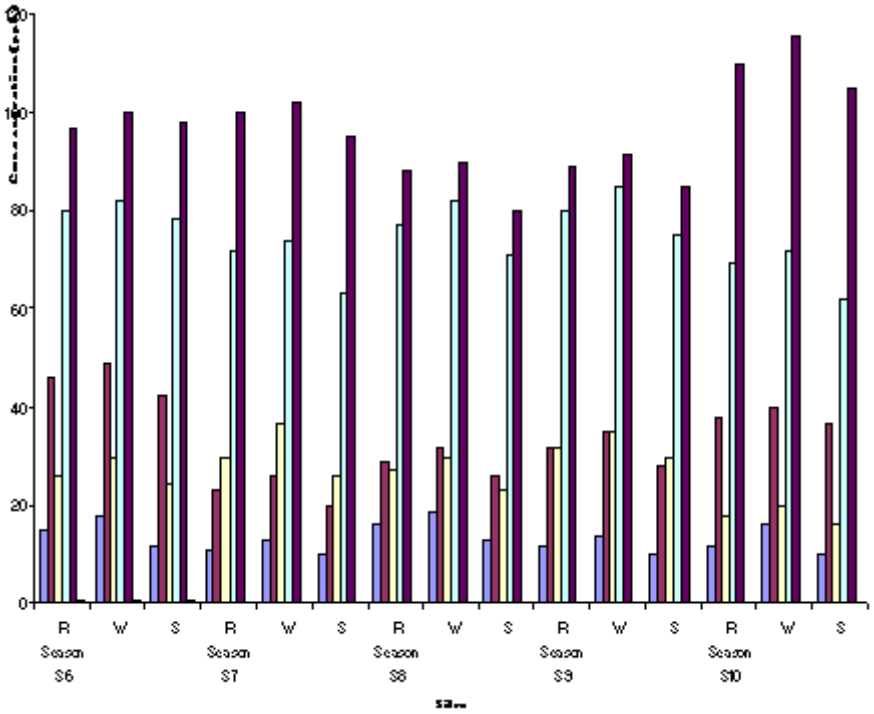
100
80
60
40
20
0
R W S R W S R W S R W S R W S
Season S6
Season S7
Season S8
Season S9
Season S10

Fig. 2

water and copper containing moieties on the soil.

Zinc

In the present study area values of zinc concentration obtained are much higher that the values of other trace metals. The zinc level showed gradual increase from summer to winter, during the study period, in all the samples studied.

Iron

The presence of iron in conjunction with manganese is highly undersiable in domestic water supplies [7]. It is a well known fact that both iron and manganese are essential to the human body. Hence, it can be concluded that the low limit placed upon these metals in the standards has no health significance and the limits are based on aesthetic and taste considerations Significant variation in iron is observed in almost all the sample studied. Concentration of iron is found to be maximum in summer and minimum in rainy season.

Mercury

Mercury is a toxic element and serves no physiological functions in man i.e. nonessential element. In the present study mercury ranges from 0.0 (ND) to 1.0 during rainy, winter as well as summer seasons which is in the permissible limit [8].

CONCLUSIONS

Eco-toxic metals like Cd,Pb,Zn,Cu,Fe are present in considerable concentration in ground water samples in study area this may be due to the emission and discharge of eco-toxic metal by small scale industries, combustion of fossil fuel and due to anthropogenic origin.

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Sampling sites

S1 Public Bore well, near Mosque, Powerloom Area, Chikalthana, MIDC Aurangabad.

S2 Bore well in Devgiri Chemical compound, Chikalthana MIDC, Aurangabad.

S3 Public Bore well near Skoda India Ltd., Shendra V-Star Industrial Area, Aurangabad.

S4 Public Bore well near 'Buddha Vihar', Shendra Village, Aurangabad.

S5 Public Bore well near Sterlite Industry Hanuman temple, MIDC, Waluj, Aurangabad.

S6 Public Bore well near 'Tathe Grocery Shop', Main Road, Ranjangaon, MIDC, Waluj, Aurangabad.

S7 Public Bore well near Bus Stand, Ranjangaon, MIDC, Waluj, Aurangabad.

S8 Public Bore well in Z.P. School, Ranjangaon, MIDC, Waluj, Aurangabad.

S9 Public Bore well in Ambedkar Nagar, Jogeshwari, MIDC, Waluj, Aurangabad.

S10 Public Bore well near village panchayat, Jogeshwari, MIDC, Waluj, Aurangabad.

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