



Detection of heavy metals in River Harrow at Kharala Khyber Pakhtunkhwa, Pakistan

Khalid Usman^{*1}, Sadaf Ijaz², Nabeela Firdous², Shabina Gull², Zaib-un-Nisa², Sajid Rashid Ahmad², Irfan Sheikh², Hameed Ur Rehman³, Khalid Pervaiz⁴, Inayat Ullah Malik⁵

¹Department of Zoology, Hazara University, Mansehra, Khyber Pakhtunkhwa, Pakistan

²College of Earth and Environmental Sciences, University of the Punjab, Pakistan

³Department of Chemistry, Kohat University of Science & Technology, KUST, Kohat, KP, Pakistan

⁴Fisheries Research & Training Institute, Government of the Punjab, Lahore, Pakistan

⁵Department of Biological Sciences, Subcampus Mianwali, University of Sargodha, Pakistan

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Abstract

Water becomes toxic by addition of pollutants such as heavy metals which altered the water Chemistry. Without water life is not possible in the universe. For the analysis of heavy metals a detailed research was designed in River Harrow at Kharala Khyber Pakhtunkhwa, Pakistan. For this purpose six heavy metals were selected. The selected heavy metals were Pb, Cr, Zn, Mn, Cd, and Cu respectively. The Heavy metals examined in the present research were Zn 1.13-1.78ppm; Cu 1.02-1.23ppm; Cd 0.03-1.39ppm; Pb 0.03-1.24ppm; Cr 0.03-0.15ppm and Mn 0.04-0.09ppm respectively. The present investigation summarized that that Cr, Cu, Cd and Pb were found above the permissible limits while Zn and Mn were above the permissible range.

***Corresponding Author:** Khalid Usman ✉ khalidusmankhattak1985@gmail.com

Introduction

Nickel, a major environmental pollutant, is known for its clastogenic, toxic, and carcinogenic potential (Ross, 1985; Hartwig and Schwerdtle, 2002). The carcinogenic potential of nickel compounds depends largely on their solubility. The particulate nickel compounds like Ni₃S₂ or NiO are strong carcinogens, whereas the soluble nickel (II) salts exert weaker effects (Dunnick *et al.*, 1995). This may be due to differences in bioavailability. Water soluble nickel salts are taken up only slowly by cells, while particulate nickel compounds are phagocytosed and, due to the low pH, are gradually dissolved in lysosomes, yielding high concentrations of nickel ions in the nucleus (Costa *et al.*, 1981). The aquatic systems deposition of contaminants, including heavy metals, can lead to elevated sediment concentrations that cause potential toxicity of the Aquatic biota (Yand and Rose, 2003; Heyvart *et al.*, 2000). Metal ions also damages DNA molecule and nuclear proteins that may possibly lead to carcinogenesis or apoptosis (Beyersmann and Hartwig, 2008). Assessment of heavy metals were carried out by Usman *et al.* (2017c) to examine the concentration of health hazard toxic metals in in River Kabul at Khazana Suger Mill Peshawar KP, Pakistan. Heavy metals concentration obtained from the present study was Zn 1.13-201ppm; Cu 0.55-0.9ppm; Cd 0.02-1.22ppm; pb 1.231.84ppm; Cr 0.21-1.2ppm and Mn 0.02-0.05ppm respectively. A research work was conducted by Usman *et al.* (2017d) to estimate the amount of heavy metals in River Kabul at Kond Marble factory KP, Pakistan. The concentration of heavy metals obtained was Zn 1.2-231ppm; Cu 0.3-1.89ppm; Cd 0.13-0.75ppm; Pb 1.13-0.96ppm; Cr 0.01-0.02ppm and Mn 0.11-0.44ppm respectively. Atlas *et al.* (2017) find out the amount of heavy metals such as Zn, Cu, Cd, Pb, Cr and Mn in River Kabul at Sardaryab Khyber Pakhtunkhwa, Pakistan. The heavy metals analyzed in the present research were in the range of Zn 1.14-1.86ppm; Cu 1.03-1.22ppm; Cd 0.12-0.89ppm; Pb 0.08-1.08ppm; Cr 0.02-0.12ppm and Mn 0.03-0.29ppm respectively. A research study was conducted by Farhan *et al.* (2016) to determine the concentration of some heavy metals

(Fe, Ni, Cu, Cr, Cd, Pb and Zn) in water and soil samples of four different dams located in the area of Karak, KP, Pakistan. The results obtained showed that the average value of Fe and Zn in both water and soil samples were found to be higher than other metals. In a research study demonstrated by Usman *et al.* (2018) to estimate the amount of heavy metals in the water of River Kabul at Jehangira Lower KP, Pakistan. The highest concentration of the heavy metals was found Cu 0.2-1.66, Cd 0.06-0.96, Pd 0.02-1.1, Cr 0.01-0.06 while the lowest concentration was found Mn 0.11-0.23 and zinc 1.13-2.37 respectively. A survey was carried out by Usman *et al.* (2017a) to find out the concentration of heavy metals in Jhanjira Upper site of the River Kabul KP, Pakistan. The results obtained from the current study were in the range of Zn 1.11-1.97ppm; Cu 1.05-1.63ppm; Cd 0.11-0.89ppm; Pb 0.07-1.07ppm; Cr 0.01-0.11ppm and Mn 0.02-0.28ppm respectively. Analysis of heavy metals was determined by Usman *et al.* (2017b) to explore the amount of heavy metals in River Kabul at Khairabad water KP Pakistan. The heavy metals recorded were Zn 1.5-1.59ppm; Cu 1.15-1.94ppm; Cd 0.02-0.05ppm; Pb 0.15-0.73ppm; Cr 0.01-0.02ppm and Mn 0.07-0.21ppm respectively. A study was conducted by Khan *et al.* (2017) to find out contamination of toxicological effect on environment as well as on public health and is an emerging problem in District Quetta. On average, the Antimony (Sb) (0.028±0.022 mg/L) was above the WHO standard limits while Arsenic (As) (0.006±0.0094 mg/L) was below the WHO standard limits.

The aim of the research work was to detect of heavy metals in River Harrow at Kharala Khyber Pakhtunkhwa, Pakistan.

Materials and methods

Study Area

Kharala site of the river Harrow is not too much clear. In this site a huge turbidity was found. The main reason of the water turbidity is manmade activities and domesticated discharge in to the River. In this site various fields are irrigated by small canals systems. In this area often peoples visit for picnic.



Fig. 1. Map of River Harrow at Kharala site KP, Pakistan. The blue arrow show sampling point of the selected site.

Sampling of Water

Water samples were stored in clean and dry plastic bottles with screw caps and labeled. The freshly collected samples were analyzed for Heavy metals analysis at GC University Faisalabad lab by using atomic absorption.

Method for preparation of stock solution

The stock solution was prepared as 1000ppm = 1000mg/l. Then 100ppm solution was prepared from stock solution using serial dilution equation of $C_1V_1 = C_2V_2$

Determination of heavy metals in water

The water samples were first filtered with the help of filter paper and then taken in 250 ml of glass bottles and subjected to the atomic absorption spectrophotometer (Zn, Cu, Cd, Mn, Cr, Pb) at GC University Faisalabad lab.

Results and discussion

The present research study was conducted on River Harrow at Kharala site to evaluate the concentration of heavy metals. For the analysis of heavy metals a detailed research was designed in River Harrow at Kharala Khyber Pakhtunkhwa, Pakistan. For this purpose six heavy metals were selected. The selected heavy metals were Pb, Cr, Zn, Mn, Cd, and Cu respectively. The Heavy metals examined in the present research were Zn 1.13-1.78ppm; Cu 1.02-1.23ppm; Cd 0.03-1.39ppm; Pb 0.03-1.24ppm; Cr 0.03-0.15ppm and Mn 0.04-0.09ppm respectively. The present investigation summarized that that Cr, Cu, Cd and Pb were found above the permissible limits while Zn and Mn were above the permissible range. Water becomes toxic by addition of pollutants

such as heavy metals which altered the water Chemistry. Without water life is not possible in the universe. A survey was carried out by Usman *et al.* (2017f) to find out the concentration of heavy metals in Jhanjira Upper site of the River Kabul KP, Pakistan. The results obtained from the current study were in the range of Zn 1.11-1.97ppm; Cu 1.05-1.63ppm; Cd 0.11-0.89ppm; Pb 0.07-1.07ppm; Cr 0.01-0.11ppm and Mn 0.02-0.28ppm respectively. Analysis of heavy metals was determined by Usman *et al.* (2017g) to explore the amount of heavy metals in River Kabul at Khairabad water KP Pakistan. The heavy metals recorded were Zn 1.5-1.59ppm; Cu 1.15-1.94ppm; Cd 0.02-0.05ppm; Pb 0.15-0.73ppm; Cr 0.01-0.02ppm and Mn 0.07-0.21ppm respectively. Usman *et al.* (2017e) work on River Kabul at Cantt area Nowshera to evaluate heavy metals. The metals which were recorded in the present study were Zn 1.13-1.85ppm; Cu 1.02-1.21ppm; Cd 0.03-1.32ppm; pb 0.04-1.23ppm; Cr 0.010.16ppm and Mn 0.00-0.00ppm respectively. In a research study demonstrated by Usman *et al.* (2018) to estimate the amount of heavy metals in the water of River Kabul at Jehangira Lower KP, Pakistan. The highest concentration of the heavy metals was found Cu 0.2-1.66, Cd 0.06-0.96, Pd 0.02-1.1, Cr 0.01-0.06 while the lowest concentration was found Mn 0.11-0.23 and zinc 1.13-2.37 respectively. According to Nazir *et al.* (2015), Heavy metals are bioaccumulated and biotransferred both by natural and anthropogenic sources. Results showed that concentrations of cadmium, chromium, iron and lead in water were recorded above the permissible limits set by WHO while zinc and copper were recorded below the permissible limits and no concentration of nickel was recorded in water samples.

Table 1. Concentration of heavy metals (ppm) in River Harrow at Kharala site KP, Pakistan.

S.No	Metals	U.S	M.P	D.S	Permissible limits
1	Zn	1.15	1.78	1.32	5.0 mg/l
2	Cu	1.02	1.23	1.09	0.05 mg/l
3	Cd	0.03	1.39	0.18	0.05 mg/l
4	Pb	0.03	1.24	0.18	0.05 mg/l
5	Cr	0.03	0.15	0.06	0.05 mg/l
6	Mn	0.04	0.09	0.06	50-70 mg/l

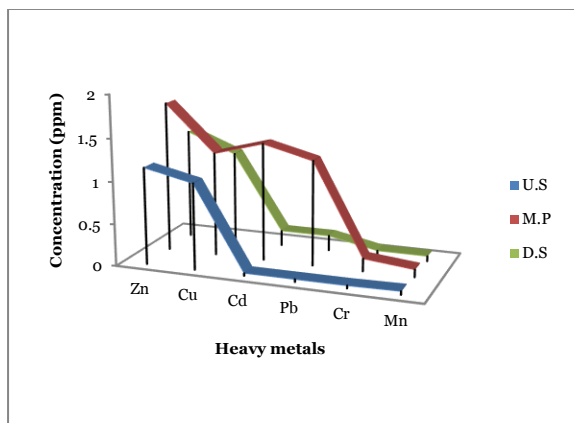


Fig. 2. Concentration of heavy metals (ppm) in River Harrow at Kharala site KP, Pakistan. U.S (Up stream); M.P (Mid point); D.S (Down stream).

Conclusion

From the present survey it can be summarized that that Cr, Cu, Cd and Pb were found above the standard values. So this point of the study area was found contaminated and not recommended for use of both aquatic life and land organism. It might be adversely affected on the inhabited peoples near to this point.

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