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Concentration of heavy metals in River Kabul at Dalda Oil Mill Nowshera Khyber Pakhtunkhwa, Pakistan

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Abstract

The objective of the current investigation was to study the water quality of the River Kabul at Dalda Oil Mill Nowshera with respect to heavy metals contamination. Water samples were collected from three different sites along the course of the River Kabul at Dalda Oil Mill Nowshera. The amount of heavy metals such as cadmium, chromium, copper, manganese, lead, and zinc were determined using atomic absorption spectrophotometer. The majority of the samples were found to exceed from the permissible limit recommended by WHO. The ranges of the heavy metals obtained during the present research were Zn 2.11-2.8 ppm; Cu 0.3-2.23 ppm; Cd 0.12-0.88 ppm; Pb 0.02-2.06 ppm; Cr 0.02-0.16 ppm and Mn 0.4-1.11 ppm respectively.

Keywords: River, Kabul, Dalda Mill, Nowshera, Heavy Metals, contamination

1. Introduction

Environmental pollution is a worldwide problem in which heavy metals belonging to the most important pollutants. The progress of industries has led to increased emission of pollutants into ecosystems [1]. Manzala Lake is one of the most important aqua systems, which receives disposal of industrial chemicals from many drains (such as Bahr El-Bakar) and agricultural pollutions (from Bahr Hadose) [2]. In addition, it was contaminated by Cairo and Delta sewage drainage system [2]. Metals tend to accumulate in water and move up through the food chain. So, studies to ascertain the level of heavy metals in environment and determine potentially hazardous levels for human are necessary. It is well known that this metal easily accumulates in fish tissues such as bones, gills, kidneys, liver, and scales [3]. Heavy metal ions do not degrade into harmless end products and will be toxic to many life forms [4]. Due to their toxicity and accumulation in biota, determination the levels of heavy metals in commercial fish species have received considerable attention in different countries [5]. There has been an increasing interest in the utilization of fishes as bio-indicators of the integrity of aquatic environmental systems in recent years [6]. The aim of the research work was to check the concentration of heavy metals in River Kabul at Dalda Oil Mill Nowshera Khyber Pakhtunkhwa, Pakistan

2. Materials and Methods

2.1 Study Area

Dalda Oil Mill Nowshera is one of the biggest mills in the Nowshera Khyber Pakhtunkhwa, Pakistan. Every day lot of heavy metals contaminated influents enter into the River Kabul. These heavy metals sewage directly enter to the river without any treatment. Dalda Oil Mill Nowshera is situated on the right range of river Kabul from where all the pollutants enter to the river which adversely affected the aquatic life. There is a GT road between river Kabul and Dalda Oil Mill but their all contamination enter to the river Kabul as a results a lot of aquatic are disturbed like fishes. These heavy metals enter to human being after using the cattle milks drinking water from this site. Furthermore, another source of heavy metal entry is the consumption of those fruits or vegetables which fields are irrigated from this contaminated water site.



Fig 1: Effluent discharges of Dalda Oil Mill Nowshera into River Kabul KP, Pakistan

2.2 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 PCSIR Peshawar by using sophisticated instruments especially atomic absorption^[9].

2.3 Method for preparation of stock solution

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

2.4 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) (Model: Z-2000; Hitachi, Tokyo, Japan) which gives direct results of heavy metals on computerized system^[9].

3. Results and Discussion

Water plays a vital role for survival of all living organisms. Life is only possible when plenty of water existing. In Pakistan majority of areas especially villages using unsafe water because there is no other resources of pure water^[9]. The current study was conducted on river Kabul at Dalda Oil Mill Nowshera Khyber Pakhtunkhwa, Pakistan. The recorded heavy metals analyzed by atomic absorption results were Zn 2.11-2.8 ppm; Cu 0.3-2.23 ppm; Cd 0.12-0.88 ppm; Pb 0.02-2.06 ppm; Cr 0.02-0.16 ppm and Mn 0.4-1.11 ppm respectively. From the present investigation, it can be concluded that almost heavy metals were found above the permissible levels. These metals may be able to create serious health problems. Another survey was conducted by Lokhande *et al.* to analyze the amount of heavy metals of Kasardi River India. Over here industrial influence discharge into the River. It was observed that concentration of most of these heavy metals were much higher than the maximum permissible limits. The authors point out that as India moves towards stricter regulation of industrial effluents to control water pollution, there is a need to implement common objectives, compatible policies and programmes for improvement in the industrial waste water treatment methods^[7]. Another study was conducted by Khan *et al.* to examine the concentration of heavy metals cadmium (Cd), chromium (Cr), copper (Cu), nickel (Ni), manganese (Mn), lead (Pb) and zinc (Zn) in the surface water of the Shah Alam River. All the selected metals were assayed using an atomic absorption (AA) spectrophotometry and the results shown as mg of heavy metal/ L of fresh water sample (mg/L). The order of heavy metal concentration was $Ni > Mn \geq Zn \gg Cu > Cd \approx Pb \gg Cr$. The highest concentration of Ni determined was ≈ 30 times whereas Cd and Pb levels were ≈ 10 times higher

than the permissible World Health Organization (WHO) established safe drinking water quality standards. The levels of Cu, Cr, Mn and Zn were within the prescribed limits^[8]. According to Usman *et al.* (2017) except Mn, all the remaining trace metals (Pb, Cd, Zn, Cu and Cr.) were found above the standard level in the River Kabul, Khyber Pakhtunkhwa Province, Pakistan. All the heavy metals were detected by atomic absorption spectrophotometer. The analyzed heavy metals were Pb 0.06-4.41 ppm; Zn 4.11-7.11 ppm; Cd 0.42-1.46 ppm; Cu 1.07-3.86 ppm; Mn 0.06-2.11 ppm and Cr 0.05-2.11 ppm^[9]. The current survey conducted on River Kabul at Dalda Oil Mill Nowshera revealed that Cu, Cd, Pb and Cr were found above the permissible limits recommended by the WHO (1973). The WHO recommended value of heavy metals are Zn 5.0 mg/l, Cu 0.05 mg/l, Cd 0.05 mg/l, Pb 0.05 mg/l, Cr 0.05 mg/l and Mn 50-70 mg/l respectively. Furthermore in the previous study conducted by Usman *et al.* only Manganese was in limits but the remaining 5 metals were found above the standard level. The reason of this variation may be that in the previous study there were 9 sites while in the current study only 1 site was studied.

Table 1: Concentration of heavy metals (ppm) in River Kabul at Dalda Oil Mill Nowshera site KP, Pakistan.

S. No	Metals	U.S	M.P	D.S	Permissible limits
1	Zn	2.11	2.8	22.2	5.0 mg/l
2	Cu	0.3	2.23	0.58	0.05 mg/l
3	Cd	0.12	0.88	0.23	0.05 mg/l
4	Pb	0.02	2.06	0.03	0.05 mg/l
5	Cr	0.02	0.16	0.04	0.05 mg/l
6	Mn	0.4	1.11	0.6	50-70 mg/l

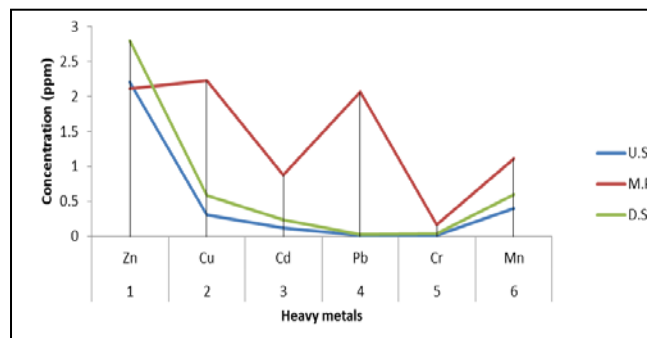


Fig 2: Concentration of heavy metals (ppm) in River Kabul at Dalda Oil Mill Nowshera site KP, Pakistan. U.S (Up stream); M.P (Mid point); D.S (Down stream).

4. Conclusion

Dalda Oil Mill Nowshera released huge amount of influents which directly discharged into the River Kabul without any treatment. These metals accumulated in the fish tissues and at last enter to our bodies by consumption of fish meat. Besides all these resources another way of metal intake is the irrigation of field crops by this contaminated water. So from the current study I strongly recommended that Environmental Protection Agency should want to take immediately action against this issue otherwise it would be very health threaten to the human being.

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