Analysis of Heavy Metals in Water Samples of Euphrates River in Nasiriya City, Iraq

تحليل للعناصر الثقيلة في نماذج مياه من نهر الفرات في مدينة الناصرية، العراق

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Abstract

Water samples were collected from the water of Euphrates River in September, 2011.Total concentrations of four heavy metals, Cadmium (Cd), Nickel (Ni), Chromium (Cr)and Lead (Pb) were determined using atomic absorption spectrometry in order to assess their contamination levels of the Water. Four stations were chosen in the Euphrates at Nasiriya city. Results showed that the average concentrations of these heavy metals in the water were significantly higher than those similar global studies. Location variations were detected in this metals. The highest concentration of Cd was (38µg.L$^-$)at sta.3 and the lowest (15µg.L$^-$) were recorded in sta.4 respectively , Ni revealed the highest conc. (416 µg.L)- at sta.3. The lowest (317µg.L-) was recorded in sta.1.The highest conc. of Pb was encountered in sta.2 (370µg.L$^-$) ,while lowest values were recorded from sta.1 was (327 µg.L$^-$). Cr showed increments in sta.2 (884 µg.L$^-$). and the lowest values were recorded in sta.1 was (420µg.L-).The study showed that pollution with some of this metals compared with global standard request watching period and continue test in regular periods.

الخلاصة

تم اخذ مجموعة نماذج مياه من نهر الفرات خلال ايلول 2011 لغرض قياس التركيز الكلي لاربع من العناصر الثقيلة (Ni, Cr, Cd, Pb) باستخدام تقنية الامتصاص الذري اللهبي، حيث تم اختيار اربع مواقع لتمثل النهر ضمن حدود مدينة الناصرية. الدراسة وضحت ان هناك اختلافا معنويا في تراكيز العناصر المدروسة مقارنة بدراسات عالمية مشابهه اضافة الى التغيرات الموقعية لتلك العناص. التركيز الاعلى للكادميوم كان (38µg.L$^-$) في موقع 3 بينما سجل التركيز الاقل(15µg.L$^-$) في الموقع 4، بينما سجل النيكل ارتفاعا ملحوظا 416 µg.L(في الموقع 3 بينما انخفض الى (317µg.L$^-$) في الموقع 1، اظهر الرصاص ارتفاعا في الموقع 3 ليصل الى (370µg.L$^-$) بينما انخفض في الموقع 1 الى (327 µg.L$^-$) اظهر الكروم ارتفاعا في الموقع 2 ليصل الى (884 µg.L$^-$) لكن القيمة الاقل سجلت عند الموقع 1 (420µg.L$^-$). الدراسة بينت ان التلوث بالعناصر المدرسة مقارنة بدراسات عالمية يتطلب فترة متابعة واختبارات مستمرة ضمن اوقات منتظمة.

Introduction

Water pollution is considered as the most complex problem because of its wide defects and its close relationship to human and its diffusion(1). Metals that are naturally introduced into the Rivers come primarily from such sources as rock weathering, soil erosion, or the dissolution of water-soluble salts [(2)]. Naturally occurring metals move through aquatic environments independently of human activities, usually without any detrimental effects. The metals added by human activities have affected the water quality. Some of these metals are essential for proper metabolism in all living organisms yet toxic at high concentrations; other metals currently thought of as non-essential are toxic even at relatively low concentrations. [(3)]

Major sources of toxic metals arising from human activities are domestic and industrial wastewaters and their associated solid wastes. In the most cases trace element concentrations in bottom sediments indications of water pollution. Soluble fractions of trace elements are, in most aquatic environments, rapidly absorbed either by clay or organic compounds and deposited in sediments or they are caught by plankton and root tissues of aquatic plants. Thus, concentrations of trace elements in selected samples of aquatic compartment reflect either chemical composition of bedrocks or anthropogenic influence[(4)]. Trace elements that occur and/or may occur in human body are as follows: Essential: Cu ,Fe and Zn Non-essential: Cd, Pb. (In bold are elements of high toxicity to humans.[(5)]

Euphrates River (Figure, 1) .The length of the main river is about(2700) km, (Figure, 1).Its basin populated by more than million people using about 432000 m^3/year of refined water and passing through an agricultural area of about 215019 h in the south west of Iraq [(6).]

The geographical position lies between the north latitude (32 Â 27 º - 31 Â 2 º) and east longitude (45 Â 45 º - 46 Â 4 º). This position gives the area climate features like ; the high rate of sun radiation, high temperature, few rain occasions , low moisture, and high rate of evaporation [(7)].

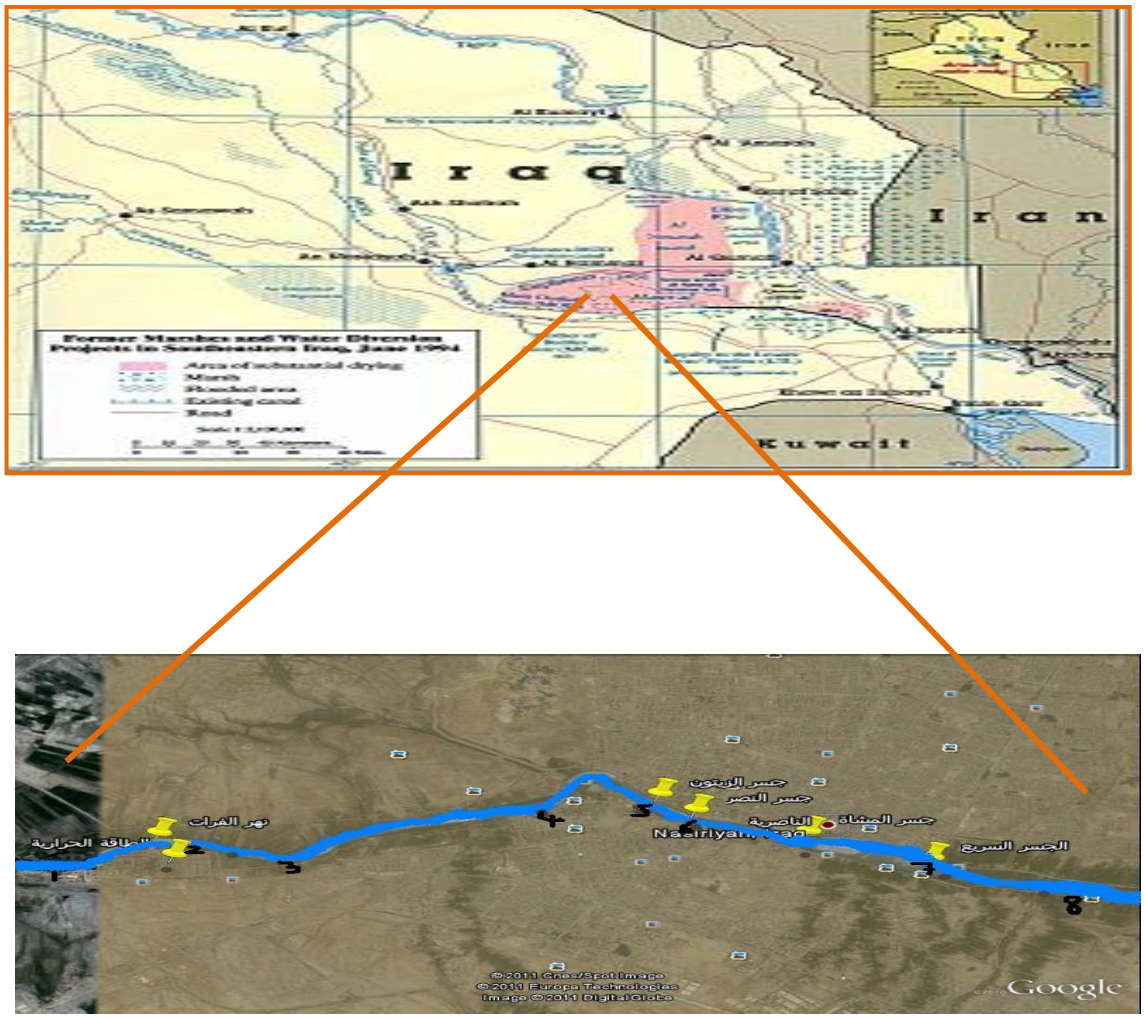

Figure (1): Sampling Stations on Euphrates River.

Materials and Methods

Subsurface (0-20cm) water samples have been collected from all stations utilizing the sampling devise Recommended by EPA 2004 [8].The samples analysis by using Atomic Absorption PG 990 with suitable hollow cathode lamps .

Resultes and Discussion

Heavy metals released into the Euphtates River by both natural processes and human activities, can be distributed among several different stations within the water environment and the level of metals in Euphtates River is listed in table 1.

Our data indicate that the level of **pb** observed in Euphtates River water lie above the range of values reported by EPA standard . The highest conc. of pb were recorded sta.5(2.78 µg.L^{-}) and lowest was (0.54 µg.L^{-})at sta. 1.This indicate that Euphtates River pollution has possibly discharge and Urban runoff and electricity generation station (at St. 5) may be consider as the most significant sources of metals entering

Euphtates River. Pb showed increments in sta.5 (0.2 µg.L$^-$). and the lowest values were recorded in stas.1 was (0.03µg.L$^-$).

Ni revealed the highest conc. 416 µg.L$^-$ at sta.3. The lowest (317µg.l$^-$) was recorded in sta.1. Copper dissolved in the Euphtates River comes mostly from industrial and municipal wastewaters. Concentrations of dissolved copper generally increase in the downriver direction, especially near urban centers.

The highest concentration of Cd was (1.26µg.L$^-$) and the lowest was (0.08µg.L$^-$) were recorded in sta.1.During weathering processes, Cd forms simple compounds, such as CdO, $Cd(OH)_2$, $CdCl_2$ and CdF_2 that are easily mobile and follow Zn, The median Cd concentration in world ocean waters has been estimated to range from 0.07 to 0.11 µg\ l$^{-(7)}$

Iron plays an important role in marine environments as a micronutrient for organisms and its low bioavailability may limit growth of phytoplankton that are critical for the oceans primary production [8]. Iron concentrations in landfill leachate and ground water can create various technologic and environmental problems. Redox conditions of in landfill leachates are very complex, but reducing conditions may predominate. Therefore concentrations of Fe in groundwater around waste disposal sites may vary in the broad range from 3 to 5 500 mg\ l [9], whereas Fe contents of groundwater in unpolluted zones of temperate humid climate average 0.75 mg \l [5].

Table1: Concentration µg.l$^-$ of heavy metals observed in the Euphtates River water

Stations	**Ni** µg.L$^-$	**Pb** µg.L$^-$	**Cr** µg.L$^-$	**Cd** µg.L$^-$
1	317	327	420	22
2	386	330	884	28
3	416	370	680	38
4	390	365	634	15
Average	377.25	348	654.5	25.75
EPA[10] Standard	16-110	460--1100	200-400	0.6-10

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