

## The Determination of Water Sources Pollution Situation From Yozgat, Tukey

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### Abstract

Determination of water contamination with heavy metals (HM) has become the prime focus of environmental scientists in recent years. The aim of this study, water samples were taken periodically from sampling points where the important water sources are located between March-June 2014. Standard methods were used for determining of chemical characteristics of the water samples. Pb and Fe contents of the drinking water samples were determined by atomic absorption spectrometry. The contents of the samples have been analysed and the rations of iron and lead were determined. These results are then compared with the water quality criteria. The data showed the variation of the investigated parameters in water samples as follows: Fe 0.1-0.45 mg/L and Pb 0.002-0.004 mg/L. None of the drinking water samples analyzed for iron exceeded the limit permitted by WHO, EPA, TS-266 and EC, except for Ofis Üstü. Lead concentration in all the drinking water samples from Yozgat were below the detection limit. The concentrations of investigated parameters in the drinking water samples from Yozgat were within the permissible limits of the World Health Organization drinking water quality guidelines, Turkish drinking water standards (TS-266), US Environmental Protection Agency (EPA) and European Commission (EC). The drinking water standards for total hardness ( $\text{CaCO}_3$ ) (mg/L) were studied. The total hardness was determined by using Standard metod. The hardness of the samples were in the range of 9.0-46.0 mg  $\text{CaCO}_3$ /L. The total hardness of the drinking water samples content was below the permissible limits given by the WHO.

**Keywords:** Heavy metal, Drinking water quality, Standard methods, Yozgat-Turkey

### Introduction

Recently, metal contamination in the aquatic environment has attracted global attention. Large quantities of waste water of heavy metals have been released into receiving environment and it can cause air, soil and water pollution. The sources of heavy metal are mining, smelting, paper, pesticide, electroplating and other industrial production process [1,2].

Iron is common metallic elements found in the earth's crust. It is mainly present in water in two forms: either the soluble ferrous iron or the insoluble ferric iron. It can affect the color of water. However, it is considered aesthetic contaminant. Essential for good health, iron helps transport oxygen in the blood [3].

Lead is a non-essential metal and is a common historical and contemporary contaminant throughout the world. Once absorbed, lead accumulates in high concentrations in bone, teeth, liver, lung, kidney, brain, and spleen, and it goes through the blood-brain barrier and the placenta. Long time exposure to high levels of lead can cause kidney, liver, central nervous system and reproductive system damages [4].

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Yozgat is a city in the Middle Anatolia Region of Turkey. The city is located at an elevation of 4,380 ft (1,335 m), situated 170 km east of Ankara, near the head of a narrow valley through which the Ankara–Sivas road runs. Like much of the Anatolian Plateau, the lands around Yozgat have been deforested over thousands of years of human habitation. According to 2009 census, population of the district is 113,614 of which 73,835 live in the city of Yozgat [5].

In this work both iron and lead in drinking water samples from the water sources in Yozgat. They were determined by atomic absorption spectrometry. Chemical properties of the samples were also determined by using standard analytical methods. Drinking water standards of heavy metals for WHO, TS-266, EPA and EC are summarized in Table 1. The present study is designed to investigate the concentration of heavy metals in drinking water, possible sources of contamination and their respective potential health risks in Yozgat in Turkey.

Parameters (mg/L)	World Health Organization (WHO)	Turkish Standards-266 (TS-266)	US Environmental Protection Agency, (EPA)	European Commission, (EC)
Iron	0.3	0.2	0.3	0.2
Lead	0.05	0.05	0.05	0.01
Total hardness (CaCO <sub>3</sub> ) (mg/L)	500	-	-	-

**Table 1:** Drinking water standards [6,7,8,9].

### Material and Methods

The drinking water samples were collected in pre-washed (doubly de-ionised distilled water, diluted HNO<sub>3</sub> and doubly de-ionised distilled water, respectively) polyethylene bottles from 7 stations in Yozgat in March-June 2014. One liter of each water sample was taken in duplicate at two different sampling periods. The samples were obtained directly from the water pump after allowing the water to run for at least twenty minutes. The samples for metal determinations were stored in 1 liter polyethylene bottles and acidified to 1% with nitric acid. These samples were subsequently stored at 4°C for as short a time as possible before analysis to minimize physicochemical changes. The analysis for the chemical parameters of the samples were carried out following the established analytical methods.

Iron (Fe) was determined Standard Metod (SM) 3111B, lead (Pb) was determined SM 3113B [10].

### Results and Discussion

The drinking water samples collected from the seven water taps in Yozgat. They were analysed by atomic absorption spectrometry in triplicate to determine iron and lead contents. The concentration of trace metal ions in the drinking water samples are summarized in Table 2.

The lowest and highest levels of elements detected ranged between 0.002 mg/L for lead and 0.45 mg/L for iron. The highest levels of total trace heavy metal ions were found in the water sample from Ofis Üstü in June 2014. As can be seen in Table 1, in this station Pb concentration was found to be 0.002 mg/L in June 2014 below the limit of detection. However, the concentrations of Fe for Ofis Üstü were above the permitted levels of the WHO, EPA, TS-266 and EC.

The highest iron level was found in Ofis Üstü as 0.45 mg/L. None of the drinking water samples analyzed for iron exceeded the limit permitted by WHO, EPA, TS-266 and EC, except for Ofis Üstü.

March 2014	Station No	Station Name	Fe (mg/L)	Pb (mg/L)
	1	Aşağı Nohutlu Mahallesi	0.05	0.001
	2	Çamlık	0.04	0.0015
	3	Eski Pazar Mahallesi	0.05	0.0012
	4	Fatih Mahallesi	0.03	0.0012
	5	Gölet Çeşmesi	0.01	0.0019
	6	Karayolları	0.02	0.0032
	7	Ofis Üstü	0.05	0.001
	Station No	Station Name	Fe	Pb
June 2014	1	Aşağı Nohutlu Mahallesi	0.05	0.001
	2	Çamlık	0.04	0.0015
	3	Eski Pazar Mahallesi	0.05	0.0012
	4	Fatih Mahallesi	0.03	0.0012
	5	Gölet Çeşmesi	0.01	0.0019
	6	Karayolları	0.02	0.0032
	7	Ofis Üstü	0.45	0.001

**Table 2:** The concentration of trace metal ions in the drinking water samples.

The drinking water standards for total hardness ( $\text{CaCO}_3$ ) (mg/L) were given Table 3. The total hardness was determined by using Standard metod. The hardness of the samples were in the range of 9.0-46.0 mg  $\text{CaCO}_3$ /L. The total hardness of the drinking water samples content was below the permissible limits given by the WHO.

March 2014	Station No	Station Name	Total hardness ( $\text{CaCO}_3$ ) (mg/L)
	1	Aşağı Nohutlu Mahallesi	33.0
	2	Çamlık	18.0
	3	Eski Pazar Mahallesi	21.8
	4	Fatih Mahallesi	26.0
	5	Gölet Çeşmesi	46.0
	6	Karayolları	16.4
	7	Ofis Üstü	18.0
	Station No	Station Name	Total hardness ( $\text{CaCO}_3$ ) (mg/L)
June 2014	1	Aşağı Nohutlu Mahallesi	24.6
	2	Çamlık	11.0
	3	Eski Pazar Mahallesi	11.4
	4	Fatih Mahallesi	9.0
	5	Gölet Çeşmesi	29.4
	6	Karayolları	18.0
	7	Ofis Üstü	14.2

**Table 3:** Drinking water standards for total hardness ( $\text{CaCO}_3$ ) (mg/L).

### Conclusion

Heavy metal concentrations showed the variation of the investigated parameters in water samples as follows: Fe 0.1-0.45 mg/L and Pb 0.002-0.004 mg/L, in the drinking water. The highest iron level was found in Ofis Üstü as 0.45 mg/L. None of the drinking water samples analyzed for iron exceeded the limit permitted by WHO, EPA, TS-266 and EC, except for Ofis Üstü. Therefore, it is strongly recommended that contaminated location should not be used for drinking purpose without proper treatment. The total hardness of the drinking water samples content was below the permissible limits given by the WHO.

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### Bibliography

1. Liang N., *et al.* "Heavy metal pollution in surface water of Linglong gold mining area, China". *Procedia Environmental Sciences* 10.Part A (2011): 914-917.
2. Md Saiful Islam., *et al.* "Heavy metal pollution in surface water and sediment: a preliminary assessment of an urban river in a developing country". *Ecological Indicators* 48: 282-291.
3. Grazuleviciene R., *et al.* "Effects of elevated levels of manganese and iron in drinking water on birth outcomes". *Polish Journal of Environmental Sciences* 18.5 (2009): 819-825.
4. Squadrone S., *et al.* "Heavy metals distribution in muscle, liver, kidney and gill of European catfish (*Silurus glanis*) from Italian rivers". *Chemosphere* 90.2 (2013): 358-365.
5. Yozgat, Wikipedia, The Free Encyclopedia.
6. WHO. "Guidelines for drinking-water quality". (1999) World Health Organization, Geneva.
7. TS 266. Türk Standardı 266, insani tüketim amaçlı sular hakkında yönetmelik, sular içme ve kullanma suları, Türk Standardları, Ankara (2005).
8. EPA. "Ground water and drinking water". *Environmental Protection Agency*, U.S. (2002).
9. EC. "Council Directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption". *Official Journal of the European Communities* L 330/42 (1998).
10. Standard Methods, A.P.H.A.-A.W.W.A.W.P.C.F. "Standard methods for the examination of water and wastewater". Washington, D.C. (1998).

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