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Research Article

Investigation of Heavy Metals In And Around Badnapur, dist. Jalna

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ABSTRACT

The aim of present investigation was to determine the concentrations of heavy metals in groundwater of Badnapur and surrounding area. Groundwater from ten sampling stations were analysed for heavy metals like cadmium, chromium, lead, arsenic, copper, zinc and mercury.The results reveal that the concentration of lead is higher than the permissible limit prescribed by the WHO.

Keywords: Groundwater, heavy metal, Badnapur.

INTRODUCTION

The ground water is defined as water that is found underground in cracks and spaces in soil, sand and rocks. This source has two distinct functions; firstly, it is a significant source of both urban and rural population's water supply and secondly it sustains many wetland ecosystems. One of the most important environmental issues today is ground water contamination and between the wide diversity of contaminants affecting water resources, heavy metals receive particular concern considering their strong toxicity even at low concentrations.

Heavy metals are elements having atomic weights between 63.546 and 200.590 and a specific gravity greater than 4.0 i.e. at least 5 times that of water. They exist in water in colloidal, particulate and dissolved phases with their occurrence in water bodies being either of natural origin (e.g. eroded minerals within sediments, leaching of ore deposits and volcanism extruded products) or of anthropogenic origin (i.e. solid w aste disposal, industrial or domestic effluents, harbour channel dredging). Heavy metals are probably the most harmful insidious pollutants because of their non biodegradable nature and their potential to cause adverse effects to human beings at concentration higher than permissible limits (Lokhande and Keikar, 2000).

The present investigation deals with the study of heavy metals in groundwater in and around Badnapur, Dist. Jalna.The heavy meals studied are Cadmium, Chromium, Lead, Arsenic, Copper, Zinc, Mercury. The site selected for the study is a developing area of Jalna district. There are number of steel industries around Badnapur which may have contamiation with the groundwater of the area. The ground water samples were collected from the Dug well of Arts, Commerce and Science College, Badnapur-B1, Bore well near High School, Kadegaon-B2, Bore well in Mahanubhav Ashram, Badnapur-B3, Public dug well at Keligavan-B4, Public dug well at Ambadgaon-B5, Bore well in St. Thomas Church, Badnapur-B6, Public bore well at Jarhad Lane, Badnapur-B7, Public bore well at Pawar Lane, Badnapur-B8, Public bore well at Shekamat Lane, Badnapur-B9, Public bore well at Mali Lane, Badnapur-B10.

MATERIALS AND METHODS

Groundwater samples were collected from the dug well and bore wells of selected ten sampling sites in the month of November 2008 in plastic bottles cleaned and rinsed with sample water.

Digestion : To ensure the removal of organic impurities from the samples and thus prevent interference in analysis, the samples were digested with concentrated nitric acid. 10ml of nitric acid was added to 50ml of water in a 250ml conical flask. The mixture was evaporated to half its volume on a hot plate after which it was allowed to cool and then filtered.

Table 1: Heavy metal analysis of groundwater samples of Badnapur in ppm

Heavy Metal	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
Cd	0.015	0.026	0.016	0.022	0.018	0.013	0.021	0.014	0.016	0.011
Cr	0.008	0.011	0.006	0.009	0.022	0.012	0.011	0.008	0.009	0.008
Pb	0.020	0.050	0.070	0.025	0.080	0.022	0.026	0.030	0.020	0.022
As	0.0	0.002	0.003	0.006	0.001	0.002	0.0	0.003	0.005	0.005
Cu	0.022	0.023	0.007	0.011	0.006	0.007	0.009	0.021	0.020	0.022
Zn	0.032	0.029	0.033	0.027	0.008	0.088	0.060	0.056	0.026	0.020
Hg	0.0	0.0	0.0	0.0003	0.0006	0.0	0.0002	0.0001	0.0	0.0001

Preparation of standards: Standard solutions which will be required for the analysis were prepared by dilution of 1000 mgL-1 stock solution obtained from Siso Research Laboratories Pvt. Limited (SRL) using micropipette and glass wear clean by soaking in 10% HNo.3 for 24 h and rinsed gently with deionized water. Use and stored for more than 2 days of standard solutions were prepared with deionized water before.

Analysis: The samples were analyzed for heavy metals following Standard Methods (APHA, 2005). The analysis was performed using flameless Atomic Absorption Spectrophotometer (AAS). The quality control was monitored using 10% sample blanks and 10% sample duplicates in each set of sample analysis. The samples were analysed for the presence of Cadmium, Chromium, Lead, Arsenic, Copper, Zinc, Mercury.

RESULTS AND DISCUSSION

The summary of the results of the study are presented in table 1. Cadmium concentration ranges from 0.011 to 0.026ppm which is lower than the permissible limit of WHO i.e. 0.003ppm. Chromium is present in small quantities in nature. It is maximum present in rocks than in those of silica type. The toxicity of chromium depends on its physico-chemical shape; hexavalent salts are considered the most dangerous. The concentrtaion of chromium ranged between 0.006 to 0.022ppm. The chromium level is well within the range given by the WHO standards. Lead (Pb) is used principally in the manufacturing of lead acid battery and alloys. Lead is generally toxic and it accumulates in kidney and skeleton. Infact, children up to the age of 6 years and pregnant women are most susceptible to its adverse effects. It is seen that all the samples has lead level above the WHO standard of 0.01ppm.The range of arsenic is from 0.0 to 0.006ppm and copper range is from 0.006 to 0.023ppm. The source of copper may be due to the intrusion of industrial and domestic wastes. Corrosion of brass and copper pipes also contributes to copper level in water. Range for zinc is from 0.008 to 0.088ppm Zn is an essential plant and human nutrient and metabolism, yet zinc causes astringent taste and opalescence in water and mercury ranges from 0.0 to 0.0006ppm. It is below the desirable limit. Mercury is also a toxic metal.

CONCLUSION

The results of the study reveal that heavy metal concentration in the groundwater sources in the area is high in some locations with respect to lead. . This calls for serious concern, as the levels of contamination needs remediation. To remediate the effects of the polluted water on the health of the inhabitants, the authorities concerned should designate a properly engineered landfill in the area, putting into consideration the groundwater and its flow directions. There is need to also establish functional waste disposal mechanisms in the area with sanitation inspectors recruited with enactment of sanitary bye-laws. More importantly, systematic study of the heavy metals concentrations in groundwater sources in the area should be carried out regularly. This is imperative since the inhabitants in the area depend on groundwater for drinking purposes. Industries in the area should set up effluent treatment plants and should remain effectively operational in order to safe guard the groundwater in the area.

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