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Comparison of Heavy Elements in Surface and Groundwater of Ariana Town, Herat Province

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Abstract

Water plays a key role as a vital raw material for drinking, washing and use in agriculture and industry. Water is polluted by any substance in which it dissolves, and it directly threatens human health. The most important pollutants are iron (Fe), cobalt (Co), Mercury (Hg), silver (Ag), lead (Pb), nickel (Ni), manganese (Mn), and chromium (Cr) cations. Arrangements with higher concentrations than International Rhinoceros (WHO) are poisonous for drinking and sometimes lethal. From these studies, water quality is very important. The purpose of this study was to analyze the water quality of Ariana town, especially to study the parameters of iron, cobalt, Mercury, silver, lead, nickel, manganese and chromium. The approach of this research is applied and its method is also experimental, Sampling In this research, a quantitative cross-sectional analysis in which water samples were analyzed in four stages from four seasons, the results are presented in graphs and compared with the international range. The results show that the concentrations of cobalt, nickel and manganese cations in surface waters are high of the international standard (WHO) which causes problems in health and agriculture. Also in groundwater, the concentration of manganese and Mercury cations is higher than the international range (WHO) and its use is worrying.

Key Word's: Pollutants, Cations, Surface water, Groundwater, Heavy elements, Ariana Town.

Introduction

Undoubtedly, the best sentence to show the importance of water was made by the Mayan ancestors, and that is that water is a sign of prosperity. Life without water is not possible and life depends on it. Solvent water is strong and therefore has cleansing properties. Contaminants are washed away and dissolved in water, so water becomes impregnated with all kinds of contaminants. In addition, due to non-compliance with environmental standards, including the discharge of municipal and industrial wastewater into running water, excessive and irrational use of chemical fertilizers and pesticides in agriculture and lack of proper public education. And enough, water resources are becoming more and more polluted. Unfortunately, these infections kill millions of people worldwide every year (Seifi, 1395: 9).

Contaminants in water are caused by the entry of waste materials into the water, which changes its composition and properties. Also, spraying agricultural lands and adding chemicals to water to control organisms also causes water pollution. Soluble salts such as iron cations, magnesium, lead, cymbals, silver, nickel, cobalt, are among the most important constituents of impurities in water that cause various diseases in the human body.

It is necessary to know the compounds present in the waters of Ariana town and to receive the cations of heavy elements in these waters, and research should be done in this regard. The importance of this research is to find out the level of water pollution in Ariana town and to predict solutions to prevent over-pollution of this water, which is for the health of the people who live there. It is important.

problem statement

A water pollutant is a physical agent or a chemical or biological substance that originates from human activities and in abnormal intensity or concentration, causes a gradual change in the natural quality of water and causes water pollution. We can say that there is a change in the physical, chemical and biological characteristics that make water unsuitable.

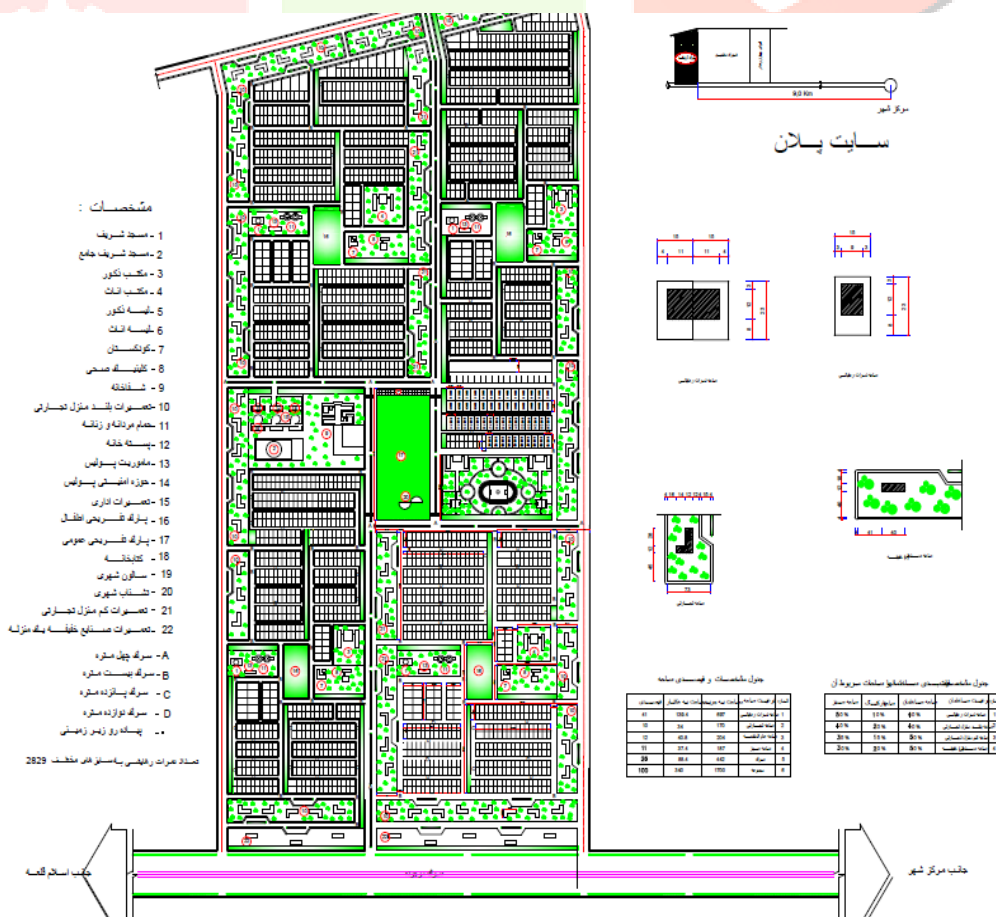
Investigation of water concentration in Ariana town Due to the fact that there are many residential houses in Ariana town that can pollute water sources for various reasons, which are the source of water pollution, In particular, elements such as lead and arsenic can cause serious problems in water pollution. Also, there are almost people living in this area who are not fully acquainted with the urban system, and most of them live in rural areas. They are exposed to more water pollution and can do it in any way: laundry, sewage, sewage. They can contaminate water, which increases the COD and BOD of water. As the concentration of metals in the water increases, they cause various diseases for the residents who live in this area. Therefore, we wanted to do some research on the concentration of substances in the water of this area. Let's put.

Research question: What is the amount of heavy element cations in the waters of Ariana town?

Objective: To investigate the cations of heavy elements in the surface and groundwater of Ariana town.

Location: This research is about the surface and groundwater of Ariana town in Herat province, and it would not be out of place to introduce this area as well. This town is located 9 km from Herat city, located in the north of Islam Qala highway, which has two phases. The first phase has an area of 334,123 hectares of land and the second phase has 443,883 hectares of land with a total area of 7,783,003 hectares of land.

Detailed plan of Ariana town



Research background

wahid, Ramesh and Ehsan Razipour in 1397 have conducted a study entitled *Environmental Protection and Natural Resources* and have also conducted a study on water pollution, according to which the pollution in Water can include: household and urban pollution, agricultural and livestock pollution, industrial pollution, organic pollution and water pollution with toxic and chemical substances. .

A study conducted by Khoda Rahm, Bazi, and his colleagues on the *Middle East Water Crisis (Challenges and Solutions)* in 2010 concluded that: *Environmental resources to meet economic needs have an impact on the environment, including water resources. Water resources have long been an important issue in the domestic politics of countries, especially in arid and water-scarce regions of the world such as the Middle East.*

Water experts predict that in the not-too-distant future tensions, national, regional and international conflicts over water will increase, and since everyone needs fresh and clean water, far from it. It would not be wise for future world wars over water resources.

The study of drinking water was conducted by the journal (Indian Institute Technology Bombay, 2003). And the rest are left raw and unrefined in the surrounding environment. In the big cities of this country, 51%, in big cities 35.5% and in other cities only 8.7% of the produced wastewater is treated. 50 to 55 percent of the country's sewage is used for irrigation.

A study conducted by Mohammad, Malakotian in 2013 under the title of study of concentrations of heavy metals arsenic, cadmium, lead and copper in drinking water sources in the southeastern villages of Rafsanjan plain by descriptive cross-sectional analysis has concluded that in all samples The amount of copper was less than the limit recommended by WHO and Iranian Standard 1053. Arsenic in 31.7% of the samples, lead in 25% and Codmiyam in 58.1% of the samples were higher than the standard. 10.4% of the population of the study area are exposed to arsenic, 66.6% are exposed to lead and 46.7% are exposed to Codmiyam above the standard.

Research Methods

This research is a quantitative and quantitative cross-sectional analysis in which water samples were first collected from four different points in four seasons and measured in the laboratory of heavy element cations according to the scientific method using advanced devices in the laboratory of Jami University. The results were analyzed in Excel software.

Field research tools

1. *Special bottles containing 0.001 percent nitric acid (HNO₃)*
2. *Gloves*
3. *Mask*
4. *Pipette*

Laboratory research equipment

1. *Special reagents for element cations*
2. *Analyzed water*
3. *Multi Ter Meter*
4. *Kit Delqoua*
5. *pH*
6. *Sampler tip*
7. *mixer*
8. *Bekar*
9. *Test tube*

10. Micro Pipette

11. Centrifuge

12. Heat source

13. Metal catch

14. Sensitive scales 0.001 g

15. Gloves

16. Mask

Due to the extremely high harmfulness of cations of heavy elements in the surface and groundwater of Ariana town, the amount of the findings was compared with the international standard. In the composition of these researched waters, cations of heavy elements with different amounts were available after the measurement laboratory in 3mlit / lit, which was measured by the advanced devices of Jami University laboratory.

After a calculation, we find out what amount of the above cations are in one liter of water. (For example, the calculation of iron and lead ions is as follows).

Calculation of iron cation: (Fe)

$$1000\text{mlit} \quad 2.66\text{mgr}$$

$$3\text{mlit} \quad x$$

$$x = \frac{3\text{mlit} \times 2.66\text{mgr}}{1000\text{mlit}} = 0.007\text{mgr/lit}$$

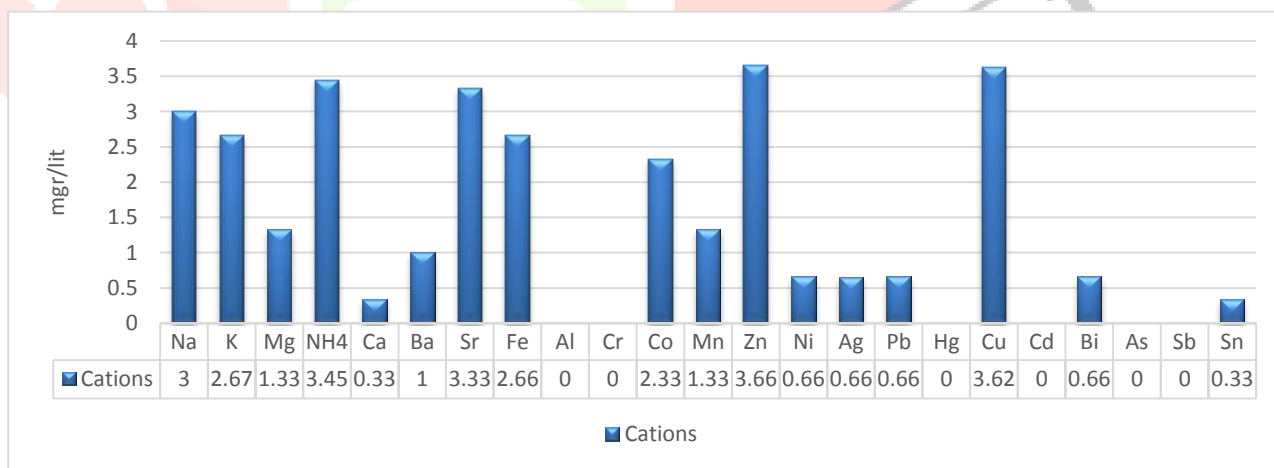
Calculation of lead cation: (Pb)

$$3\text{mlit} \quad 0.006\text{gr}$$

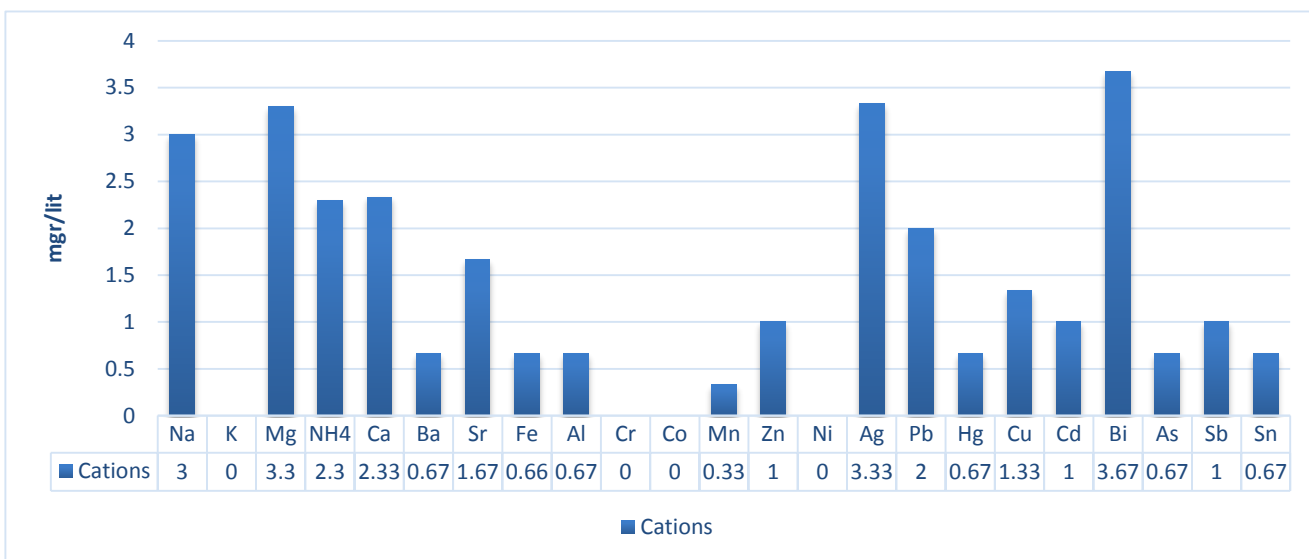
$$1000\text{mlit} \quad x$$

$$x = \frac{1000\text{mlit} \times 0.006\text{gr}}{3\text{mlit}} = 2\text{mgr/lit}$$

Results and discussion

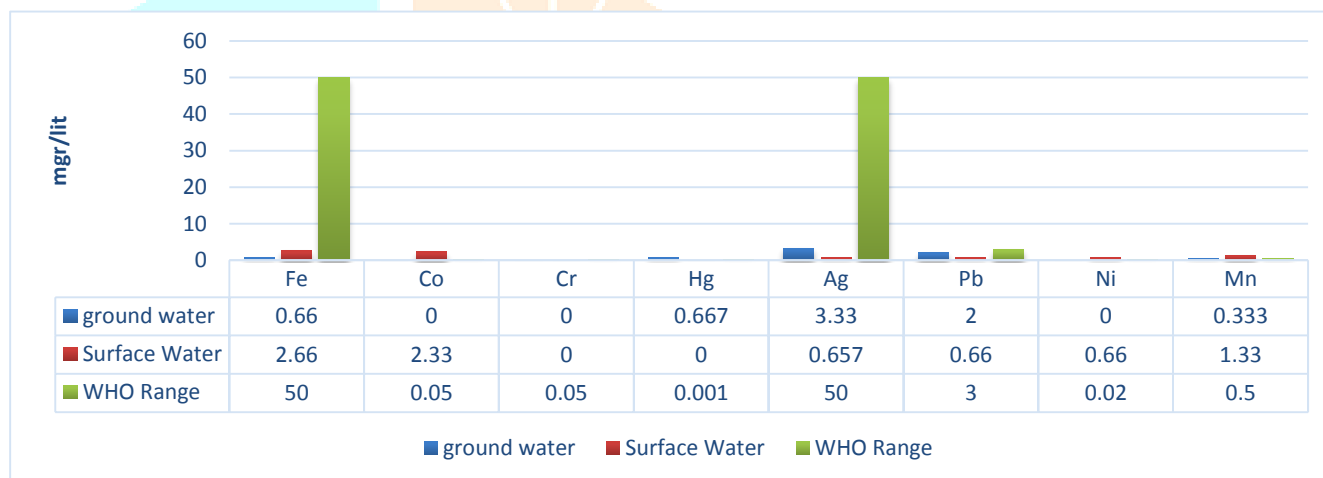


Graph (1): The amount of cations in the surface waters of Ariana Town As can be seen from the graph above, the amount of cations of elements in these waters, especially heavy elements, is high in the international range, and this in itself causes problems. It is healthy for the people of this town.



Graph (2): The amount of cations in groundwater, as seen in the graph, the amount of cations in groundwater from the international range is high, and this poses serious risks in the sector. Health and also in agriculture.

Comparison of surface and groundwater cations in Ariana town



Graph (3): Comparison of cations in surface water and groundwater of Ariana town, as shown in this graph, the amount of element cations in surface water and groundwater, most of them from the upper international range Groundwater is more polluted than surface water.

General conclusion

Iron, lead, manganese, copper, silver, silver, nickel, chromium cations are always present in surface and groundwater. If the concentration of these cations is higher than international standards, there are many problems in surface water and groundwater. These problems affect the cells of living organisms and cause a sudden mutation in the cell, which is caused by the elevation of the graph of the elements mentioned above in the water. That a cell divides as soon as possible and becomes a diet. This condition can cause cancer. After the graphs were examined in the surface and groundwater of Ariana town, according to WHO standard, which is 50mg / lit for iron, 0.05mg / lit for cobalt, 0.05mg / lit for chromium, 0.001mg / lit for silver, 50mg / lit for silver, Lead 3mg / lit, nickel 0.02mg / lit, manganese 0.5mg / lit. The results are presented in graphs and compared with the WHO range. The results show that the concentration of cobalt, nickel and manganese cations in surface waters of the International Standard (WHO) is high which causes problems. Also in groundwater, the concentration of manganese and cyanide cations is higher than the international range (WHO) and its use is worrying.

Offers

- 1- To use this water for drinking, the water must be complied with the reverse test filtration system by large devices and in accordance with international standards WHO and ANSA.
- 2- If the concentration of these cations is reduced from groundwater, it should be rinsed for a long time to reduce the concentration of toxic cations in the water.
- 3- This water does not cause problems for fruitless trees and should not be used for fruit trees.

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