Commun. Fac. Sci. Univ. Ank. Series B
V. 46. pp. 7 - 10 (2000)

TRACE METALS DETERMINATION IN SULTANSUYU AND ITS SPRINGS

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(Received April 27, 2000; Revised May. 17, 2000; Accepted May 22, 2000)

ABSTRACT

Spring water attains the characteristics of the region where it flows. On reaching the surface it is affected by the outside influences and thus pollution occurs. Heavy metals affected this pollution extremely. Sultansuyu of Malatya which is in east of Turkey, was chosen for research due to quite high heavy metal content.Spring and stream samples were collected and examined for Cd, Cu,, Co, Cr,, Fe, Zn, Pb, Ni by atomic absorption spectrometry method.

1. INTRODUCTION

Atomic absorption spectrometry is well studied for the analysis of metal in natural waters. The method is popular among the scientists and a lot of papers are available about the analysis of natural waters because of its sensitivity. The analysis can be run directly and the concentration can be determined by standards containing only the metal of interest [1-3] If the metal concentration is below the detection limits, preconcentration methods like extraction [4-9] ion exchange [10], absorption on activated carbon [11-13] and electroanalytical methods [2] can be employed.

Sultansuyu is a branch of Tohma Çayı which is itself the most important branch of Euphrates. Sultansuyu is fed by Sürgü Dam and Beypınarı Spring which is in Malatya (east of Turkey) The union of these sources is Polat Stream which flows to the North. After joining the Melet Stream,it takes the name of Sultansuyu and connects with the Tohma.

EXPERIMENTAL WORK

For determination of heavy metals, sample of stream and spring waters were measured in a volume of 250 mL volumetric flask and then transferred to a beaker. 2 mLsolution of phthalate buffer was added to the water and pH was adjusted to 3.2±0.1 with a reagent grade hydrochloric acid and transferred to a 500 mL separatory funnel. The sample was treated with 4 mL of 5% ammonium pyroolidinedithocarbamate (APDC) and shaken gently for 1 minute. Following

transfer of 10 mL of metylisobutyl ketone (MIBK) the mixture was shaken vigorously for 1 minute and allowed for separation of phases. The aqueous layer was drained and discarded.The organic layer was collected into a 5 mL volumetric flask and was brought to volume with MIBK. The extracts were mixed by shaking and then analyzed by a Perkin-Elmer AAS model 400.

10, 25, 50, 75, 100 ppb standart solution of metals and 250 mL of bidistilled water were extracted as above and collected into a 5 mL of volumetric flask.

The atomic absorption spectrometer was set up according to the operational procedures, outlined in the operator's guide and the metals were determined (2,6,14) as in Table 1.

Table 1.Metals concentration of the samples (ppb)

TAKAZ(spring water)

	Cd	Co	Cr	Cu	Fe	Ni	Pb	Zn
May	0	0	8	1	15	0	0	13
June	0	0	11	2	17	0	4	7
July	0	0	10	2	23	0	7	16
August	0	0	15	3	18	0	8	14
September	0	0	13	4	23	0	6	14
SÜRGÜ DAM								
May	0	0	8	1	15	0	0	13
June	0	0	8	1	15	0	0	13
July	0	0	4	3	32	1	6	16
August	0	2	5	6	18	2	7	15
September	0	2	8	2	28	2	5	13
BEYPINARI(spring water)								
May	0	0	4	3	32	1	6	16
June	0	0	14	4	24	0	0	10
July	0	0	12	0	18	0	0	8
August	0	0	21	2	22	0	0	12
September	0	0	20	2	21	0	0	11
SULTANSUYU(stream)								
May	0	0	18	3	30	4	6	28
June	0	2	20	6	35	4	6	34
July	2	4	24	5	38	6	8	35
August	0	2	28	7	36	4	7	32
September	0	2	30	5	37	2	8	36

RESULTS and DISCUSSION

Spring water takes on the physical qualities of topographical area which it flows. It adopts minerological, physiological and biological qualities of that area. For this reason , a spring can be divided into sulfury,bittery or sweety springs. Spring water forms streams and rivers which flow to the sea.[2].

Before it reaches the surface, spring water takes the characteristics of the area it passes through.When it reaches the surface, it is also influenced by the environment, human activities ,animal life, agricultural areas and atmospheric activities which effect the surface water and different types of water obtained. The pollution rate of spring water rises in relation to the distance from its origin [7].

In order to examine the heavy metal content of Sultansuyu ,samples were taken from the Beypinari (spring), Sürgü Dam.Takaz,(spring) and later at a point before Sultansuyu joins the Polat and Melet streams. The Polyethylene sample bottles were washed up with detergent , tap water, chromic acid.tap water.(1:1) nitric acid, tap water, distilled and double distilled water, succesively..Before taking the samples,the bottles were held against the current and filled.The samples were filtered through blue band filter paper.The first 50 mL of sample water wasn't used, but the rest was used for analysis[14].

Takaz Spring and Sürgü Dam do not directly flow into Sultansuyu, because water is filtered out of the dam and used for irrigation purposes. Due to incorrect irrigation methods, Sultansuyu retains a muddy colour from time to time.

Samples were taken during the summer because of the hard transporting conditions.

The result were taken as the average of five determinations.

As Takaz Spring feeds the Sürgü Dam, the heavy metal content of both are similar.The only difference is that more iron is found in Sürgü Dam because of the proximity to the iron bed of Polat.

The amount of heavy metal found in Beypinari Spring water was considerably less then that of Sultansuyu.The reason for this is the iron and chromium beds found by MTA(Institute of Metal Research) in the region of Sultansuyu and the water therefore collects a certain amount of heavy metals, cadmium, cobalt, copper, chromium ,nickel, lead and zinc. Second reason for this increase can be poor irrigation system and slope of the land which result in erosion.

In spite of the poor irrigation system and the erosion of the land, metal concentration is less then the rivers and streams in western countries.[7,15,16]

To prevent this increase, the whole irrigation system should be changed and terracing should be practised on the slope in order to slow down the speed of water flow into Sultansuyu.

After the completion of Çat Dam on the upper part of the Sultansuyu, a larger area will be irrigated and if irrigation methods are not changed, more erosion will occur badly affecting the surrounding agricultural area and Sultansuyu will be polluted more than before.

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