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Determination of LC50 of linear anionic detergents and diazinon toxin on *Rutilus frisii kutum*

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Abstract

The harmful effect of Diazinon and two anionic detergents on valuable fish:*Rutilus frisii kutum*, individually and in mixed concentration under laboratory conditions have been determined. The LC50- 96 h of Diazinon pesticide was calculated (0.34) mg/l . The LC50- 96 h for the fingerling of the same species under the effect of liquid and powder detergents, were 4.69 and 12.24 mg/l respectively. The LC50- 96 h under the effect of a Diazinon and liquid detergent and the mixture of Diazinon and powder detergent was 7.27 and 0.9 mg/l respectively. The result of this survey show that the toxicity of the mixture of Diazinon and powder detergent is much more profound than the other mixture. In general , it can be said that sometimes the concentration rate of detergents in a given ecosystem is less than the calculated LC50- 96 h in a laboratory condition , but when the same concentration rate of detergent in ecosystem is mixed with another chemical material , it is very much possible that the percentage rate of mortality in fishe rises even higer.

Key words:LC50- 96 h , Acute toxicity, Anionic detergent, Diazinon, *Rutilus frisii kutum*

1-Introduction

Today, pesticides are used in agriculture and for many divers purposes such as human and animal health protection, pest control in forest and aquatic environments, and protection of buildings and other structures.

Increased and continued pesticides are estimated to actually reach the targeted pests, and therefore large amounts are entering the environment and contaminating soil and water resources(Young, 1987). Pesticides sources in the environment include those resulting from direct pesticide application for a specific purpose, such as those used for weed and insect control in aquatic environments, and those entering indirectly from spray drift, atmospheric precipitation runoff and erosion from agricultural lands, effluent discharges from sewers and factories, accidental spills and volatilization.

The quantity of a pesticide moving with runoff and sediment to an aquatic environment depends on many factors. These include topography, intensity and duration of runoff or irrigation, soil erodibility, land management and cropping practices.

Pollution magnitude varies with aquatic environment properties such as surface area and deapth, hydraulic characteristics, however, highest pesticide residues are in rivers, lower residues occur in estuaries and the lowest are in the oceans. Pollution magnitude in lakes and reservois depends on their proximity to an agricultural or industrial area(Tami metal, 1988). Biological communities are sensitive to their chemical environment, although the degree of sensitivity varies among species and communities. The use of pesticides in Iranian agriculture is common but from environmental protection of view it is not controlled as effective as ought to be. If the fields are too near to the aquatic ecosystem the pesticides may be washed out from the treated soil and pollute the aquatic ecosystem by runoff. Espicially dangerous are in this respect these pesticides, which are used in rice fields. In this case the water of the fields is directly trested and is in connection with rivers or standing waters.

In the north of Iran there are approximately 600,000 hectare of rice field, and houses near the rivers used detergents daily. There is not any ecotoxicological data about the harmful effect of pesticide and detergent individually and in mixed concentration on aquatic organisms, in Iran.

Exactly for this reason we are consider to be important the investigation of some special anionic detergents and pesticide Diazinon commonly used in rice field and other kinds of form in Iran. This is the first time in Iran to make such ecotoxicological investigations on fish.

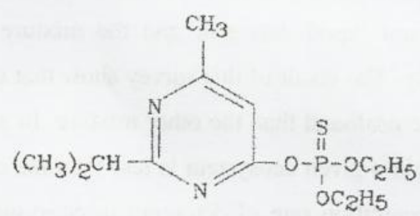
This research should correctly imply an atleast approximate equivalence of fish species in their susceptibility to chemical compounds under the conditions described in the official guidelines(OECD, 1984).

2-Material and Methods

Diazinon is commonly used in rice fields of northern Iran were bought from pesticides shop in Bandar Anzali.

Active ingredient: EC 60% (Diazinon)

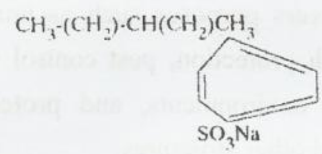
Chemical formula:



Water Solubility: In water at room temperature 40 mg/l

Toxicity: Tech(rat) : Oral LD50 300-400 mg/kg.
Inhalation: LC50 3.5mg/L(4hr).Rabbit.

L.A.S formula:



Test organism:

Rutilus frisii kutumm (White fish), was bought from Shahid Ansari fish culture and propagation station. At the Gilan Fisheries

Research Center, which was given the task of studying the effect of pesticide and detergents on fish were performed in similar equipments. The temperature room was regulated to 25±2°C. There was two light sources of 70×100cm (20w and 60cm long).

Duration of illumination (14h/day) was automatically regulated. Fish were adapted to laboratory circumastances distributed species wise in 500 liter tanks. Experiments for determining Diazinon, 24-hr, 48-hr, 72-hr, 96-hr LC10, LC50, LC90 were performed according to the TCR

standard procedures(TCR 1984). Different test concentrations plus a control were used. 1-2 g fingerling fish (*Rutilus frisii kutum)* was used for each concentration series. A total of these replicates were carried out for each one. Ten fingerling fish (1-2g weight) were placed in a 30 liter aquarium containing 20 liter tap water for each test concentration and control.

During of the test (4 day) the organisms were not fed and the medium was not renewed during the bioassay. Observation were made at each 24-h and the mortality results recorded. Control survival was always 100%. LC10, LC50, LC90 (The concentration of the toxicant that reduced survival rate to 10%, 50%, 90%) were calculated using linear regression analysis.

3-Results

1. Influences of the investigated pesticide Diazinon on *Rutilus frisii kutum* :

According to three different experiments with various concentrations of Diazinon on *Rutilus frisii kutum* (0.3 to 5 mg/l) in comparison with the control. The mortality was increased especially in high concentration. LC50-96hr was:0.34 mg/l. The results were summarized in Table 1 and Figure1 .

Influence of Anionic Detergents on *Rutilus frisii kutum*

Influence of Powder Detergent:

Concentrations of powder detergent in three experiments were from 10mg/l to maximum 24mg/l in comparison with the control. LC50-96h was 12.24mg/l. The effective concentrations are summarized in Table 2 and Figure 2.

Influence of Liquid Detergent:

Concentrations of liquid detergent in three experiments were from 5mg/l to maximum 25 mg/l in comparision with the control. LC50-96hr was 8.93mg/l. The effective concentrations are summarized in Table 3 and Figure 3.

Influence of mixed Pesticide and Anionic Detergents on *Rutilus frisii kutum* :

Mixed Diazinon and Powder Detergent:

According to three different experiments with various concentrations of mixed Diazinon and powder anionic detergent (1-4mg/l), the mortality of fish increased especially in high concentration.LC50-96hr was 0.9 mg/l. The results are summarized in Table 4 and Figure 4.

Mixed of Liquid Detergent and Diazinon:

According to three different experiments with various concentrations of mixed diazinon and liquid anionic detergent (4-20 mg/l) the mortality of fish increased especially in high concentration.LC50-96hr was 7.28 mg/l. Mixed Diazinon and powder detergent with comparison of mixed Diazinon and Liquid Detergent was highly toxic. The results summarized in Table 5 and Figure 5.

Table (1): Effect of Diazinon on Rutilus *frisii kutum*

Diazinon	Lethal Conoentration (p.p.m)	24hr	48hr	72hr	96hr
	LC10	0.24	0.14	0.18	0.14
Rutilus frisii kutum	LC50	1.7	0.08	0.49	0.34
	LC90	12.057	4.954	1.34	0.8

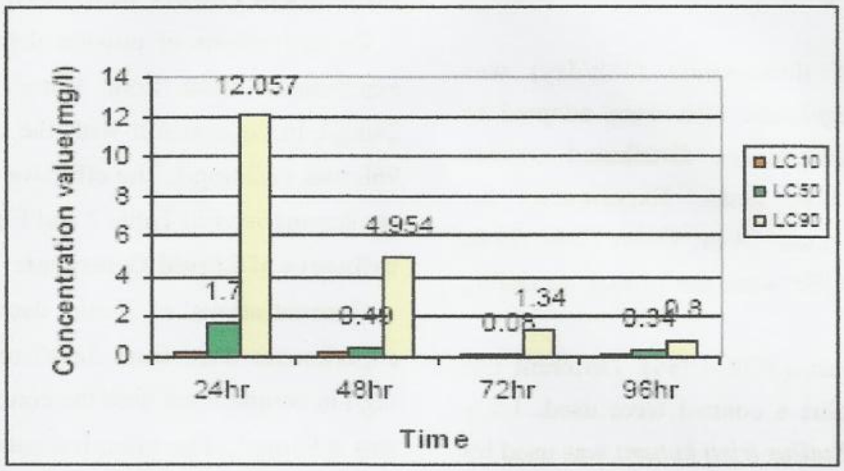


Fig. 1: Influence of Diazinon on *Rutilus frisii kutum*

Table (2): Effect of Powder detergent on *Rutilus frisii* kutums.

Diazinon	Lethal Conoentration (p.p.m)	24hr	48hr	72hr	96hr
	LC10	11.54	9.88	9.54	9.07
Rutilus frisii kutum	LC50	14.67	12.95	12.65	12.24
	LC90	18.63	16.98	16.77	16.50

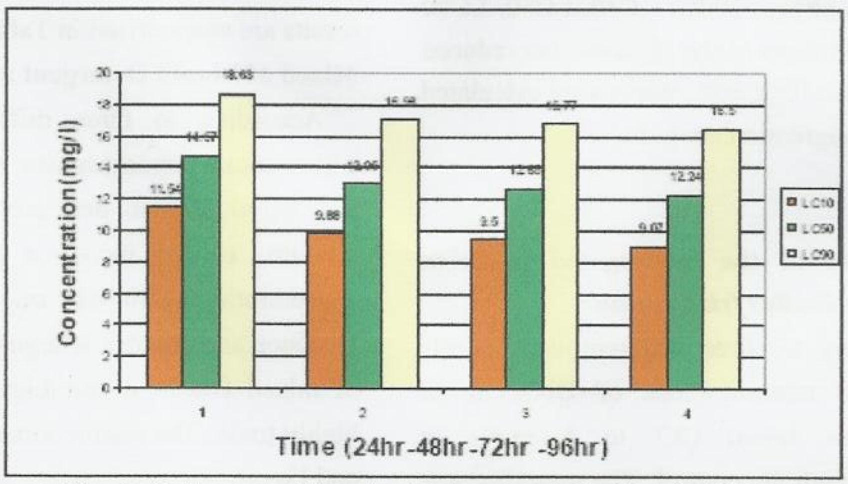


Fig. 2: Influence of Powder Detergent on*Rutilus frisii kutum*

Table (3): Effect of Liquid Detergent on *Rutilus frisii* kutum

Diazinon	Lethal Conoentration (p.p.m)	24hr	48hr	72hr	96hr
	LC10	7.80	6.05	7.24	6.59
Rutilus frisii kutum	LC50	11.68	11.06	10.08	8.93
	LC90	17.49	13.2	16.89	15.40

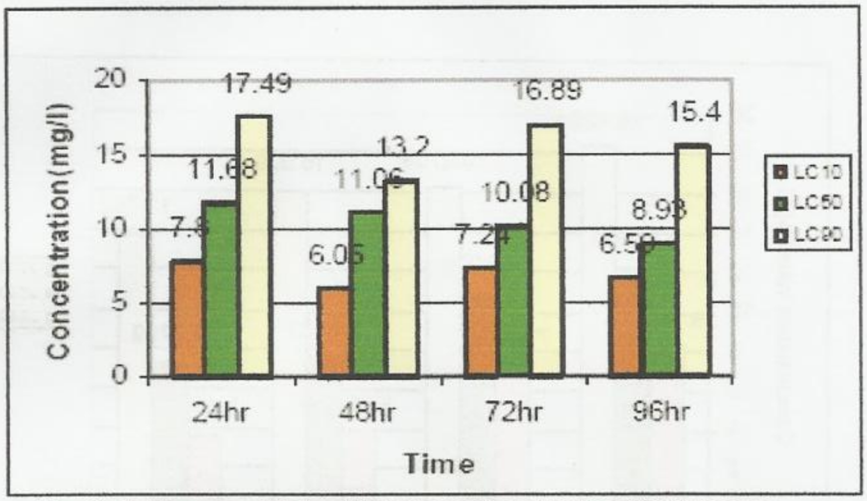


Fig. 3: Influence of Liquid Detergent on*Rutilus frisii kutum*

Table (4): Effect of mixed Diazinon and Powder Detergent on *Rutilus frisii kutum*

Diazinon	Lethal Conoentration (p.p.m)	24hr	48hr	72hr	96hr
	LC10	1.1553	1.0055	0.9446	0.5152
Rutilus frisii kutum	LC50	1.7313	1.5677	1.4762	0.8970
	LC90	2.5945	2.4444	2.3067	1.5615

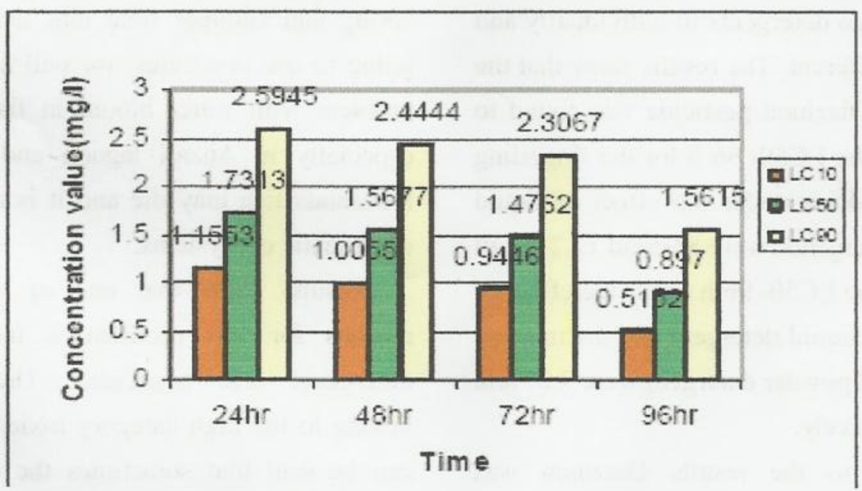


Fig. 4: Influence of Mixed Diazinon and Powder Detergent on*Rutilus frisii kutum*

Table 5: Influence of mixed Diazinon and Liquid Detergent on *Rutilus frisii kutum*

Diazinon	Lethal Conoentration (p.p.m)	24hr	48hr	72hr	96hr
Rutilus frisii kutum	LC10	8.1995	7.4043	3.8637	3.6386
	LC50	12.2831	10.9760	7.632	7.2759
	LC90	18.4061	16.2708	16.009	13.703

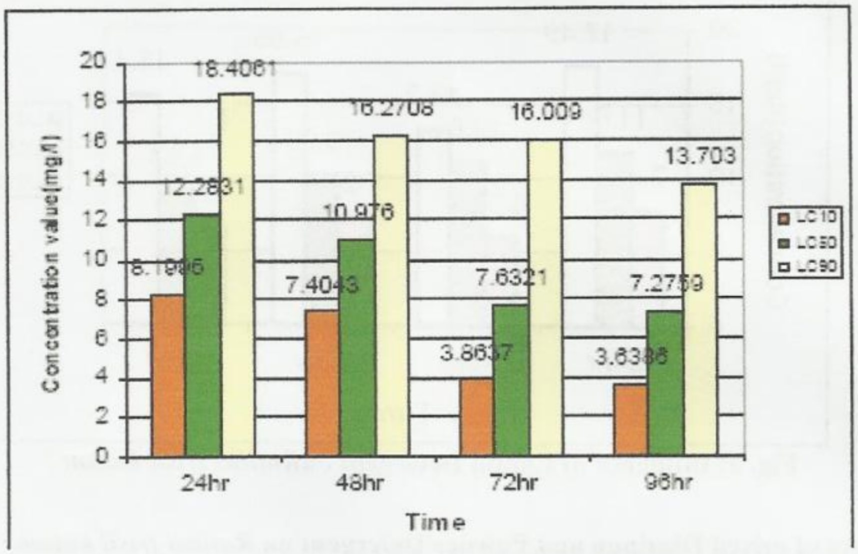


Fig. 5: Influence of Mixed Diazinon and Liquid Detergent on*Rutilus frisii kutum*

4-Discussion

This study indicates that the effect of the pesticide and two detergents in individually and in mixed are different. The results show that the LC50-96hr of Diazinon pesticide was found to be 0.34 mg/l. The LC50- 96 h for the fingerling of the same species under the effect of liquid and powder detergents, were 8.93and 12.24 mg/l respectively. The LC50- 96 h under the effect of a Diazinon and liquid detergent and the mixture of Diazinon and powder detergent were 7.27 and 0.9 mg/l respectively.

According to the results Diazinon was highly toxic, and it´s LC50–96hr was 0.34 mg/l. It is clear that if Diazinon enter to lagoons, water bloom, will happen, and nowadays in spring and summer time that the farmers are going to use pesticides, we will have a serious problem with water bloom in fish ponds and especially in Anzali lagoon and every years thousands fish may die and it is dangerous for our aquatic ecosystems.

Results show that one of the important reasons for this problem is the mixing of detergents and pesticides. These mixtures belong to the high category toxic. In general it can be said that sometimes the concentration rate of detergents under a given ecosystem is less than the calculated LC50-96hr in a laboratory condition, but when the same concentration rate of detergent in ecosystem is mixed with another chemical material, it is very much possible that the percentage rate of mortality in fishes rises even higher.

During the first 15 minutes of exposure, there was a rapid increase in the rhythm of opercular movements. Fish would also swim to the surface, gasping for air. A side from increased opercular rates, exposed fish also exhibited dark colorations on its dorsal side, along the entire dorsal lengh. Then the fish started to lose equilibrium, swimming in a vertical head down position, and setting on the bottom vertical side up. It would lie quietly, operqular movement becoming irregular with occasional bursts of frenzied swimming. Fish were also less sensitive to noise or movement. Death occurred within 3-9hr after the body darkening reaction started.

This pigment modification of the dorsal surface of both investigated fish typically resembled fish under stress(Tames and Gacutan, 1994). Eyeballs become expanded and abnormal behavior of fish increase with the increase of concentration of pesticide and detergents. In the all experiments dissolved oxygen in the aquatic medium of fish was always near to 80-100% of air saturation. The pH values have significantly decreased from 7.57 at concentration in aquatic medium to minimum 6.1.Hardness of water in the experiments was increased from 326 to 658 mg/l. When test were finished (96hr), the control aquaria showed a very clean aquatic medium, but aquaria with pesticide and detergents individually and in mixed showed a very turbid medium. This turbidity was probably caused by the fish residues or the suspended compounds or its degradation products on water.

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تحديد التركيز المؤثر LC50 للمساحيق ذات الايونية السالبة الخطية وللقاح الدايازينون على اسماك *Rutilus frisii kutum*

الملخص

تم تحديد وحساب التركيز المؤثر القاتل لمركب الدايازينون ونوعين من المساحيق ذات الايونية السالبة على بعض انواع الاسماك المعروفة *Rutilus frisii kutum* .

تمت الدراسة باستخدام المبيد الدايازينون والمساحيق كل على انفراد وكذلك استخدام تراكيز مختلفة من خليط لهما وتحت ظروف مختبرية مسيطر عليها. ووجد ان التركيز القاتل LC50-96h للدايازينون هو ((0.34 mg/l)، بينما كانت القيم المؤثرة للمسحوقين السائل والصلب على هذا النوع من الاسماك الصغيرة هي: 4.69mg/l و 12.24 على التوالي. اما التركيز المؤثر لخليط الديازينون مع المسحوق السائل وخليط المبيد مع المسحوق الصلب فقد بلغ 7.27mg/l و 0.9 على التوالي.

دلت نتائج هذه الدراسة على ان سمية خليط الديازينون والمسحوق الصلب هي الاكثر تأثيراً وبشكل كبير، وبصورة عامة يمكن القول : في بعض الاحيان يكون معدل تركيز المساحيق في نظام معين هو اقل من التركيز المؤثر LC50-96h المحسوب مختبرياً ولكن عند خلط نفس التركيز بان معدل نسبة التحسس عند السمك سيزداد ازدياداً ملحوظاً.

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Levels and Distribution of Trace Metals in the Southern Wetlands of Iraq

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Abstract

Trace metals Cd, Co, Cu, Fe, Mn, Ni, Pb and Zn were determined in water and sediments from southern Iraqi wetlands represented by Marshes, (Al-Hawiezh, Central and Al-Hammar), Shatt Al-Arab, Garmat Ali and Northern Arabian Gulf. Subsurface water samples and bottom sediments were collected from each site of sampling on a seasonal basis during the period July/2004 to July/2005. Trace metals were extracted from each sample by means of standard methods and determined by adopting of Atomic Absorption Spectrophotometer. The highest mean concentrations for trace metals in water (in µg/l) were 85.97(Cd) in Beeshah, 407.98(Co) in Qurna, 57.83(Cu) in Mashab, 574.33(Fe) in Khite, 85.34(Mn) in Seebah, 181.0(Ni) in Mashab, , 90.25(Pb) in Beeshah, and 702.34(Zn) in Beeshah during different seasons of the study, while the highest mean concentrations of trace metals in sediments (in µg/g) were 35.92(Cd) in Central marsh, 836.46(Co) in Central marsh, 48.69(Cu) in Central marsh, 18435.50(Fe) in Al-Hawiezh marsh, 3648.28(Mn) in Qurna, 486.95(Ni) in Garmat Ali, 5435.5 (Pb) in Qurna and 539.8(Zn) in Qurna. Certain sites along Shatt Al-Arab river receive huge amounts of wastes from municipal, industrial and commercial which might increase the levels of pollutants in water and sediments, as it is found in Beesha at the top north of Arabian Gulf as pollutants in the particulate phase of water are precipitated.

Key Wards: Trace metals, Marshes, Sediments, Waters, N.W. Arabian Gulf

1-Introduction

There are numerous types of pollutants in the aquatic environments, such as organic materials, major ions and heavy metals. These pollutants could be introduce to the aquatic environment as a result of urbanization, industrialization and agricultural activities (Al-Kafaji 1996). Heavy metals are the major anthropogenic contaminant of estuarine and coastal waters. Humans have affected aquatic trace element cycling through direct discharges into streams and atmospheric emissions, which are deposited at varying distances from the source, and the human activities result in substantial inputs to the environment of Sb, As, Cd, Cr, Cu, Pb, Hg, Mn, Ni, Se, Sn, V, and Zn (Brigham 2000). Many heavy metals, even if present in minute quantities are toxic to plants and animals, thus their release to aquatic environments from either natural or anthropogenic sources has an adverse effect upon ecosystem health (Catherine and Gabriel 2000).

Trace metals in aqueous solution seldom frond as free ions but exist as ionic complex utilized by vary of organism in organic and hydrated legends which affected mobility, reactivity and solubility (Wood 1989). They are of environmental interest both as limiting nutrients and as toxicants. Cupper, Zinc and partly Nickel are essential to natural organisms in low concentrations, while they are toxic in higher concentrations. Cadmium and Lead are toxic even at low concentrations and not regarded as being micronutrient.

Trace metals appear in fresh water naturally and in trace concentrations and varied according to kind of sediment (Evans and Engel 1994). Speciation of metals in sediments is sometimes necessary to identify pollution sources, especially to distinguish between mineralized or lattice-hold metals and the more bio-available fraction (Kerstin and Forester 1989).

The aims of this study were firstly to quantify heavy metal concentrations in different classes of water categorized between brackish waters (Al Beesha, Northern Arabian Gulf) to fresh water (Al Hawiezh and central marshes and Iraqi inland waters) and to know if their are any temporal correlation among the sites, secondly to identify the environmental conditions associated with enhanced mobility, and to confirm whether those correlations were significant or not between sites, seasons, and metals.

2-Material and methods

Sites chosen for sampling in this study were two sites of Iraqi Marshlands [(1)Al-Hawiezh and (2)Central marshe], three sites along Shatt Al-Arab river [(3)Al-Qurnah, (4)Al-Seeba and (5)Ras Al-Beesha) and three sites at southern Al-Hammar Marsh [(6)Al-Mashab, (7)Al-Khiet and (8)Garmat Ali] as shown in fig.(1). Samples as subsurface water and surface bottom sediments were collected in a fine whether days on a seasonal basis during the period July/2004 to July/2005.

For water samples, polyethylene bottles prewashed by 0.5N HCl and distilled water were used. Each water sample is thoroughly mixed by shaking , and 100 ml of it is transferred into a glass beaker of 250 ml volume , to which 5 ml of conc. Nitric acid is added and heated to boil till the volume is reduced to about 15-20 ml, by adding conc. Nitric acid in increments of 5 ml till the residue is completely dissolved. The mixture is cooled , transferred and made up to 100 ml using metal free distilled water (limgis 2001).

Van veen grab sampler was used to collect bottom sediment from each site. In the lab, sediments were dried, grinded and extracted according to Sturgeon *et al*. (1982) procedure.

The concentrations of trace metals, Cd, Co, Cu, Fe, Mn, Ni, Pb and Zn, were determined by flame Atomic Absorption Spectrophotometer (Pye Unicum Model SP9) in both water and sediments samples. SPSS program was used for statistical analysis.

Fig. 1: Sample locations during this study

3-Results and Discussion

The study allows comparing the trace metals concentrations in water and sediments samples from all different sites of Iraq aquatic environments. The distribution and concentrations of trace metals Cd, Co, Cu, Fe, Mn, Ni, Pb, and Zn are shown in figs. 2-9 for water and figs. 10-17 for sediment. The highest mean concentrations for trace metals in water (in µg/l) were 85.97(Cd), 407.98(Co), 57.83(Cu), 574.33

(Fe), 85.34(Mn), 181.0(Ni), 90.25(Pb), and 702.34(Zn) at the sites Beesha, Qurna, Mashab, Khiet, Seeba, Mashab, Beesha and Beesha respectively during different seasons of the study. In spite of the low different significantly there are clear variations among the studies sites for all metals, mainly due to different discharge of heavy waste, industrial and agricultural effluent as well as the nature of the bottom sediment compositions which assist that sediment do play a substantial effect in the dissolved metal contents(Anderson 1995), and also may be due to the release of metals from refolded soils that are contaminated with chemicals, mines and military ordinance. Metal concentrations can also vary significantly over short distances and as a function of tide (Batley 1995).

Most of high concentrations were during summer in which the high temperature lead to high evaporation rates, but all were still low in comparison with local standard levels (Iraqi Gazette, 1990) as shown in table (1) except Cadmium and Cobalt concentrations which are resulted from the influence of agriculture effluents and the damage effect of a pipe carrying crud oil to al-Hartha power station, Pb from leaded fuel and Zn from the erosion of ships skeleton.

Bottom sediment is the substrates which adsorbed and accumulated the metals in its natural conditions (Grot *et al* 1986). The highest mean concentrations for trace metals in sediment (in µg/g dry) were 35.92(Cd), 836.45(Co), 48.69(Cu), 18435.50(Fe), 3548.22 (Mn), 486.95(Ni), 543.75(Pb), and 539.80(Zn) at central marsh, central marsh, central marsh, Al-Hawieza, Al-Qurna, Garmat Ali, Al-Qurna and Al-Qurna respectively during different seasons of the study. Figs. 9-16 show low variations among the studied sites except Fe concentration which was high at the central and Al-Hawiezh marshes because these areas could be severely burned after drainage, some places with high surface organic covering sulfidic pyrite soils beneath altered chemically and then exposed to oxygen resulting in the formation of sulfuric acid (Fitzpatrick, 2004) , which in turn lead to the liberation of Fe, Ca, Mg and Cu . The overall conditions of certain areas of marshes will become hard like ceramic due to the conversion of FeS_2 to Fe_2O_3, on reflooding this soil will not rewet and cannot support plant life (Richardson and Hussain 2006).. In comparison with sediment quality standard, the trace metals concentrations were very low as shown in table (1).

The accumulation effects are greatly dependent on the sediment composition and structure, the same observation was reported by Hussain and Khan(2000).

When making comparison to present study water concentrations, it is important to note that the data are for total metals concentrations and so that be higher when comparison with other studies in Iraq(table 2), but lower than Hussain and Khan(2000) and Guien and Martin(2002) whom are detected total metal concentrations.

Table (1): Mean of trace metals concentrations in water and sediments from southern wetlands of Iraq with mean standard concentrations.

	Water							Sediment			
metal	Present study 2004-2005	EQS standards 2001	EU standards 1998	WHO standards 1993	Water quality Standards 1990	SPA Scope 1980	USEPA 1976+ 1992	Present study 2004-2005	NOAA 2000	CEQG 2002	USEPA 2004
Cd	**7.86**	10	5	3	5	10	5	**13.79**	1.2-9.6	0.6-3.5	
Co	**265.23**	-	-	-	50	500	-	**137.67**			
Cu	**23.02**	40	2000	2000	50	200	1000	**12.44**	3.4-270	35.7-197	390
Fe	**7621.14**	-	200	-	300	2000	100	**176.37**			
Mn		-	50	500	100	500	650	**28.47**			
Ni	**154.30**	10	20	20	100	200	-	**46.55**	20.9-51.6		
Pb	**67.62**	10	10	10	50	100	50	**32.60**	46.7-218	35-91.3	450
Zn	**118.51**	-	-	3000	500	2000	5000	**194.96**	-150 410	123	410

Table 2: Comparison the present water study trace metals concentration (µg/l) with the same in other area.

Site	Cd	Co	Cu	Fe	Mn	Ni	Pb	Zn	References
Shatt Al Arab river/Al Iraq	0.26	-	0.90	716	1.30	3.40	0.30	1.80	Abaychi and DouAbul (1985)
Shatt Al Arab river/Al Iraq	0.93	-	0.52	-	0.07	0.50	0.04	0.80	Abaychi and Mustafa (1988)
Shatt Al-Arab estuary	0.15	0.33	0.58	389.20	0.69	2.45	0.18	0.93	Al-Saad and Al Kafaji (1996)
Shatt Al-Arab estuary	0.19	0.37	0.47	173.00	1.52	2.85	0.23	0.82	Al-Khafaji (1996)
Shatt Al Hilla	1.11	3.27	1.81	6.74	0.96	0.27	4.21	8.73	Al-Taee (1999)
Karnafully estuary	8-168		125-482	4200-22230	282-931	101-572	33-540	206-985	Hussain and Khan(2000)
Danube delta	1.1-2.4	16-19	201-1092	3.78-4.04%	1286-2290	66-71	58-65	212-218	Guien and Martin (2002)
Shatt Al-Arab / Iraq	5.00	50.00	50.00	-	-	100.00	50.00	100.00	Analytical Report (2004)
Iraqi wetlands	7.86	265.23	23.02	7621.14	49.44	154.30	67.62	118.51	**Present study**

The comparison of sediments average concentrations(µg/g) with other studies inside and outside Iraq (table 3), reveal that Cu, Ni and Mn concentrations were rather low while concentrations of Cd, Co, Zn and Pb were higher, but still low in comparison with sediment quality standard(USEPA, 2004) and slightly higher than NOAA(2000) and CEQG (2002) for Zn and Cd metals concentrations.

According to tables 4, 5 and 6, statistical investigations revealed the presence of positive significant correlations between all studied trace metals except Co in water, while different correlations were found between trace metals concentrations in the sediment and the distribution of trace metals in sediments seems not to be related to the corresponding distribution in water.

Table 3: Comparison the present sediment study trace metals concentrations (µg/g dry) with the same in other area.

Site	Cd	Co	Cu	Fe	Mn	Ni	Pb	Zn	References
Shatt Al Arab river /Al Iraq	0.18	17.70	44.00	34.70	642.00	646.00	11.30	34.70	Abaychi&DouAbul(1985)
Al- Kuwait	1.50	0.91	20.5.	280.00	4099.00	96.90	22.70	280.00	Samhan *et al* (1986)
Shatt Al-Arab river	0.03	17.40	39.60	5.80	914.00	57.20	19.00	5.80	Abaychi&Al-Saad(1988)
Arab Gulf	0.03	18.60	24.20	25.20	751.00	39.80	6.60	25.20	Abaychi&Al-Saad(1988)
Kur Al-Zubier	0.26	-	28.00	72.00	541.00	90.00	29.00	72.00	Al-Edanee *et al* (1991)
Shatt Al-Arab river	0.05	-	30.00	135.00	917.00	421.00	22.50	135.00	Al-Mudafar *et al*(1992)
Al-Hammar lake	-	58.00	42.00	3149.00	700.00	197.00	-	88.00	Abaychi (1995)
Shatt Al-Arab estuary	0.27	16.98	29.24	31.99	404.10	104.20	17.74	31.99	Al-Kafaji (1996)
Shatt Al-Arab estuary	-	53.00	36.20	80.40	1063.30	398.60	63.10	80.40	Tarik & Thoraya (1997)
Shatt Al-Hilla	3.92	49.12	34.45	73.41	239.07	193.04	58.20	73.41	Al-Taee (1999)
Gurna	-	42.90	-	388.00	684.00	-	-	388.00	Itawi et al (2000)
Karnafully estuary	0.135-1.08		10118 -36.25	559.66-1117.78	11.6-29.56	16.99-35.11	11-36.21	0.16-7.47	Hussain & Khan (2000)
Unpolluted sediment	0.11	-	33.00	95.00	770.00	-	19.00	95.00	GESAMAP,1982
Iraqi wetlands	13.79	137.67	12.44	176.37	28.47	46.55	32.60	194.96	**Present study**

Tabel(4): Correlations between water trace metals concentrations

	Cd	Ni	Cu	Zn	Fe	Pb	Co	Mn
Cd Pearson Correlati	1							
Ni Pearson Correlati	.812**	1						
Cu Pearson Correlati	.727**	.568**	1					
Zn Pearson Correlati	.766**	.815**	.732**	1				
Fe Pearson Correlati	.612**	.668**	.287*	.378*	1			
Pb Pearson Correlati	.738**	.713**	.535**	.723**	.499**	1		
Co Pearson Correlati	-.155	-.124	-.029	-.199	.139	.266	1	
Mn Pearson Correlati	.497**	.752**	.258	.519**	.388*	.471**	-.073	1

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Tabel(5): Correlations between sediments trace metals concentrations

	CD.S	ZN.S	NI.S	CU. S	FE.S	PB.S	Co.S	MN.S	Cd,W	NI.W	Cu. W	ZN.W	FE.W	PB.W	Co. w	MN. W
CD.SEDIN Pearson Correlati	1															
ZN.SEDIM Pearson Correlati	-.010	1														
NI.SEDIM Pearson Correlati	.609**	-.064	1													
CU.SEDIM Pearson Correlati	.092	.030	.302	1												
FE.SEDIM Pearson Correlati	.526**	-.120	.638*	.357*	1											
PB.SEDIM Pearson Correlati	.012	.174	.235	.027	-.019	1										
CO.SEDIN Pearson Correlati	-.109	-.010	.117	.304	.035	-.117	1									
MN.SEDIN Pearson Correlati	.084	.560*	-.016	.150	.245	.045	-.004	1								
CD.WATEI Pearson Correlati	.123	-.221	.146	-.138	.267	-.012	-.197	-.052	1							
NI.WATER Pearson Correlati	.235	-.163	.122	-.138	.337*	.019	-.337*	-.018	.812*							
CU.WATEI Pearson Correlati	-.060	.232	-.029	-.148	.123	.102	-.168	.469*	.727*	.568*	1					
ZN.WATEF Pearson Correlati	.249	.145	.068	-.029	.275	.000	-.239	.321	.766*	.815*	.732**	1				
FE.WATEF Pearson Correlati	.167	-.322	.208	-.105	.297	.155	-.313	-.165	.612*	.668*	.287	.378*	1			
PB.WATEF Pearson Correlati	.118	-.045	-.053	-.261	-.132	.256	-.323	-.183	.738*	.713*	.535*	.723*	.499*	1		
CO.WATEI Pearson Correlati	-.233	.032	-.070	-.119	-.344*	.523*	-.172	-.133	-.155	-.124	-.029	-.199	.139	.266	1	
MN.WATEI Pearson Correlati	.126	-.071	-.061	-.104	.160	.249	-.276	-.164	.497*	.752*	.258	.519*	.388*	.471*	-.073	1

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Tabel(6):Correlations between water and sediments trace metals concentrations

	Cd	Ni	Cu	Zn	Fe	Pb	Co	Mn
Cd Pearson Correlation	1							
Ni Pearson Correlation	.812**	1						
Cu Pearson Correlation	.727**	.568**	1					
Zn Pearson Correlation	.766**	.815**	.732**	1				
Fe Pearson Correlation	.612**	.668**	.287*	.378*	1			
Pb Pearson Correlation	.738**	.713**	.535**	.723**	.499**	1		
Co Pearson Correlation	-.155	-.124	-.029	-.199	.139	.266	1	
Mn Pearson Correlation	.497**	.752**	.258	.519**	.388*	.471**	-.073	1

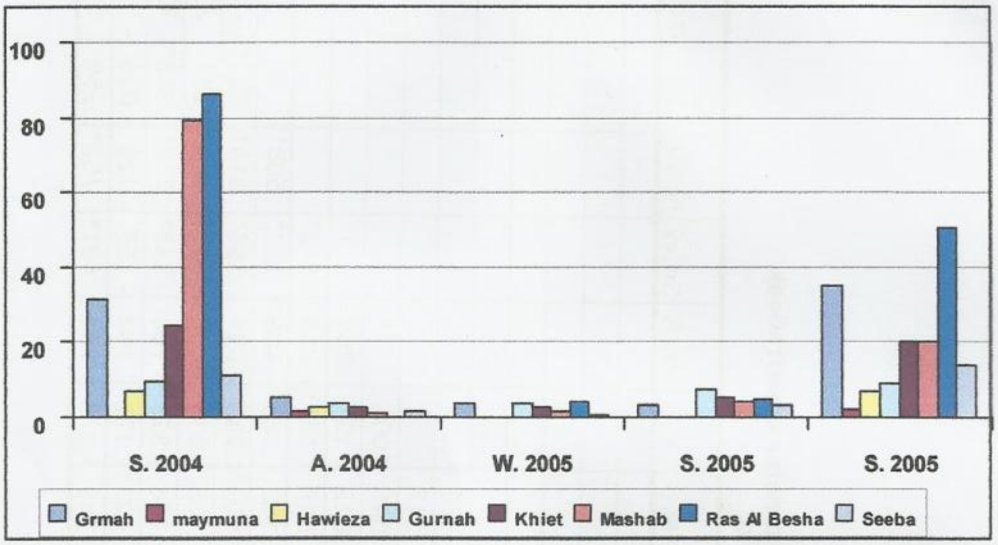

Fig. 2: Seasnal average conc. of Cadmium(Cd)in water (µg/L) from southern wetlands of Iraq

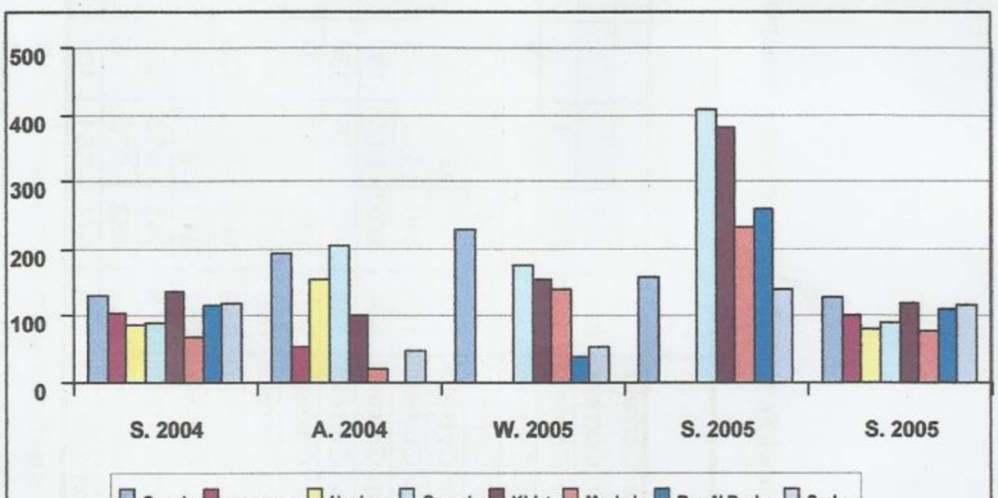

Fig. 3: Seasnal average conc. of Cobalt(Co) in water (µg/L) From southern wetlands of Iraq

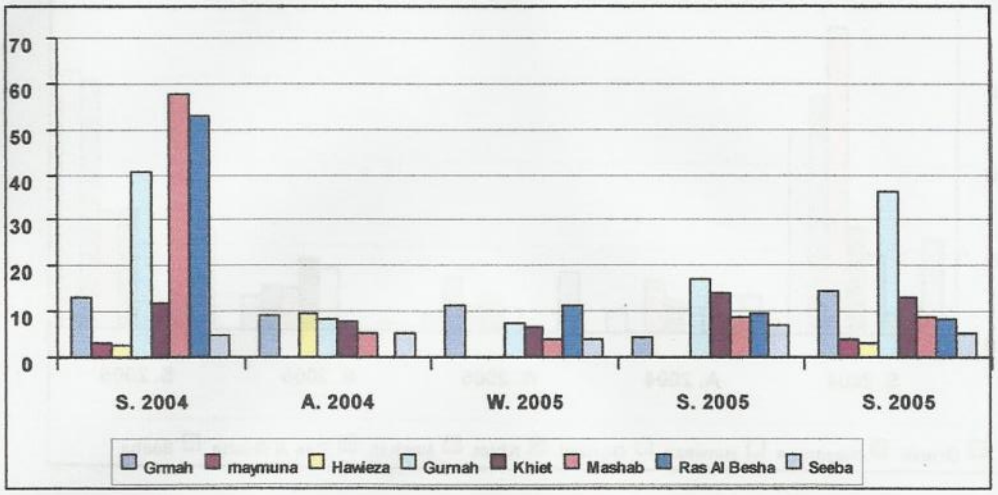

Fig.4: Seasnal average conc. of Copper (Cu)in water (μg/L)from southern wetlands of Iraq

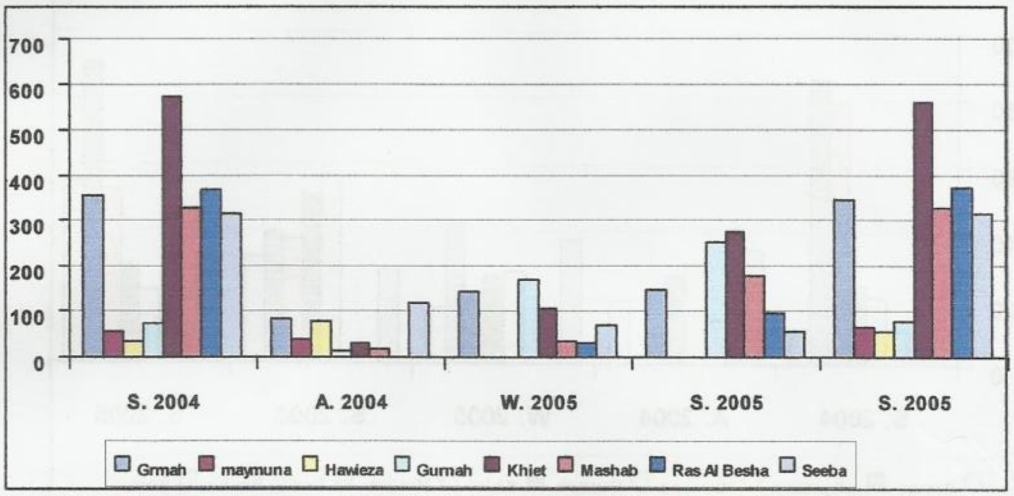

Fig.5: Seasnal average conc. of Iron(Fe) in water (μg/L)from southern wetlands of Iraq

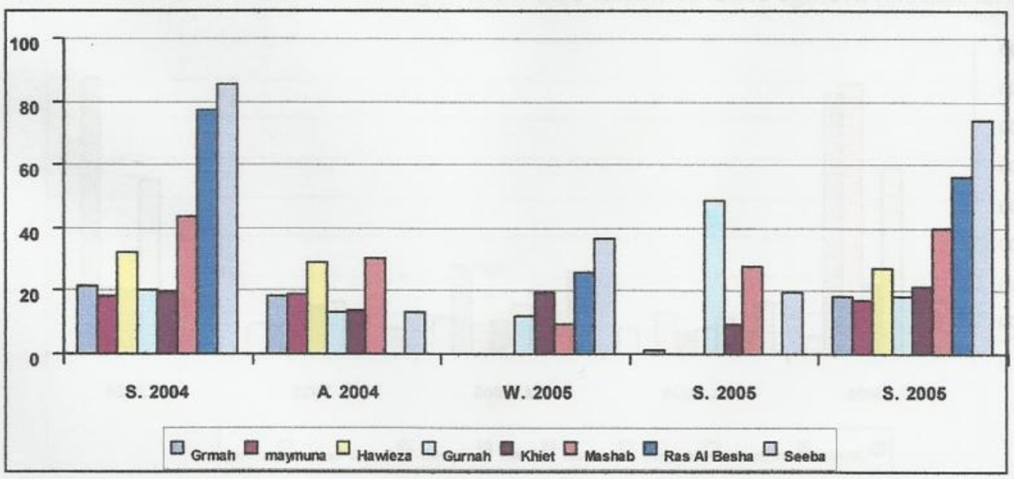

Fig.6 Seasnal average conc. of Manganes (Mn)in water (μg/L)from southern wetlands of Iraq

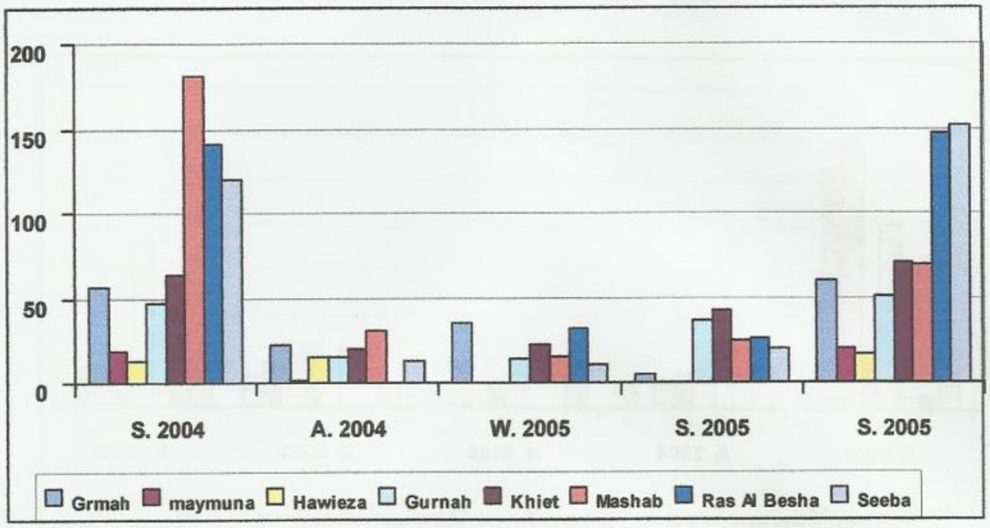

Fig.7: Seasnal average conc. of Nickel(Ni) in water (µg/L)from southern wetlands of Iraq

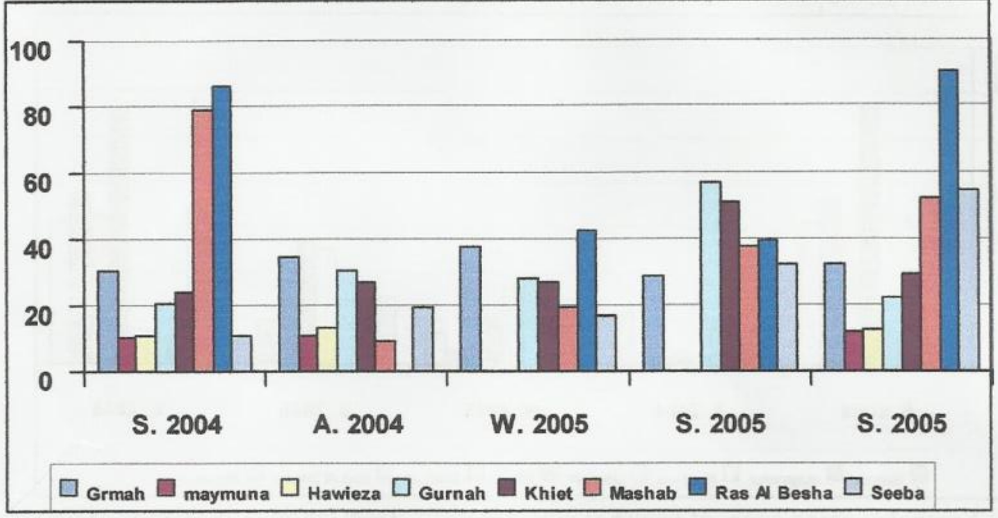

Fig.8: Seasnal average conc. of Lead(Pb)in water (µg/L)from southern wetlands of Iraq

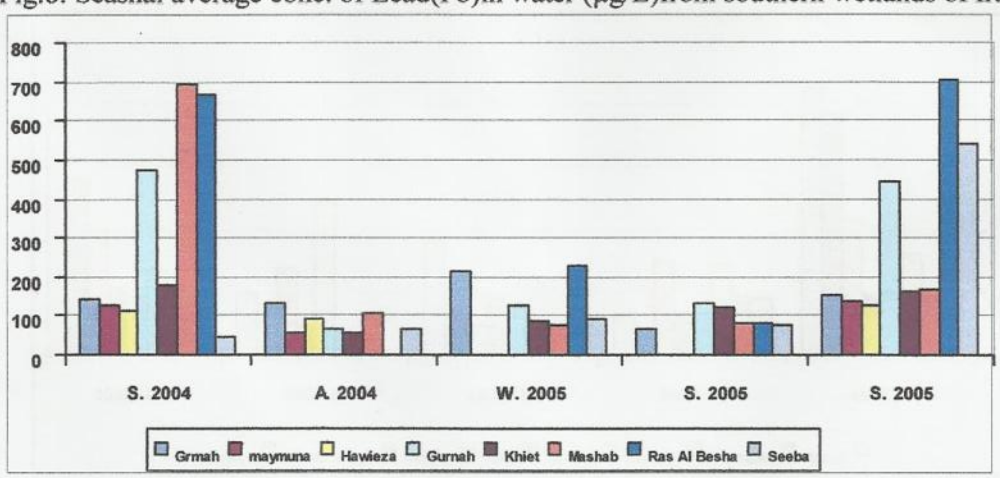

Fig.9: Seasnal average conc. of Zink(Zn) in water (µg/L)from southern wetlands of Iraq

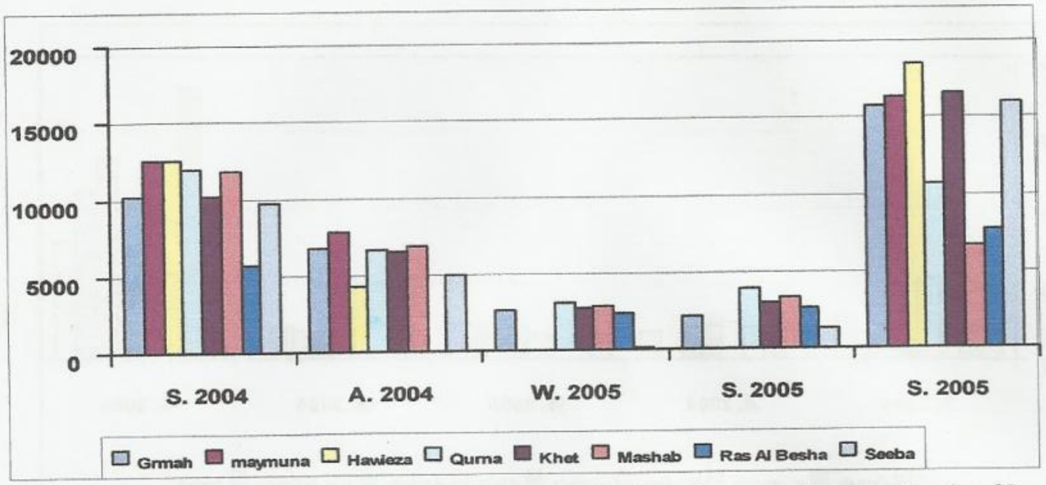

Fig.13: Seasnal average conc. of Iron (Fe)in sediment (µg/gm) from southern wetlands of Iraq

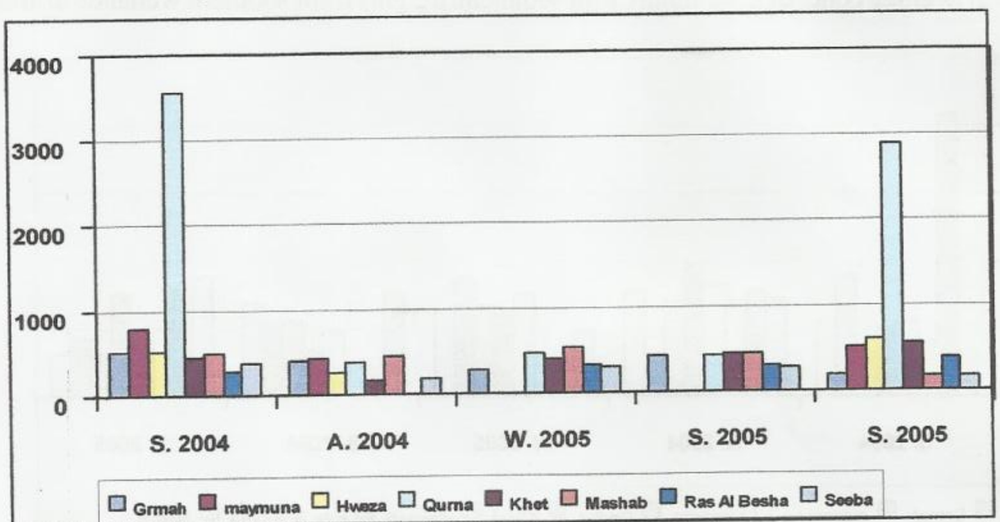

Fig.14 Seasnal average conc. of Manganes (Mn)in sediment (µg/gm) from southern wetlands of Iraq

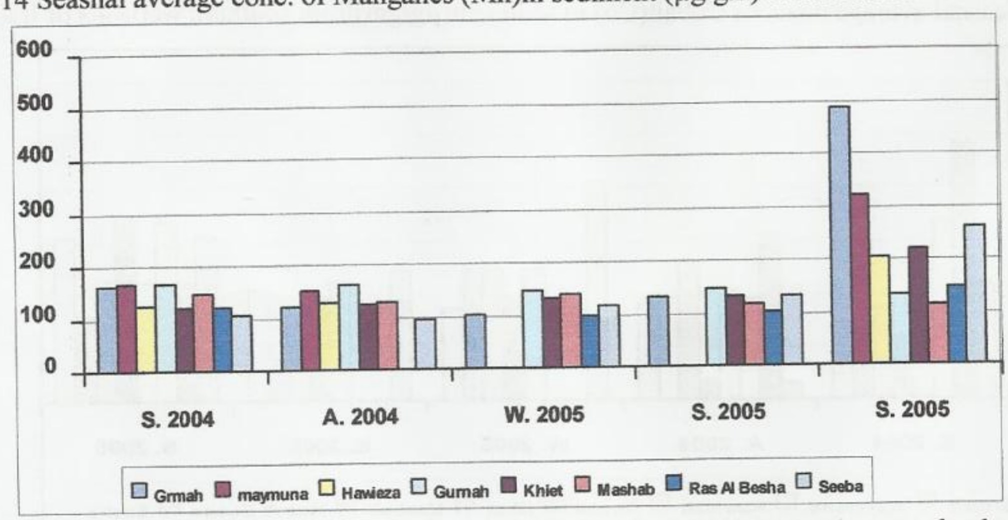

Fig.15: Seasnal average conc. of Nickel(Ni) in sediment (µg/gm)from southern wetlands of Iraq

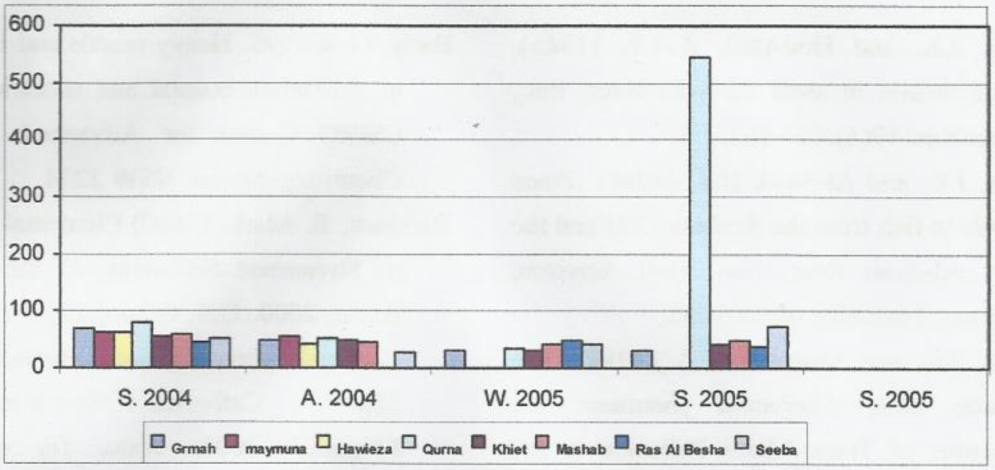

Fig.16: Seasnal average conc. of Lead(Pb)in sediment (µg/gm)from southern wetlands of Iraq

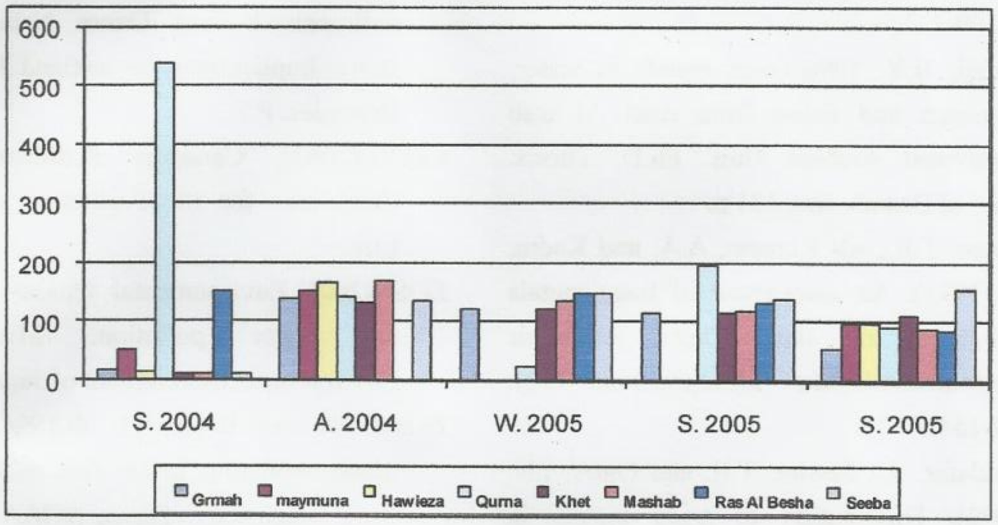

Fig.17: Seasnal average conc. of Zink(Zn) in sediment (µg/gm)from southern wetlands of Iraq

Conclusion

Data reported in this study show variable trends and unclear variations during seasons of study. This could be explain on the basis of alternative inflow of water into dried marshes as well as other sources of effluent, domestic, industrial and atmospheric fall out. Moreover, certain areas contain compounds ready for oxidation by oxygen; this will lead to incorporate the oxidation-reduction mechanisms.

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مستويات وتوزيع المعادن النزرة في مياه مسطحات العراق الجنوبية

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الملخص

أجريت دراسة لتقدير المعادن النزرة: الكادميوم والكوبلت والنحاس والحديد والمنغنيز والنيكل والرصاص والخارصين في مياه مسطحات العراق الجنوبية والمتمثلة باهوا ر الحويزة والوسطي والحمار وشط العرب وكرمة علي وراس البيشة عند شمال الخليج العربي. تم جمع عينات مياه تحت سطحية ورواسب قاعية لفترات موسمية خلال الفترة تموز\2004 إلى تموز\2005. استخلصت المعادن النزرة لكل عينة وتم تقدير تراكيزها بالطرق القياسية وباستخدام جهاز الامتصاص الذري اللهبي. كانت معدلات التركيز العليا للمعادن النزرة في المياه (بوحدات مايكرو غرام\لتر)بمقدار 85.95 (كادميوم) في البيشة، 407.9 (كوبلت) في القرنة، 57.83 (نحاس) في المسحب ، 574.33 (حديد) في الخيط ، 85.34 (منغنيز) في السيبة ، 181.0 (نيكل) في المسحب ، 90.25(رصاص) في البيشة و 702.34((كادميوم) في البيشة. وخلال فصول مختلفة، بينما كانت أعلى معدلات للتركيز في الرواسب (بوحدات مايكوغرام\غم وزن جاف)بمقدار 35.95 ((كوبلت) في الهور الوسطي و 836.46 (نحاس) في الهور الوسطي و 48.69 (نحاس) في الهور الوسطي و 18435.5 (حديد) في الحويزة و 3648.28 (نيكل) في القرنة و 486.95 (نيكل) في كرمة علي و 5435.5 (رصاص) في القرنة و 539.8 (خار صين) في القرنة. تميزت بعض المواقع على شط العرب وهور الحويزة بأنها تستقبل كميات كبيرة من مخلفات منزلية وصناعية وحركة نقل بالزوارق حيث سجلت مستويات عليا من الملوثات بالرواسب كما في راس البيشة عند أعلى شمال الخليج العربي.

كلمات دالة: معادن نزرة، اهوار، رواسب، مياه، شمال غرب الخليج العربي.