EVALUALION OF SOME HEAVY METALS RESIDUES IN DIFFERENT WATER SOURCES AND NILE TILAPIA IN SHARKIA GOVERNORATE EGYPT

AL-NAGAAWAY, A.M. [1], M.N. SHEHATA [2], AIDA M. DAWAH[1] AND ENAS M. MANSOUR[1]

1- Central Lab. For Aquaculture Research Abbassa, ARC, Giza
2- Botany Department, Faculty of Science, Benha University, Qalubia

(Manuscript received 17 March 2009)

Abstract

The present study was carried out to evaluate heavy metals residues in water and fish (*Oreochromis niloticus*) tissues collected periodically from summer 2007 to spring 2008 of different water sources (agricultural drainage water, mixed drainage water, and fresh water), while there were no fish could be found in mixed drainage water. There were significant differences among different water sources as well as different seasons. Water samples had Fe residuals level exceeding the permissible limit in all different water sources while Pb level exceeding the permissible limit in mixed drainage water in spring season. Bioaccumulation of Fe, Zn, Cu, and Cd varied in muscle, gills, and liver tissues of *Oreochromis niloticus*. Generally, it could be mentioned that heavy metals concentrations in different investigated fish organs were in the following order: muscle < gills < liver. Lead concentrations were not detectable in different tissues of fish collected from different sources during different seasons. The higher values of metals were detected in fish collected from the agricultural drainage water. Moreover, there were seasonal variations had been observed, where cadmium residuals level had exceeding the internationally permissible levels in winter and autumn.

INTRODUCTION

Drainage water is one of the waste wealth's that could be treated if necessary and re-used to serve in the aquacultural and agricultural development. The records show that the drainage water in Egypt represents 46-54% of total annual irrigation water which could be estimated as 10-12 milliards m^3 drainage water. Making use of these quantities of drainage water it will put an end to the problem of direct competition between agriculture and aquaculture for fresh water. As for agricultural purpose, some of the drainage water could be used successfully as it contains several nutrients that could be utilized by plant. However, it should be taken into consideration that the values of chemical measurement are in the allowable limits of plant growth (Dawah & Nagdy 2000).

There are many trails in Egypt for using the drainage water; alone; or mixed with Nile fresh water, especially in regions that have drainage water of good or moderate quality.

In aquatic ecosystems, metals occur in low concentrations, but in recent times, however, the occurrence of metal contaminants especially the heavy metals in excess of natural loads has become a problem of increasing concern. This situation has arisen as a result of the rapid growth of population, increased urbanization, and expansion of industrial activities, exploration and exploitation of natural resources, extension of irrigation and other modern agricultural practices as well as lack of environmental regulations (FAO, 1992).

Fish, as human food, are considered as a good source of protein, polyunsaturated fatty acids (particularly omega-3 fatty acids), calcium, zinc, and iron. Metal residues problems in the fish flesh are serious, as reflect by the high metal concentrations recorded in the water and sediments Wong *et al.,* (2001). The two most important factors that contribute to the deleterious effects of heavy metals as pollutants are their indestructible nature through bioremediation unlike organic pollutants and their tendency to accumulate in environment especially in the bottom sediments of aquatic habitats in association with organic and inorganic matter (Sobha *et al.,* 2007).

Heavy metals effect on organisms directly by accumulating in their body or indirectly by transferring to the next trophic level of the food chain.

Heavy metal residues in fish and its hazard effects on the health of people are a matter of great concern to food hygienists. The most non-essential heavy metals of particular concern to fish and surface water are Iron (Fe), Zinc (Zn), Copper (Cu), Cadmium (Cd) and Lead (Pb) which have the way to fish mainly via gills (Tao *et al.,* 2000), subsequently to safe guard the fish consumers, periodical evaluation of heavy metals residual level in the fish flesh and water from expected polluted area are of major importance.

The objective of this study was to evaluate Iron, Zinc, Copper, cadmium and lead contents of *Oreochromis niloticus*. and water from Al-Areeni agricultural drainage drain and sewage drain branched from the Al-Areeni drainage drain Sharkia, Egypt, which used to cover the shortage of water in canals supplying irrigation water for legal and illegal rice.

MATERIALS AND METHODS

Sampling and sites:

Water samples were collected from three different water sources located in Sharkia Governorate: Al-Areeni agricultural drainage canal (drainage water "A"), sewage canal branched from the Al-Areeni drainage canal (mixed of agricultural drainage and sewage water "B") and Bahr Abou-El Akhdar irrigation canal (Fresh water "C") as shown in Fig (1).

Water samples were taken monthly from nine points, three of each different water source. Fish samples (*Oreochromis niloticus*) were collected seasonally from agricultural drainage water and fresh water only by using screen net, preserved in ice box and taken to the laboratory for analysis. There were no fish could be caught from the mixed drainage water.

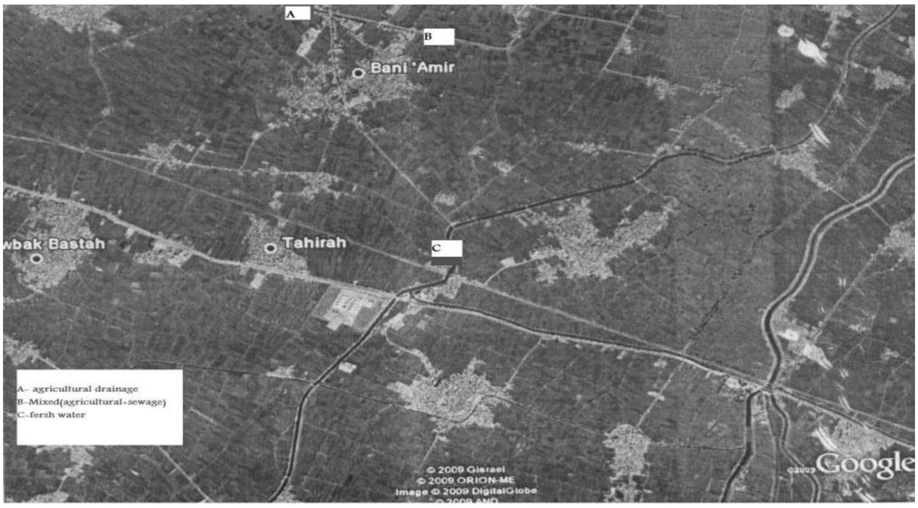

Fig (1): Map demonstrate the different water sources of the study as shown in Google earth

Laboratory analyses:

Water preparation for heavy metals residues:

Ten cm^3 of concentrated hydrochloric acid was added to 1000 cm^3 of water samples and evaporated to 50 cm^3, then preserved in a refrigerator (at 4C^o) till analysis for Fe, Zn, Cu, Cd and Pb (Parker, 1972), finally measured using Atomic Absorption Spectrophotometer (Model Thermo Electron Corporation, S. Series AA spectrometer, UK).

Fish preparation for heavy metals residues:

Oreochromis niloticus fingerlings were collected seasonally from both agricultural drainage water and fresh water. The average weight of fish samples were 130 $\pm$ 11,9

Fish were dissected to obtain samples from muscles, gills, and livers. They were ignited in order to be converted into ash as a preliminary preparation for metals analysis. To the ashed sample (ashing was carried out using muffle furnace at a temperature of 500 ^oC overnight) 2 ml HNO_3 were added with swirling. Sample was evaporated carefully just to dryness on hot plate, transferred to cooled furnace, temperature raised slowly to 450 -500 ^oC. 10 cm^3 of 1N HCl were added. Ash was dissolved by heating cautiously on a hot plate. Transfered to 25- cm^3 volumetric flask and added HCl as necessary, cooled and diluted to a certain volume, preserved in a refrigerator (at 4C^o) till analysis for Fe, Zn, Cu, Cd and Pb then measured using Atomic Absorption Spectrophotometer (Model Thermo Electron Corporation, S. Series AA spectrometer with Gravities Furnace, UK) (Official Methods of analysis, 1980).

Statistical analysis:

Statistical analysis was performed using the analysis of variance (ANOVA) and Duncan's Multiple Range Test .Standard errors were estimated using (SAS, 1987).

RESULTS AND DISCUSSION

Heavy metals residues in water:

The present study indicated that heavy metals concentrations in both mixed drainage water and agricultural drainage water were higher than their concentrations in fresh water. This observation could be attributed to the richness of drainage water with organic matter which chelates these metals.

The annual over all means of pH were 7.88, 7.45, and 7.89 in the agricultural drainage water, mixed drainage water, and fresh water respectively, while the highest temperature was recorded in fresh water during summer (25.02 ^oC) and the lowest one was observed in mixed drainage water during winter (13.25 ^oC).

Iron (Fe):

Table (1) showing that there were no significant differences in iron concentrations among different water sources during summer, while there were significant differences during spring, autumn, and winter, The annual over all means of iron concentrations were 2.41 ± 0.97, 3.52 ± 1.41, and 1.26 ± 0.42 mg/l in agricultural drainage water, mixed drainage water, and fresh water, and this mean is represented by (803.3, 1173.3, and 420%) from the permissible limit respectively. The highest iron concentration was 6.60 ± 0.77 mg/l which recorded in mixed drainage water during spring and this may be due to the release of a certain part of the adsorbed metals from the bottom sediments into the interstitial water and hence to the overlying water due to stirring up of water by wind (Saeed, 2004).

Table 1. Mean ± standard error of seasonal variations of Iron (mg/l) in water samples collected from agricultural drainage, mixed drainage and fresh water

Water sources	Agric	Mixed	Fresh
Summer	0.48 ±0.08 ^{aC}	0.51± 0.12 ^{aB}	0.39± 0.08 ^{aB}
Autumn	1.42 ±0.14 ^{aC}	1.54 ± 0.17 ^{aB}	0.69 ± 0.06 ^{bB}
Winter	2.79±0.18 ^{bB}	5.43 ±0.73 ^{aA}	1.94 ±0.23 ^{bA}
Spring	4.96 ± 0.23 ^{bA}	6.60 ± 0.77 ^{aA}	2.05 ± 0.21 ^{cA}
Over all mean	2.41 ± 0.97	3.52 ± 1.41	1.26 ± 0.42
% of Permissible limit	803.3	1173.3	420.0
Permissible limit	0.3 mg/l		

a, b, c Values-having different script at the same row are significantly (P<0.05) different

A, B, C. Values-having different script at the same column are significantly (P<0.05) different

Zinc (Zn):

The lowest concentration of zinc was 4.04 ± 1.29 µg/l which recorded in fresh water during winter while the highest one was 25.89 ± 4.23 µg/l which recorded in mixed drainage water during autumn. The annual over all means of zinc concentrations were 9.16 ± 2.09, 18.77 ± 3.82, and 6.02 ± 0.66 µg/l in agricultural drainage water, mixed drainage water, and fresh water, and this mean is represented by (7.6, 15.6,and 5.01%) from the permissible limit respectively. The highest zinc concentration was recorded in both agricultural drainage water and mixed drainage water during autumn; this may be due high concentration of phytoplankton during autumn Saleh *et al.,* (1988).

Table 2. Mean ± standard error of seasonal variations of Zinc (µg/l) in water samples collected from agricultural drainage water, mixed drainage water and fresh water.

Water sources	Agric	Mixed	Fresh
Summer	8.23 ± 1.01 ^{bB}	24.9 ±2.33 ^{aA}	6.96 ±0.81 ^{bA}
Autumn	15.19 ±1.96 ^{bA}	25.89 ±4.23 ^{aA}	6.51 ± 1.02 ^{cA}
Winter	5.96 ±0.64 ^{bB}	12.23 ±0.95 ^{aB}	4.04 ±1.29 ^{bA}
Spring	7.25 ± 1.09 ^{bB}	12.08 ±0.48 ^{aB}	6.58 ± 0.32 ^{bA}
Over all mean	9.16 ± 2.09	18.77± 3.82	6.02 ± 0.66
% of Permissible limit	7.6	15.6	5.01
Permissible limit	120 µg/l		

a, b, c Values-having different script at the same row are significantly (P<0.05) different

A, B, C. Values-having different script at the same column are significantly (P<0.05) different

Copper (Cu):

Table (3) showing that there were significant differences in copper concentrations among different water sources. The lowest and highest concentrations of copper were 1.19 ± 0.12 µg/l which recorded in fresh water during summer and 6.55 ± 0.59 µg/l which recorded in mixed drainage water during autumn respectively. The annual over all means of cupper concentrations were 2.96 ± 0.70, 4.86 ± 1.01, and 1.83 ± 0.22 µg/l in agricultural drainage water, mixed drainage water, and fresh water, and this mean is represented by (22.7, 37.3, and 14%) from the permissible limit respectively.

Mixed drainage water showed higher copper concentration than both agricultural drainage water and fresh water. Mixed drainage water includes municipal water, whereas domestic sources contribute major percentage of copper in the environment (Issa *et al.*, 1997).

The elevated copper concentrations which recorded in different water sources during winter could be attributed to mixing of wastes with water and water sediments interactions.

Table 3. Mean ± standard error of seasonal variations of Copper (µg/l) in water samples collected from agricultural drainage water, mixed drainage water and fresh water.

Water sources	Agric.	Mixed	Fresh
Summer	1.27± 0.18 ^{bC}	2.06 ± 0.33 ^{aB}	1.19 ± 0.12 ^{bA}
Autumn	3.88 ±0.79 ^{bAB}	6.55 ± 0.59 $^{a A}$	2.09 ± 0.51 ^{bA}
Winter	4.34 ± 0.84 $^{ab A}$	6.14 ± 1.4 $^{a A}$	1.84 ± 0.25 ^{bA}
Spring	2.37 ± 0.26 ^{bBC}	4.72 ± 0.74 ^{aA}	2.20 ± 0.26 ^{bA}
Over all mean	2.96 ± 0.70	4.86 ± 1.01	1.83 ± 0.22
% of Permissible limit	22.7	37.3	14.0
Permissible limit	13 µg/l		

a, b, c Values-having different script at the same row are significantly (P<0.05) different

A, B, C. Values-having different script at the same column are significantly (P<0.05) different

Cadmium (Cd):

Table (4) revealed that there were no significant differences in cadmium concentration among different water sources during summer and spring, while there were significant differences during autumn and winter. The lowest cadmium concentration was 0.28 ± 0.07 µg/l which recorded in fresh water during autumn while the highest concentration of cadmium was 1.55 ± 0.31 µg/l in agricultural drainage water during winter. The cadmium concentrations annual means were 0.94 ± 0.21, 0.64 ± 0.09, and 0.41 ± 0.07 µg/l in agricultural drainage, mixed drainage, and fresh water, and this mean is represented by (21.8, 14.8, and 9.3%) from the permissible limit respectively.

Cadmium concentration in the agricultural drainage water was higher than in both mixed drainage water and fresh water, this may be explained with the fact that the main source of cadmium is fertilizer and pesticides. The highest cadmium concentration was recorded in agricultural drainage water during winter and this may be due high concentration of phytoplankton during winter Saleh *et al.,* (1988).

Table 4. Mean ± standard error of seasonal variations of Cadmium (µg/l) in water samples collected from agricultural drainage water, mixed drainage water and fresh water.

Water sources	Agric.	Mixed	Fresh
Summer	0.56 ±0.21 ^{aB}	0.35 ±0.04 ^{aA}	0.29 ±0.02 ^{aA}
Autumn	0.89 ± 0.19 ^{aAB}	0.76 ± 0.12 $^{a A}$	0.28 ±0.07 ^{bA}
Winter	1.55 ±0.31 ^{aA}	0.73 ±0.21b ^{A}	0.43 ±0.11^{bA}
Spring	0.76 ±0.11 ^{aAB}	0.71 ± 0.14 ^{aA}	0.50 ± 0.13 ^{aA}
Over all mean	0.94 ± 0.21	0.64 ± 0.09	0.41 ± 0.07
% of Permissible limit	21.8	14.8	9.3
Permissible limit	4.3 µg/l		

a, b, c Values-having different script at the same row are significantly (P<0.05) different

A, B, C. Values-having different script at the same column are significantly (P<0.05) different

Lead (Pb):

The highest lead concentration was 5.40 ± 1.17 µg/l which recorded in mixed drainage water during spring. Lead concentrations were below the used method detecting limit in both agricultural drainage water and fresh water during winter and spring seasons Table (5). The lead concentrations annual means were 0.11 ± 0.07, 1.79 ± 1.2, and 0.05 ± 0.02 µg/l in agricultural drainage, mixed drainage, and fresh water, and this mean is represented by (4.4, 71.6, and 2%) from the permissible limit respectively.

Pb level in mixed drainage water during spring was higher the maximum permissible limit (2.5 µg/l) reported by (USEPA, 1999). This may resulted from atmospheric inflow of dust which holds a huge amount of lead. Lead concentrations in both agricultural drainage water and fresh water during winter and spring were not detectable which may be due to high pH which in turn decrease the concentration of heavy metals in water.

Table 5. Mean ± standard error of seasonal variations of Lead (µg/l) in water samples collected from agricultural drainage water, mixed drainage water and fresh water.

Water sources	Agric.	Mixed	Fresh
Summer	0.12 ±0.03 ^{aB}	0.35 ±0.10 ^{aB}	0.11 ±0.02 ^{aA}
Autumn	0.31 ± 0.10 ^{abA}	0.59 ± 0.15 ^{aB}	0.08 ±0.02 ^{bA}
Winter	ND ^{bB}	0.84 ±0.19 ^{aB}	ND ^{bB}
Spring	ND ^{bB}	5.40 ± 1.17 ^{aA}	ND ^{bB}
Over all means	0.11 ± 0.07	1.79 ± 1.20	0.05 ± 0.02
% of Permissible limit	4.4	71.6	2
Permissible limit	2.5 µg/l		

a, b, c Values-having different script at the same row are significantly (P<0.05) different

A, B, C. Values-having different script at the same column are significantly (P<0.05) different

Heavy metals residues in fish (*Oreochromis niloticus*):

In fish, bioaccumulation of Fe, Zn, Cu, Cd, and Pb varied in muscle, gills, and liver tissue of *Oreochromis niloticus* which collected from the agricultural drainage water and fresh water as shown in Table (6). Generally, it could be mentioned that heavy metals concentrations in different investigated fish organs were in the following order: muscles < gills < liver.

Liver and gills had a strong tendency to accumulate increased concentrations of heavy metals, while muscles tissues tend to retain lower concentrations of such metals. Similar observations were previously reported by many authors (Saeed, 2004). The increased accumulation of heavy metals in liver and gills tissues may be attributed to the metallothioneins proteins which are synthesized in liver and gills tissues when fishes are exposed to heavy metals and detoxify them. These proteins are thought to play an important role in protecting them from damage by heavy metal toxicants Jobling (1995).

The obtained results revealed an increased accumulation of heavy metals in fish tissues during winter and autumn might be due to the intensive feeding on phytoplankton and other organisms during these seasons. This agrees with some other workers (Saleh *et a*l., 1988).

Metals concentrations in fish organs raised in agricultural drainage water were more than their concentrations in fish rose in fresh water as the result of increasing pollution from agricultural wastes which include pesticides and fertilizer. However, it could be concluded from the obtained results that the investigated heavy metals residues in the edible muscles of fish caught either from fresh water canal or from agricultural drainage water, were lower than the allowable concentrations reported by (FAO, 1983) (30, 50, 20, 0.5, and 2.0 µg/g for Fe, Zn, Cu, Cd, and Pb, respectively) and hence are quite safe for human consumption.

Table 6. Heavy metals concentrations in the muscle, gill, and liver tissues of (*Oreochromis niloticus*) Which collected from agricultural drainage water and fresh water during different seasons.

metals		Fe(mg/g)		Zn (µg/g)		Cu (µg/g)		Cd (µg/g)		Pb (µg/g)	
Water sources		Fresh	Agric.	Fresh	Agric	Fresh	Agric	Fresh	Agric	Fresh	Agric
Summer	Muscle	0.33	0.41	3.83	4.09	1.58	2.16	0.12	0.16	ND	ND
	gills	0.73	1.7	4.03	5.46	2.92	4.03	0.16	0.21	ND	ND
	liver	1.21	2.93	23.63	87.03	7.81	8.78	0.3	0.44	ND	2.6
Autumn	Muscle	0.37	1.14	4.41	6.67	2.08	6.19	0.21	1.22	ND	ND
	gills	1.23	2.35	7.25	9.42	3.49	5.02	0.22	1.23	ND	ND
	liver	2.27	3.55	93.23	384.22	4.57	6.93	1.4	1.69	ND	ND
Winter	Muscle	0.5	0.91	3.64	5.82	2.12	3	0.19	0.53	ND	ND
	gills	1.1	1.51	5.34	8.09	4.14	4.36	0.64	0.94	ND	ND
	liver	1.68	3.43	143.93	164.21	5.51	6.6	0.98	1.48	ND	ND
Spring	Muscle	0.24	0.46	2.45	5.38	1.49	1.52	0.16	0.19	ND	ND
	gills	1.01	1.94	5.54	7.95	3.58	4.89	0.19	0.43	ND	ND
	liver	1.72	2.53	83.85	122.69	5.96	6.02	0.31	0.44	ND	ND
MAL*		30		50		20		0.5		2	

*MAL = maximum acceptable limit (µg/g) according to WHO, 1984 for iron and FAO, 1983 for the other metals.

It should be taken in consideration as previously mentioned, that there were no fish could be found in mixed drainage water alongside the study period, this may be due to the following reasons: low dissolved oxygen content, increased total ammonia concentration, high un-ionized ammonia concentration Water Act. (1989).

REFERENCES

1. Dawah, A. M. and Z. A. Nagdy. 2000. Drainage-Grown microalgae as a protein supplement for cultivation of Tilapia nilotica (*Oreochromis niloticus*). Proc. 1st Int. Conf. Biol. Sci. (ICBS) Fac. Sci., Tanta Univ. 7-8 May 2000, *Vol. 1*: 123-135.
2. FAO. 1983. Compilation of legal limits for hazardous substances in fish and fishery products. FAO Fishery Circular. 464 : 5-100.
3. FAO. 1992. Committee for Inland Fisheries of Africa. Report of the third session of the working party on pollution and fisheries, Accra, Ghana, 16-20 June 1986. FAO Fisheries Report, 471, Rome, FAO.
4. Issa, Y. M., A. A. Elewa, M. B. Shehata and A. M. Abdel-Satar. 1997. Factors affecting the distribution of some major and minor elements in River Nile at Greater Cairo Area, Egypt J. Anal. Chem., 6: 58-68.
5. Jobling, M. 1995. Environmental Biology of Fishes. First edition. Printed in Great Britian. Chapman and Hall, London.

6. Official Methods of Analysis of the Association of Official Analytical Chemists 1980. Atomic absorption method for fish. 13 th ed., P. 399.
7. Parker, R. C. 1972. Water analysis by atomic absorption spectroscopy. Varian techtron, Switzerland.
8. Saeed, S. M. 2004. Impact of inorganic pollutants on aquatic environment and fish performance in Lake Borollus. Ph.D. Thesis, Institute of Environmental studies and Research. Ain Shams Univ, Egypt.
9. Saleh, M. A., M. H. Saleh, M. M. Fouda, M. S. Abdel-Latif and B. L. Wilson. 1988. Inorganic pollution of the Man-Made Lakes of Wadi El-Raiyan and its impact on aquaculture and wildlife of the surrounding Egyptian desert. Arch. Environ. Contam. Toxicol., 17: 391-403.
10. SAS. 1987. SAS user's guide: statistics, version 6 edition. SAS Institute Inc., Cary, NC, USA.
11. Sobha, K., A. Poornima, P. Harini and K. Veeraiah. 2007. A study on biochemical changes in the fresh water fish, *Catla catla* (Hamilton) exposed to the heavy metal toxicant cadmium chloride. Kathmandu Univ. J. of Sci., Engineering and Technology. I (IV): 1-11.
12. Tao, S., C. Liu, R. Dawson, A. Long and F. Xu. 2000. "Uptake of Cadmium Adsorbed on Particulates by Gills of Goldfish (*Carassius auratus*)." *J. Ecotoxicol. Environ. Saf.,* 47, No. 3, 306-313.
13. USEPA. 1999. National Recommended Water Quality Criteria Correction Office of Water, EPA 822-Z-99-001, 25 pp.
14. Water Act, 1989. Schedule 2 of the water supply (Water quality) regulations, HMSO, London.
15. WHO. 1999. "Food Safety Issues Associated with Products from Aquaculture. Report of a Joint World Health Organ." *Tech. Rep., 883, i-vii:* 1-55.
16. WHO. 1984 "Guidelines for drinking-water quality, Geneva: World Health Organisation.
17. Wong, C. K., P. P. Wong and L. M. Chu. 2001. "Heavy Metals Concentrations in Marine Fishes Collected from Fish culture Sites in Hong Kong." *J. Arch. Environ. Contam. Toxicol.,* 40, No. 1, 60-69.

تقييم متبقيات بعض العناصر الثقيلة في المياه والبلطى النيلى من مصادر المياه المختلفة بمحافظة الشرقية– مصر

عمرو النجعاوى[١]، محمد نور شحاتة[٢]، عايدة محمد ضوة[١] ، إيناس محمد منصور[١]

١ –المعمل المركزي لبحوث الثروة السمكية – مركز البحوث الزراعية – جيزة
٢ – كلية العلوم بنها– قسم النبات –القليوبية

أجريت هذه الدراسة لبيان تأثير مصادر المياه المختلفة [مياه صرف زراعي– مياه صرف مختلط (صرف زراعي وصرف صحي) – مياه عذبه] علي تراكم متبقيات بعض العناصر الثقيلة (الحديد– الزنك– النحاس– الكادميوم– والرصاص) في المياه و في بعض أنسجه سمكة البلطي النيلي (عضلات– خياشيم– كبد) ولكن في مياه الصرف المختلط لم يتم وجود اي نوع من الأسماك وقد اوضحت النتائج ما يلي

– وجود فروق معنوية في تركيزات العناصر الثقيلة المختبرة في الموسم الواحد وكذلك بين المواسم لنفس مصدر الماء حيث انها كانت اعلي في فصل الشتاء والخريف والربيع عنه في فصل الصيف. لقد تجاوز تركيز متبقيات عنصر الحديد الحد المسموح به في جميع مصادر المياه في حين تجاوز مستوى الرصاص الحد المسموح به في مياه الصرف المختلطة في موسم الربيع.

– قابلية أنسجة الكبد والخياشيم لأسماك البلطى النيلى لاختزان العناصرأكثر من العضلات . وكان ترتيب تركيزات هذه العناصر فى المياه والأسماك كالتالي : الحديد> الزنك> النحاس> الكادميوم> الرصاص. ولم يتم كشف أي تركيز للرصاص في الأنسجة المختلفة للأسماك التي جمعت من مصادر المياه المختلفة خلال المواسم المختلفة. كانت هناك اختلافات موسمية فى تركيز العناصر . وخلصت الدراسة الي أن تركيز العناصر في مصادر المياه المختلفه في الحدود المسموح بها دوليا ماعدا عنصر الحديد وكذلك عنصر الزنك في أنسجة الكبد لأسماك البلطي بمياه الصرف الزراعي والماء العذب في المواسم الأربعة ماعدا فصل الصيف.