Status of Some Heavy Metals in Sewage Water in Udgir (MS), India

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Abstract

Utilization of water resources is crucial to agricultural production for meeting the ever increasing demand of irrigation water for producing more and more food. Since resources are limited and large gap exists between available water supply and amount required, appropriate use of waste water of domestic origin can help in meeting a part of increased demand of water for crop production .The present study aims to understand pollution status of the sewage with respect to heavy metals. Heavy metals like Fe, Cu, Zn, Cd, were analyzed.

The maximum concentration of Fe, Cu, Zn & Cd was recorded in all sewage water sample during summer season. While the minimum values recorded during rainy season.

Keywords: Heavy Metal , Sewage, Agriculture.

Introduction

Water is the essential part of human life and ecology on earth. It is one of the most valuable resources available to man for his domestic, agriculture and industrial uses, Out of which agriculture claims lion's share accounting for about two-third of water demand. Its availability is also essential for social welfare and economic development at regional as well as national level for agriculture, hydropower production, municipal and industrial water supply, in stream ecosystem, water based recreation and in land navigation depends on surface ground water resources

The quantity and quality of water supplies pose a serious problem today in many regions. With population growing at an annual rate of 1.6 per cent, while irrigation is expanding at the rate of about one per cent only, shortage of water is being experienced in many part of the world especially in arid and semi-arid regions. Since intensive agriculture cannot depend on rainfall alone, sewage water as well as low quality water resources may become immense important sources of water in areas, where other sources are inadequate.

Heavy metals in sewage can negatively affect plant growth and health, animal health, human health and have other environmental impacts. They are relatively immobile in soil and accumulate in the plough layer of soil and remain there indefinitely. Different soil types and soil pH will affect how plants react to these heavy metals in soil. Plants have different elements uptake rate and heavy metal tolerance, since these metals have a long biological half-life, their subsequent entry into the food chain would cause health hazard to animals and human beings. Thus the accumulation of heavy metals in plant parts needs to be monitored when they are grown on the sewage water irrigation.

The city sewage water contains significant organic matter and macro- micronutrients essential for plant growth. However, it may also contain potential contaminants such as heavy metals like Fe, Cu, Ni, Cd, As, Cr etc. and pathogen and therefore must be used appropriately. This is a matter of concern because of persistence of metal pollutants in soil, uptake by crops and cumulative effects in animals and human beings.

The present attempt of the study was mainly to understand pollution status of the sewage with respect to heavy metals.

Materials and Methods

The present investigation was undertaken to evaluate the heavy metal levels in domestic sewage at Udgir. The sewage water from Udgir city is discharged along the hill slopes near fort area and this water is being used for irrigation purpose. Udgir is a taluka headquarters in Latur district of Maharashtra state (India) extending between its geographical coordinates are 18° 23' 0'' North, 77° 7' 0'' East.

The present investigation was carried out by collection of sewage water samples from two different sites (sample 1 and sample 2). The well water sample as control (sample 3) was also collected. Water samples were collected in polythene cans by employing the grab sampling method (APHA, 1985). The methods suggested for sewage water analysis as per APHA (1985) have been used.

The total micronutrients viz., Fe, Zn, Cu and heavy metal like Cd, were estimated by using acid digestion and measured by Atomic Absorption Spectrophotometer method as described by APHA (1985).

Experimental Result and Discussion:

Iron

The concentration of Fe in sewage water sample I range from 2.5 to 3.8 mg/L with an average value of 3.15 mg/L. The Fe content in sewage water sample II ranged from 2 to 2.36 mg/L and that of in control sample III was 1.3 to 1.96 mg/L (Table and Fig. 01).

Zinc

The concentration of Zn in sewage water sample I range from 1.2 to 2 mg/L with an average value of 1.6 mg/L. The Zn content in sewage water sample II ranged from 0.95 to 1.69 mg/L and that of in control sample III was 0.05 to 0.11 mg/L (Table and Fig. 02).

Copper

The concentration of Cu in sewage water sample I range from 0.11 to 0.14 mg/L with an average value of 0.125 mg/L. The Cu content in sewage water sample II ranged from 0.12 to 0.18 mg/L. whereas in control sample III was 0.008 to 0.014 mg/L (Table and Fig. 03).

Cadmium

The concentration of Cd in sewage water sample I range from 0.072 to 0.094 mg/L with an average value of 0.083 mg/L. The Cd content in sewage water sample II ranged from 0.05 to 0.078 mg/L. while in control sample III was 0.001 to 0.005 mg/L (Table and Fig. 04).

Table and fig. 01 Fe (mg/L) content of water samples during different seasons

Season	Water samples		
	Sample I	Sample II	Sample III
Summer	3.8	2.36	1.96
Winter	3.5	2.2	1.5
Rainy	2.5	2	1.3

Max	3.8	2.36	1.96
Min	2.5	2	1.3
Mean	3.15	2.18	1.63
SD	0.65	0.18	0.33

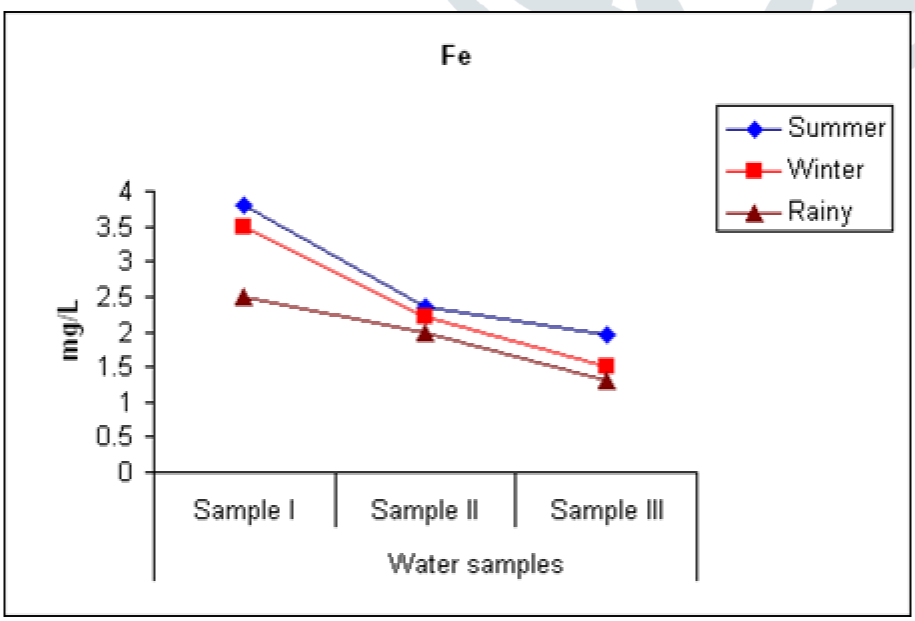


Table and Fig. 02 Zn (mg/L) content of water sample during different seasons

Season	water samples		
	Sample I	Sample II	Sample III
Summer	2	1.69	0.11
Winter	1.53	1.04	0.07
Rainy	1.2	0.95	0.05

Max	2	1.69	0.11
Min	1.2	0.95	0.05
Mean	1.6	1.32	0.08
SD	0.4	0.37	0.03

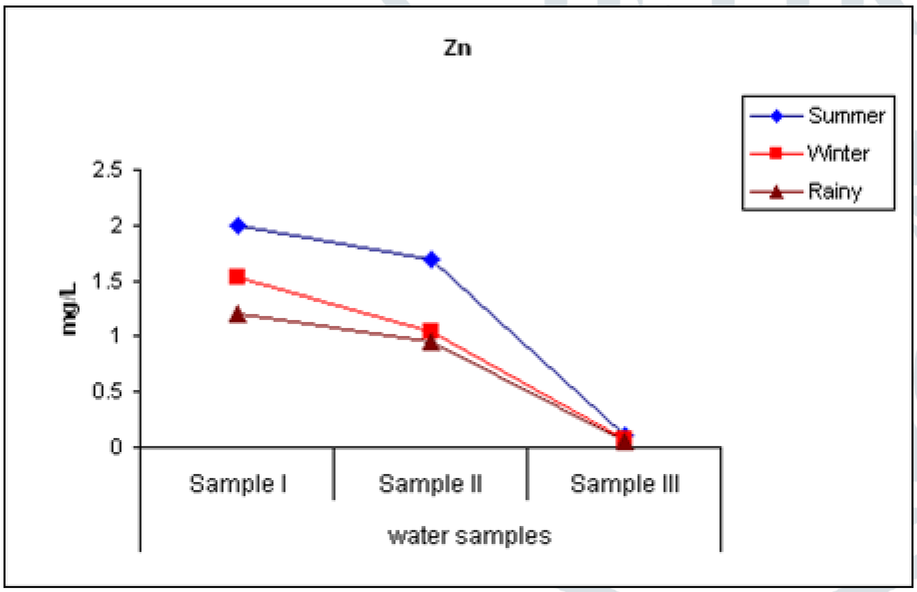


Table and Fig. 03 Cu (mg/L) content of water samples during different seasons

Seasons	Water samples		
	Sample I	Sample II	Sample III
Summer	0.14	0.18	0.014
Winter	0.13	0.14	0.01
Rainy	0.11	0.12	0.008

Max	0.14	0.18	0.014
Min	0.11	0.12	0.008
Mean	0.125	0.15	0.011
SD	0.015	0.03	0.003

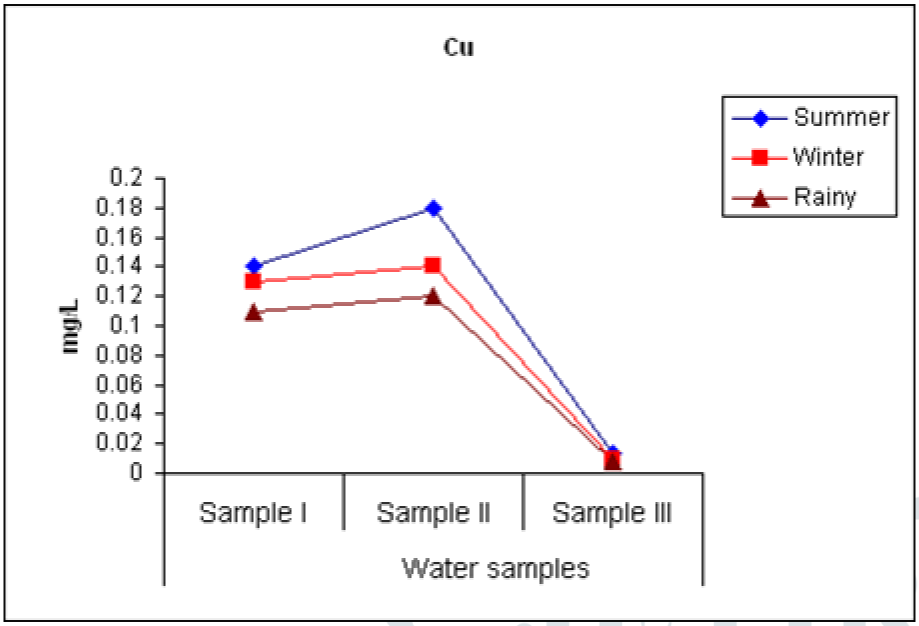
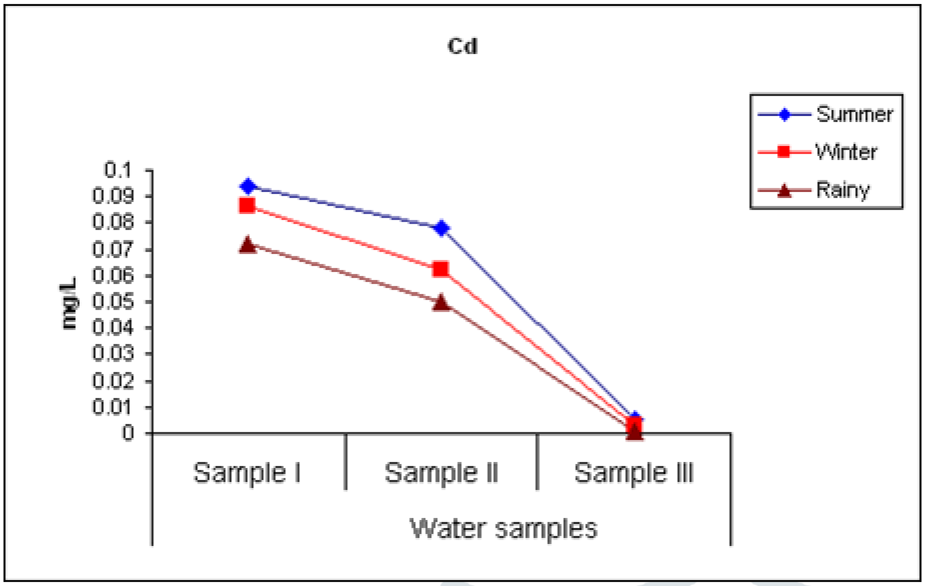


Table and Fig. 04 Cd (mg/L) content of water samples during different seasons

Seasons	Water samples		
	Sample I	Sample II	Sample III
Summer	0.094	0.078	0.005
Winter	0.086	0.062	0.003
Rainy	0.072	0.05	0.001

Max	0.094	0.078	0.005
Min	0.072	0.05	0.001
Mean	0.083	0.064	0.003
SD	0.083	0.064	0.003



Iron-Fe

The maximum concentration of Fe was recorded in sewage water sample I as 3.8 mg/L during summer season. While the minimum value as 1.3 mg/l in control sample III during rainy season (table and Fig. 01). The Fe content was within the recommended maximum concentration for waste water use in agriculture as 5 mg/L as suggested by FAO (1985) and above the permissible limit of 0.1 mg/L as per WHO (1984) .

Zinc-Zn

The highest concentration of Zn was recorded in sewage water as 2 mg/L during summer season. While lowest value as 0.05 mg/L in control sample III during rainy season (Table and Fig. 02). The Zn concentration was within the recommended maximum concentration (2 mg/L) for waste water use in agriculture as suggested by FAO (1985) and also within the permissible limit (5 mg/L) as per WHO (1984).

Copper-Cu

The maximum concentration of Cu was recorded in sewage water sample II as 0.18 mg/L during summer season. While the minimum of 0.008 mg/L in control sample III during rainy season (Table and Fig. 03). The concentration of Cu was within the recommended maximum concentration (0.2 mg/L) for waste water use in agriculture as suggested by FAO (1985) (Table 33) and above the permissible limit (0.05 mg/L) as per WHO (1984).

Cadmium-Cd

The maximum concentration of Cd was recorded in sewage water sample I as 0.094 mg/L during summer season. While minimum value of 0.001 mg/L in control sample III during rainy season (Table and Fig. 03). The Cd content in water sample during monsoon was within the recommended maximum concentration (0.01 mg/L) as suggested by FAO (1985).

The heavy content of sewage water of Kurukshetra in Haryana was within the limits for land disposal and should not pose any serious hazard (Yadav et. al., 2003). M.I. lone et. al., (2003) also reported increase in heavy metal content of heavy sewage water than that of tube well water of Hassanabdal area. The results are in corroboration with Abida begum et. al., (2009) who reported the heavy metal content of Cauvery river water.

Summary

- Iron Fe is an important trace element found in waste water. Its concentration was found to be inversely proportional to the precipitation and the concentration was in safe level.

- Zinc Zn concentration also followed the same pattern indifferent seasons and its level was also within the recommended maximum concentration.

- Copper-Cu in the sewage water was lower in monsoon and higher during post monsoon period but its concentration never exceeded the permissible level.

- Cadmium-Cd concentration among other elements was found to be significantly higher in study samples. In rainy season, its concentration reached almost the permissible limit but in post rainy season period, is concentration showed a many fold increase. Higher Cd concentration prevailing for greater period is likely to pose serious hazard when it enters in food chain.

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