Annals Agric. Sci., Ain Shams Univ., Cairo, 48(1), 373-387, 2003

SEASONAL DISTRIBUTION OF PESTICIDES AND METALS RESIDUES IN WATER BODIES COLLECTED FROM DIFFERENT LOCATIONS OF KALUBIA GOVERNORATE, EGYPT

[28]

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ABSTRACT

The pesticide residues in drainage water, ground water and sediment samples collected from different locations through four different seasons at Kalubia governortae were monitored within July, 1999 till June 2000. In the drainage water, it was noticed the dominance of organochlorine insecticides among the monitored compounds. Samples location and season proved important role on the frequency and occurrence of pesticides residues. As example, El-Esmailia water analysis showed that *p,p'*-DDT was detected in 0.204 ppb as average of the four seasons, i.e., Summer, Autumn, Winter and Spring, while the other chlorinated hydrocarbons were found in lower levels, from 0.06 (Heptachlor) to 3.55 (β-HCH). Benefin was found at 13.2 ppb., while the OP's parathion existed in 44.08 ppb in spite of its banning since 1990 in Egypt. The pyrethroid fenpropathrin was found at 2.51 ppb, and followed by alpha-methrin 1.93 ppb. The obtained results indicated the existence of high levels of α-HCH in ground water from El-Esmailia (405.3 ppb, Autumn), aldrin (25.9 ppb, Spring), *p,p'*-DDE (44.0 ppb, Summer), fenitrothion (300.7 ppb, Spring), parathion (13.3 ppb, Summer). Sediment samples were found containing high levels of pesticides but in various levels due to the location and season. Sediment from El-Esmailia was found containing total α-HCH (47.7 ppb), β-HCH (891.6 ppb), Benefin (910 ppb), fenpropathrin (242 ppb) and Thiram (107.6 ppb). The obtained results indicate the negligible existence of metals in drainage and/or ground water i.e. Co, Ni, Cr and Pb. Mn was the only exception which exhibited the high amounts in water samples at the three selected sites.

Key words: Pesticides, Metals, Residues, Nile Water, Sediment, Monitoring, Egypt.

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(Received January 15, 2002)
(Accepted April 8, 2002)

INTRODUCTION

The pollution of soils and water resources by pesticides, detergents, solvents and a variety of industrial organics is a pressing worldwide problem. It is especially acute in regions of intensive industrial and agricultural activities, where a severe burden on the environment results from pesticide production and treatment, chemical industry, waste production, as well as from fuel processing, storage and use. Many of the organic chemicals of anthropogenic origin are persistent, tend to accumulate in living organisms and are capable of penetration into ground water (**Cohen *et al* 1986 and Borner, 1994**). Some of these pesticides and other pollutants exhibit long-term toxicity. The removal of organic pollutants from water and effluents prior to their disposal, as well as their reuse, is therefore of special significance.

The Nile water in Egypt is distributed through a dense network of irrigation canals and is controlled through a series of hydraulic control structure, including seven main barrages and thousands of other regulators and smaller structures.

The rate of discharge of waste products into the River Nile is rapidly increasing because of this and the growing demand of water, the quality of River Nile water is becoming of major importance. It is evident that pollution is affecting the use of the River Nile water. Hence, there is a growing concern about the water quality.

With increasing population in Egypt, industrialization and food production, the amounts of these pollutants entering the river water are continuously increasing. Data of monitoring program carried on by Nile Research Institute (NRI) indicated that the River Nile from Aswan to the Mediterranean sea is suffering from pollution in some locations. This result highlights the need to establish a permanent water quality monitoring programs along the River Nile.

Many publications revealed the existence of pesticide residues mainly organochlorine compounds in various aquatic ecosystems components **Abdel-Razik *et al* (1991); Abou-Arab *et al* (1995); Hassan *et al* (1996); Badawy (1998); Osfor *et al* (1998) and El-Kabbany *et al* (2000).** Also, several investigators reported significant amounts of metals in river Nile water (**Zayed *et al* 1994; Abdel Naser *et al* 1996 and Seddek *et al* 1996**).

The present investigation aimed to study the seasonal contamination of drainage water, ground water and sediment from industrial and agricultural areas at Kalubia governorate by pesticides and metals during the year 1999/2000.

MATERIAL AND METHODS

1- Method of collecting water and sediment samples

River water-composite samples of two liters each were taken from grab at 0.5 m. depths of a river. Commercial sampler allows deep water samples to be taken. It consists of a tube-like device with removable stoppers on either end. As the device drops through the water, the water flows through the device.

Physically, Loamy (mucky) sediment is the most difficult sample to collect. Depending on the depth of the river or body of water it may be possible to dig with a paddle or shovel to obtain a sample.

2- Extraction and clean-up of pesticides

The extraction procedure adopted by **Mann, (1981)** was followed with water samples while samples of sediment were extracted and cleaned-up according to the official methods of analysis, **(Anonymous, 1990).**

3- Separation and identification of the studied pesticides by GC

The operating conditions for the GC (Shimadzu 12A) were as follows:
Sixteen organochlorine insecticides were separated on GC column packed with 2% dexile on sumikasorb. Q

- Detector: ECD
- Temperature:
  Inj./Det. Temp. 250°C
  Oven temp. prog. 180-250°C(2°C/min)
- Gas pressures: N_2 1.5 kg/cm^2
  Carrier gas
  Attenuation: 10 × 5

Eleven pesticides belongs to fungicides, herbicides and insecticides were separated on GC column packed with 3% silicon OV-101 on chromosorb Q.

- Detector: FID
- Temperature:
  Inj./ Det. Temp. 250°C
  Oven temp. prog. 180-250°C (5°C/min).
- Gas pressures:
  Carrier gas N_2 1.5 kg/cm^2
  Burner gas H_2 1.0 kg/cm^2
  Air 1.0 kg/cm^2
  Attenuation 10 × 5

About 2.5 to 3.5 mg from all pesticides were weighed into 5 ml volumetric flask, dissolved and diluted with acetone to the end volume of 5 ml. A suitable aliquot of standard solution was injected in GLC (Shimadzu 12A), at the suitable conditions. The retention time (R.T.) ,area under peak , the weight of the studied compounds and separation factors (R) were established as presented in Table (1). Amount recovered ranged between 75-85 percent for added amounts of tested pesticides.

4- Metal analysis

Drainage water and ground water samples collected from the selected sites during 1999/2000 were taken after preparation for trace metals analysis of Mn, Cr, Co, Pb and Ni by using Atomic Absorption Flame Emission Spectrophotometer (Shimadzu, AA-6200) **(AOAC, 1990).**

RESULTS AND DISCUSSION

1- Drainage water

Data in Table (2) and Fig. (1-A) indicate the monitoring of very negligible residues of pesticides in drainage water samples collected from the different locations at Kalubia governorate within the year 99/2000. It is clearly evident to notice the dominance of organochlorine insecticides among the monitored compounds. Location and season factors proved important role on the frequency and occurrence of pesticide residues. The average of the detected pesticide residues between the four seasons (Summer, Autumn, Winter and Spring) were varied between the pesticide groups and/or location. For example, El-Esmailia water samples containing *p,p'*-DDT (0.204 ppb), while the other chlorinated hydrocarbons were found in other levels, i.e. 0.06 ppb (Heptachlor) to 3.55 ppb (β-

Table 1. Separation of certain pesticides on GLC.

Compound	Rt.*	Area/10000	The weight (µg)	Separation factor (R)
α-HCH	4.942	9.3	0.495	2.55
β-HCH	6.455	9.5	0.521	2.66
Delta-HCH	7.648	12.7	0.717	1.79
Heptachlor	8.427	33.2	1.43	1.12
Aldrin	10.433	21.5	0.686	2.45
Heptachlor-	12.82	12.1	0.498	2.89
o.p'-DDE	14.87	36.2	0.873	2.59
cis-Chlordane	15.69	6.7	0.323	0.95
p,p'-DDE	17.575	46.3	1.069	2.59
o,p'-DDD	18.485	35.3	0.868	1.11
Endrin	19.282	32.8	2.028	1.08
o.p'-DDT	20.633	34.7	0.887	1.65
p.p'-DDD	22.1	111.7	2.648	1.4
p.p'-DDT	24.545	19.4	0.496	0.98
Mirex	28.903	34.8	1.931	5.58
Endrin-keton	29.918	18.7	0.569	1.04
Thiram	2.513	12.86	1.82	2.14
Benefin	2.898	16.26	0.42	1.03
Fenitrothion	5.677	22.60	3.0	6.35
Parathion	6.32	13.98	0.27	1.84
Profenofos	8.975	17.32	2.58	4.39
Benalaxyl	11.287	25.29	0.83	4.0
Fenpropathrin	13.892	26.77	0.73	4.12
Pyridaben	15.955	16.55	1.17	3.88
Alpha-	17.335	26.89	0.83	2.30
Etofenprox	21.0	13.27	2.17	3.72
S-fenvalerate	24.7	47.98	1.83	1.68

* Rt = Retention time in minutes

Table 2. Monitoring of some pesticides residues (ppb) in drainage water samples collected from different locations of Kalubia governorate during 7/99-6/2000.

Pesticides	El-Ismailia, sector El-Khanka				El-Kanater, sector El-Kanater				El Sunafin, sector Benha			
	Summer	Autumn	Winter	Spring	Summer	Autumn	Winter	Spring	Summer	Autumn	Winter	Spring
α-HCH	4.72	1.73	0.91	ND	ND	ND	1.46	0.936	1.71	ND	ND	ND
β-HCH	13.1	ND	1.1	ND	1.94	ND	0.3	1.3	ND	ND	0.61	ND
Delta-HCH	ND	ND	ND	1.16	ND	0.303	ND	1.17	ND	ND	24.03	1.5
Heptachlor	ND	ND	ND	0.24	0.08	ND	4.03	ND	ND	1.73	2.36	ND
Aldrin	0.31	ND	ND	0.43	ND	0.31	ND	ND	ND	ND	ND	ND
Hept-epoxide	8.86	ND	ND	ND	9.86	ND	ND	6.93	ND	ND	ND	ND
o,p'-DDE	ND	ND	ND	ND	5.03	ND	ND	3.13	ND	ND	ND	ND
Cis-Chlordane	ND	ND	ND	6.76	ND	ND	1.83	ND	ND	ND	ND	37.5
p,p'-DDE	1.04	104	ND	1.47	6.34	ND	ND	ND	17.1	ND	ND	1.6
o,p'-DDD	ND	ND	ND	ND	ND	0.63	ND	ND	ND	ND	ND	3.13
Endrin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.47	ND
o,p'-DDT	ND	6.03	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
p,p'-DDD	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.06	ND	ND
p,p'-DDT	0.41	ND	0.406	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mirex	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	13.56
Endrin-keton	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Thiram	ND	ND	ND	13.83	ND	ND	5.13	ND	ND	ND	ND	ND
Benefin	51.03	ND	1.76	ND	ND	ND	ND	0.33	ND	ND	ND	ND
Fenitrothion	ND	ND	ND	ND	ND	5.13	ND	ND	ND	3.36	ND	ND
Parathion	ND	176.3	ND	ND	10.3	ND	ND	1.73	ND	ND	ND	1.75
Profenofos	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.27	ND
Benalxyl	ND	ND	ND	24.93	1.3	ND	ND	ND	ND	ND	ND	5.3
Fenpropathrin	ND	6.13	3.9	ND	ND	ND	ND	ND	1.7	ND	ND	ND
Pyrazophos	ND	ND	ND	ND	0.76	ND	ND	ND	3.63	ND	ND	ND
Pyridaben	ND	ND	ND	ND	ND	ND	ND	ND	1.03	ND	ND	ND
Alpha-methrin	ND	ND	ND	7.73	ND	ND	ND	ND	ND	ND	ND	ND

ND: Not detected under the limit of detection in our laboratory (1 ppb).
Summer Date: 20/6 – 21/9 (7-8-9 / 98) Autumn : 21/ 9 - 20/12 (10-11-12 / 98).
Winter :20/12 – 21/3 (1-2-3 / 99). Spring :21/3 - 20/6 (4-5-6 / 99).
Etofenprox and S-fenvalerate were not detected under the limit of detection.

HCH). Benefin was detected at 13.2 ppb., while parathion was monitored in 44.08 ppb in spite of its banning since 1990 in Egypt. The pyrethroid fenpropathrin was found at 2.51 ppb, followed by alpha-methrin (1.93 ppb). S-fenvalerate was not detected in analyzed samples. As for seasonal abundance of monitored pesticides in water data in the same table indicate the existence of more pesticides in number and type in water during Summer and Spring compared with Autumn and Winter. The same trend of results was noticed at El-Kanater sector, but the levels of pesticide residues were lower than El-Esmailia sector. DDT was detected in very low amounts in parallel pattern to organochlorine complex. Again, summer showed the highest number of monitored pesticides (8), followed by Spring (7), while Autumn and Winter showed the least number (4 and 5).

The same data indicate the detection of mirex in water from El-Sanafin sector in spite of that this insecticide has never been used in Egypt. Water collected during spring was found containing 7 pesticides, by summer and winter samples (5) while less numbers were detected in autumn samples which contained three compounds only.

Generally, Such findings are in agreement with that obtained by **Abu-Elamayem *et al* (1979)**. Also, **Hassan *et al* (1996)** monitored the pesticides residue in samples of water collected from near the shore (2-5 m) and from the middle of the River Nile from February to April 1995 in Cairo governorate, Egypt. The water samples did not contain appreciable amounts of organochlorine residues, and it is concluded that there is no risk to human health. Average levels of organochlorine pesticide in the water samples were 5.09 and 2.17 μg/kg at the shore and middle sites, respectively.

2- Ground water

Data in Table (3) and Fig (1-B) indicate the existence of high levels of pesticides, in water from El-Esmailia sector, i.e. α-HCH, Autumn (405.3 ppb), aldrin (25.9 ppb, Spring), *p,p'*-DDE (44.0 ppb, Summer), fenitrothion (300.7 ppb, Spring), Parathion (13.3 ppb, Summer). Water from El-Kanater sector was found containing few number and types & lower amounts of pesticides compared with El-Esmailia sector, except *o,p'*-DDE (43.6 ppb, Summer), Pyridaben (70.3 ppb, Summer) and heptachlor-epoxide (18.16 ppb, Spring). Water from El-Sanafin was found containing negligible residues of pesticides in most of the collected samples, i.e. α –HCH (8.05 ppb), aldrin (7.8 ppb) and prefenofos (8.03 ppb) during Summer.

3- Sediment

Data in Table (4) and in Fig. (1-C) indicate the existence of high levels of monitored pesticides in sediment samples collected from Kalubia governorate. Such pesticides were found in various levels due to the location and season. Sediment from El-Esmailia was found containing total α-HCH (47.70 ppb), β-HCH (891.60 ppb), Benefin (910.00 ppb), fenpropathrin (242.00 ppb) and Thiram (107.60 ppb). The other pesticides were not detected in sediment samples or found in negligible values. El-Kanater sediment samples were found containing some pesticide residues in higher values, the total amounts within the vesical year July,99 to

Table 3. Monitoring of some pesticides residues (ppb) in ground water samples collected from different locations of Kalubia governorate during 7/99-6/2000.

Pesticides	El-Esmailia, sector: El-Khanka				El-Kanater, sector: El-Kanater				El-Sanafin, sector: Benha			
	Summer	Autumn	Winter	Spring	Summer	Autumn	Winter	Spring	Summer	Autumn	Winter	Spring
α-HCH	ND	ND	ND	ND	ND	ND	ND	ND	8.05	ND	ND	ND
β-HCH	ND	405.3	0.7	ND	ND	1.43	ND	0.57	1.46	ND	ND	0.3
Delta-HCH	0.56	4.56	0.63	1.16	0.303	ND	ND	5.3	0.32	ND	ND	ND
Heptachlor	0.66	ND	ND	ND	4.88	ND	ND	0.44	ND	ND	ND	ND
Aldrin	ND	0.03	ND	25.9	ND	ND	4.76	ND	7.8	ND	ND	ND
Hept-epoxide	ND	ND	ND	ND	ND	4.27	ND	18.16	ND	ND	ND	ND
o,p'-DDE	ND	3.76	ND	ND	43.6	ND	ND	ND	ND	ND	ND	ND
Cis-Chlordane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
p,p'-DDE	44.0	ND	1.07	ND	ND	ND	ND	ND	ND	4.56	ND	1.02
o,p'-DDD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin	ND	ND	ND	0.81	ND	ND	3.36	ND	ND	ND	ND	ND
o,p'-DDT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.4	ND
p,p'-DDD	ND	ND	ND	ND	ND	ND	0.84	ND	ND	ND	ND	ND
p,p'-DDT	ND	3.7	ND	0.83	ND	6.7	ND	ND	ND	ND	ND	ND
Mirex	ND	ND	ND	40.1	ND	ND	ND	ND	ND	ND	ND	10.7
Endrin-keton	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Thiram	4.36	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benefin	0.59	ND	ND	ND	ND	ND	ND	ND	1.19	ND	ND	ND
Fenitrothion	ND	ND	ND	300.7	ND	ND	ND	ND	ND	ND	ND	ND
Parathion	13.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Profenofos	1.33	ND	ND	ND	ND	ND	ND	ND	8.03	ND	ND	ND
Benalxyl	ND	ND	ND	1.06	ND	ND	ND	ND	ND	ND	ND	ND
Fenpropathrin	1.43	ND	ND	ND	ND	ND	ND	ND	0.77	ND	ND	ND
Pyrazophos	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Pyridaben	ND	ND	ND	ND	70.3	ND	ND	ND	ND	ND	ND	0.38
Alpha-methrin	ND	ND	ND	7.73	ND	ND	ND	ND	ND	ND	ND	ND

ND: Not detected under the limit of detection in our laboratory (1 ppb).
Summer Date: 20/6 21/9 (7-8-9 / 98) Autumn : 21/9 - 20/12 (10-11-12 / 98).
Winter :20/12 – 21/3 (1- 2-3 / 99). Spring :21/3 - 20/6 (4-5-6 / 99).
Alpha-methrin, Etefenprox and S-fenvalerate were not detected under the limit of detection.

Table 4. Monitoring of some pesticide residues (ppb) in sediment samples collected from different locations of Kalubia governorate during 7/99-6/2000.

Pesticides	El-Esmailia, sector: El-Khanka				El-Kanater, sector: El-Kanater				El-Sanafin, sector: Benha			
	Summer	Autumn	Winter	Spring	Summer	Autumn	Winter	Spring	Summer	Autumn	Winter	Spring
α-HCH	47.7	ND	ND	37.3	46.36	ND	ND	ND	ND	ND	ND	ND
β-HCH	ND	410.0	481.6	ND	76.7	ND	37.3	ND	6.3	ND	ND	77.0
Delta-HCH	ND	75.6	ND	ND	4.06	ND	401.4	ND	ND	ND	ND	ND
Heptachlor	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aldrin	ND	ND	14.03	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hept-epoxide	ND	ND	ND	ND	ND	313.6	ND	ND	583.3	124.0	ND	ND
o,p'-DDE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	49.6
Cis-Chlordane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
p,p'-DDE	3.5	ND	ND	ND	ND	ND	ND	170.6	ND	ND	ND	ND
o,p'-DDD	13.03	11.13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin	ND	ND	ND	ND	ND	6.06	ND	ND	ND	ND	97.0	ND
o,p'-DDT	ND	ND	ND	ND	ND	ND	ND	ND	ND	44.3	ND	ND
p,p'-DDD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	40.0	4.1
p,p'-DDT	ND	ND	ND	ND	42.83	ND	ND	ND	ND	ND	ND	ND
Mirex	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin-keton	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Thiram	ND	ND	107.6	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benefin	910.0	ND	ND	ND	926.6	ND	ND	ND	87.0	ND	ND	ND
Fenitrothion	ND	70.0	ND	ND	10.03	ND	ND	ND	105.0	ND	ND	ND
Parathion	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Profenofos	1.73	ND	ND	ND	ND	ND	ND	ND	ND	12.8	103.6	ND
Benalxyl	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	790.0
Fenpropathrin	195.4	ND	40.0	6.61	274.8	ND	ND	ND	ND	13.83	ND	ND
Pyrazophos	ND	ND	ND	ND	ND	ND	104.0	ND	186.9	ND	ND	139.6

ND: Not detected under the limit of detection in our laboratory (1 ppb).
Summer Date: 20/6 - 21/9 (7-8-9 / 98) Autumn : 21/ 9 - 20/12 (10-11-12 / 98).
Winter :20/12 21/3 (1-2-3 / 99). Spring :21/3 - 20/6 (4-5-6 / 99).
Pyridaben, Alpha-methrin and Etefenprox were not detected under the limit of detection.

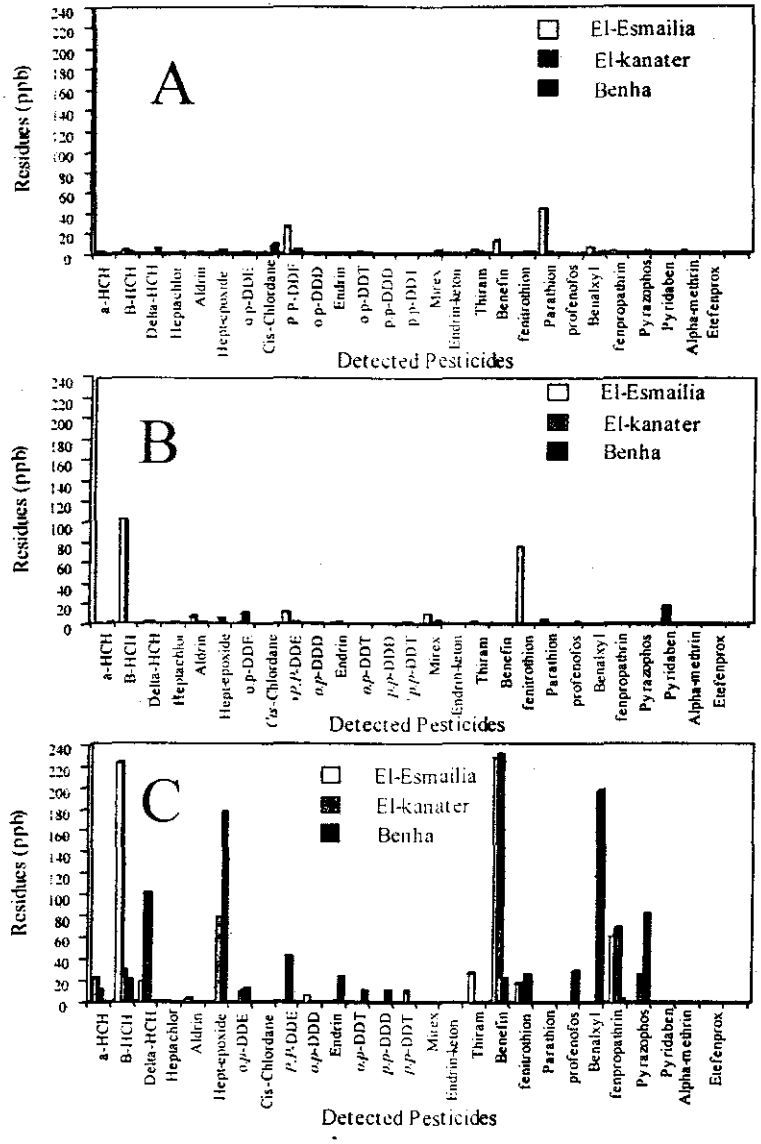

Fig. 1: Average levels of the detected pesticides residues (ppb) in samples of drainage water (A), ground water (B) and sediment samples (C) collected from different locations of Kalubia governorate during 1999/2000.

June, 2000, reached Delta-HCH (405.46 ppb), heptachlor-epoxide (313.60 ppb), *p,p'*-DDE (170.60 ppb), Benefin (926.60 ppb), fenpropathrin (274.80 ppb). No clear trend was noticed with season factor. Sediment from El-Sanafin was found containing high levels of heptachlor-epoxide(707.3 ppb), benalaxyl (790.0 ppb) and pyrazophos (326.50 ppb). In the same location, a total of moderate residues levels were recorded with β-HCH (83.30 ppb) *o,p'*-DDT (97.00 ppb), fenitrothion (105.00 ppb), profenofos (116.40 ppb). The other pesticides were found in negligible levels in some of analyzed samples.

The same trend of results was found by several investigators, i.e. **Iwata *et al* (1995).** In addition, considering the permissible levels and maximum residue limits of pesticides in water, it could be mentioned that such levels are available only for drinking water **(WHO, 1984)**, while not available for drainage and ground water. Accordingly, the high levels in the aforementioned Tables and finding should be considered for risk and hazards assessments.

However, the existence of the detected pesticide residues may be explained by the extensive use of pesticides of various groups, especially insecticides and fungicides in summer crops while the contrarily was occurred in winter. In addition, transfer and movement of pesticides from treated area to water resources are greatly responsible for such contamination with low levels of pesticides. Moreover, it is quite strange and interesting to detect mirex which was never imported and / or applied in Egypt for agriculture as well as health purposes. This may be attributed to the fact that mirex was derived from the conversion of some long lasting organochlorine pesticides remained from 1960's.

4- Metals in water

Data in Table (5) indicate different pattern of metals existence and their seasonal distribution in drainage water collected from the three selected sites at Kalubia governortae during 1999/2000. Nickel was not detected in El Kanater aud Benha sites in all seasons, while found in Spring samples only in El-esmailia (0.67 ppb). Cobalt was existed in Summer only of El-Esmailia drainage water (0.67 ppb) and Winter of both El-Kanater (5.00 ppb) and Benha (1.67 ppb). Chromium was found in samples collected during Summer and Winter of El-Esmailia (5.00 & 3.33 ppb), Spring of El-Kanater (1.00 ppb) and Autumn of Benha (1.00 ppb), while it was absent from the other seasons at these locations. Lead was found in Autumn samples only from El-esmailia (0.33 ppb) and Benha (7.33 ppb), while detected in El-Kanater during Summer, Autumn and Spring (0.33, 1.00 & 10.00 ppb, respectively). Manganese was found in samples collected during Summer and Spring of El-Esmailia (75.67 and 27.00 ppb), Summer, Winter and Autumn of El-Kanater (57.67, 13.00 & 43.67 ppb) and Winter and Autumn of Benha only (0.67 & 5.00 ppb, respectively). This data indicate the high contamination of drainage water by manganese in El-Esmailia and El-Kanater, showing the mean values of 18.92 and 28.58 ppb, respectively, compared with 1.41 ppb in Benha samples.

Data in the same Table indicate the negligible existence of the detected

Table 5. Detection of some elements (ppb) in the drainage water and ground water samples collected from different markets of Kalubia governorate during 7/1999-6/2000.

Location	Season	Metals (ppb)									
		Drainage water					Ground water				
		Mn	Pb	Co	Ni	Cr	Mn	Pb	Co	Ni	Cr
El-Esmailia (Sector-Elkhanka)	Summer	75.67+67.57	ND	0.67+1.15	ND	5.00+8.66	4.33+7.51	ND	ND	ND	ND
	Autumn	ND	0.33+0.58	ND	ND	ND	ND	1+1.73	ND	ND	4.33+7.51
	Winter	ND	ND	ND	ND	3.33+5.77	11.67+20.21	ND	ND	ND	ND
	Spring	27.00+46.77	ND	ND	0.67+1.15	ND	ND	2.33+4.04	1.67+2.89	ND	ND
	Average/year	18.92	0.08	0.16	0.16	2.08	4	0.83	0.42	0	1.083
El-Kanater (Sector-ElKanater)	Summer	57.67+57.01	0.33+0.58	ND	ND	ND	6.33+10.97	ND	0.67+1.15	ND	ND
	Autumn	43.67+75.63	1.00+1.73	ND	ND	ND	ND	4+6.93	ND	ND	ND
	Winter	13.00+22.52	ND	5.00+8.66	ND	ND	0.67+1.15	ND	2.00+3.46	ND	ND
	Spring	ND	10.00+17.32	ND	ND	1.00+1.73	ND	ND	2.33+4.04	ND	ND
	Average/year	28.58	2.83	1.25	0	0.25	1.75	1	1.92	0	0
El-Sanafin (Sector-Banha)	Summer	ND	ND	ND	ND	ND	43.33+75.06	ND	ND	ND	ND
	Autumn	5.00+8.66	7.33+12.70	ND	ND	1.00+1.73	ND	ND	ND	ND	ND
	Winter	0.67+1.15	ND	1.67+2.89	ND	ND	ND	ND	ND	4.33+7.51	ND
	Spring	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Average/year	1.41	1.83	0.42	0	0.25	10.83	0	0	1.08	0

ND: Not detected under the limit of detection in our laboratory (1 ppb)
Summer date: 20/6-21/9 (7-8-9/99), Autumn: 21/9-20/12 (10-11-12/99), Winter: 20/12-21/3 (1-2-3/2000) and Spring date: 21/3-20/6 (4-5-6/2000).

metals in the collected samples of ground water from the same selected sites. Nickel was detected in Benha during Winter (4.33 ppb), while chromium was found in Autumn at El-Esmailia only (4.33 ppb). The collected samples from the other sites and seasons were found free from these two elements. Lead was found in Autumn and Spring collection from El-Esmailia (1.00 & 2.33 ppb) and Autumn from El-Kanater (4.00 ppb). Cobalt was not detected in ground water from Benha at the four seasons, while detected in Spring only (1.67 ppb) in El-Esmailia water. El-Kanater water samples were found containing traces of these metals during Summer, Winter and Spring (0.67, 2.00 & 2.33 ppb). Manganese was found in great amounts in Summer samples from Benha (43.33 ppb), while disappeared in the other seasons. It was also detected during Summer and Winter, i.e. El-esmailia (4.33 & 11.67 ppb) and El-Kanater (6.33 & 0.67 ppb). Neglegting the odd values of Mn in Benha water, it could be concluded the safety of ground water in concern of metals content within the year 1999/2000.

In general, the detected metals in abnormal high concentration in water may be attributed to the aggregate amounts of these metals from different sources, i.e. pesticides, fertilizers and waste water from different industries.

ACKNOWLEDGMENT

Last but not least I would like to express our thanks and appreciation to Supreme Council of Universities for their continuos help and kind support during the course of the project.

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مجلة حوليات العلوم الزراعية، كلية الزراعة ، جامعة عين شمس ، القاهرة ، م(٤٨)، ع (١)، ٣٧٣-٣٨٧، ٢٠٠٣

التوزيع الموسمى لمتبقيات المبيدات والمعادن فى الأجسام المائية التى تم جمعها من مواقع مختلفة بمحافظة القليوبية، مصر

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يهدف هذا البحث إلى دراسة متبقيات مبيدات الآفات فى عينات من مياه المصارف والماء الأرضى والتربة الرسوبية والتى تم تجميعها من مواقع مختلفة خلال أربعة مواسم من محافظة القليوبية فى الفترة من يوليو ١٩٩٩ حتى يونيو ٢٠٠٠، وقد أظهرت النتائج وجود متبقيات من المبيدات الكلورينية العضوية بصورة واضحة ضمن ما تم الكشف عنه من مركبات. وقد تبين من النتائج المتحصل عليها أن كل من موقع وموسم أخذ العينة له دورا هاما فى طبيعة وجود المتبقيات وكميتها. فعلى سبيل المثال، وجد أن مياه ترعة الإسماعيلية تحتوى على متبقيات من المبيدد ات والتى وصلت متوسطاتها إلى ٠,٢٠٤ جزء فى البليون بينما باقى المركبات الكلورينية العضوية كانت بتركيزات أقل تراوحت ما بين ٠,٠٦ – ٣,٥٥ جزء فى البليون لمركبى الهبتاكلور و (β-HCH) على التوالى.وقد وجد أن متبقيات مركب البينيفين وصلت إلى ١٣,٢ جزء فى البليون بينما مركب الباراثيون كأحد المبيدات الفوسفورية العضوية وجدت متبقياته بتركيز ٤٤,٠٨ جزء فى البليون بالرغم من منع إستخدامه فى مصر منذ عام ١٩٩٠. كذلك، تم الكشف عن متبقيات من مركب الفينبروباثرين بتركيز ٢,٥١ جزء فى البليون يليه مركب ألفا-مثرين بتركيز ١,٩٣ جزء فى البليون بينما لم يمكن الكشف عن متبقيات مركب إس-فينفاليرات فى أى من العينات المختبرة الخاصة بمياه المصارف.

أما فى حالة عينات الماء الأرضى، فقد أشارت النتائج إلى وجود معدل عالى من مركب (α-HCH) فى العينات المأخوذة من ترعة الإسماعيلية فى فترة الخريف (٤٠٥,٣ جزء فى البليون)، ومركب الألدرين فى الربيع (٢٥,٩ جزء فى البليون) ومركب البارا-باراددإ فى الصيف (٤٤ جزء فى

البليون) ومركب الفينفاليرات فـــى الربيـــع (٣٠٠,٧ جزء فى البليون) والباراثيون فى الصيف (١٣,٣ جزء فى البليون). أما بالنسبة لعينات التربة الرسوبية، فقد تم الكشف عن كميات كبيرة من متبقيات المبيدات بها، حيث وجد أن العينات المأخوذة من الإسماعيلية تحتوى على المركبات التالية α-HCH (٤٧,٧ جـــزء فـــى البليـــون)، β-HCH (٨٩١,٦ جـــزء فـــى البليـــون) والبينيفين (٩١٠ جزء فى البليون) والفينبروباثرين (٢٤٢ جزء فى البليون) والثيرام (١٠٧,٦ جزء فى البليون). أما فيما يتعلق بالمعادن، فقد أظهرت النتائج عن وجود مستويات ضئيلة جداً من متبقيات المعادن خاصة الكوبلت والنيكل والكروم والرصاص ماعدا المنجنيـــز الـــذى وجد بكميـــات عاليـــة فـــى العينـــات المدروســـة.

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