

## MONITORING OF PESTICIDE RESIDUES IN SOME ENVIRONMENTAL ELEMENTS AT MENOFIA GOVERNORATE, EGYPT

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### ABSTRACT

The pesticide residues in drinking water, irrigation water, sediment and soil samples collected from three villages, i.e. Samadon, Ashmon and El-Ramla, located at Menofia Governorate, Egypt were monitored during the period of September 2002 to February 2003. The obtained results showed that the detected pesticide residues were varied in their types and structures in the investigated villages during period of study. It is clear that residues of organochlorine insecticide and the herbicide, atrazine, were the most frequently detected in both of drinking and irrigation water samples. According to the detected amounts and numbers of pesticide residues in all the collected samples, the soil samples contained higher pesticide residues (average of 0.07 ppm) > sediment (average of 0.05 ppm) > irrigation water (average of 0.04 ppm) > drinking water (0.01-0.02 ppm). Comparing between the selected sites, Samadon was the highest site contained pesticide residues more than Ashmon and El-Ramla.

**Keywords:** Monitoring, Pesticide residues, Menofia Governorate, Soil, Water, Sediment.

### INTRODUCTION

There are a considerable number of chemical pesticides persisting in water or soils, for more than few weeks or months, i.e. organochlorine and some of organophosphorus substances. Such persistence is affecting the quality of the environmental components through the different pathways (Matin *et al* 1998; Beernaerts *et al* 1999 and Ludvigsen and Lode 2001).

In Egypt, the quality of River Nile water is becoming of major importance. It

is evident that pollution is affecting the use of River Nile Egypt water, which in turn impose a growing concern about the water quality. This concern has highlighted the need to maintain and control the quality of water in the River Nile (Abu-Elamayem *et al* 1979 and Abd El-Razik *et al* 1988). Accordingly, several researchers have directed their attention to the environmental surveys through the monitoring processes of the environmental pollutants and contaminants, including the pesticides and the microorganisms

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(Osfor *et al* 1998; El-Zemaity; 1981 and Zidan *et al* 2003).

Considering the previous background, the aim of the present work is directed to monitoring, identification and the quantitative determination of various pesticide residues in water, sediment and soil samples collected from river Nile in several locations at Menofia, Egypt.

## MATERIAL AND METHODS

### 1. Investigated locations and collecting samples

Three locations at Menofia Governorate, Egypt, were investigated, i.e. (A) Ashmon, (B) Samadon and (C) El-Ramla. At each of these sites, three types of samples were collected, i.e. water, soil and sediment. In case of water, two types of water samples were collected, i.e. irrigation water and drinking water. For irrigation water samples, 108 samples of two liters each were taken. The sample was composted from grab samples at 0.5 m depths of the irrigation channel. Commercial sampler allows deep water samples to be taken. The drinking water samples were collected from the water purification stations located at the mentioned locations. Samples transportation and collection were made using clean glass containers.

For sediment samples, depending on the depth of the irrigation channel or body of water it may be possible to dig with a paddle or shovel to obtain a sample. Along grain their may suffice as a sampling device. For deep bodies of water, it may be necessary to drive for the 54 sample. For soil samples, it was taken 54 samples at 0.5 m depths of soil surface using a shovel to obtain the sample.

All the collected samples have been transported immediately to the laboratory to carry out the required analysis, including extraction, clean-up and quantitative determination of their content of pesticide residues.

### 2. Extraction and clean-up

For extraction procedure, the official method of analysis (AOAC, 1990), was followed. In such method, one liter of water sample was transferred to a 2 lit. separatory funnel then 100 ml of 15% methylene chloride in hexane was added. For soil and/or sediment samples a similar technique was followed using a closed glass bottle to extract the pesticide residues instead of the separatory funnel, while in the other steps, it was used a separatory funnel as mentioned above.

The extracted samples were then concentrated using a rotary evaporator and then directed to the clean-up procedure, which carried out by activated florisil and sodium anhydride column chromatography. The final eluents have been concentrated to about 5 ml for Gas Chromatography (GC) determination.

### 3. Standard calibration curves and determination of the studied pesticides

Thirty-one pesticides divided into eleven compounds as organochlorine substances, eight organophosphorus, six synthetic pyrethroids and six of different herbicides and fungicides. About 1.8 to 4.6 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 Gas-Chromatography GC (Shimadzu 12A), For the organochlo-

rine pesticides, eleven compounds were separated on GC column packed with 2% dexile on sumikasorb.Q at the following conditions: detector : ECD (Electron capture Detector); Inj./Det. Temp. (250°C); oven temp. prog. (180-250°C 2°C/min); carrier gas N<sub>2</sub> (1.5 kg/cm<sup>2</sup>); burner gas H<sub>2</sub> (1.0 kg/cm<sup>2</sup>); air (1.0 kg/cm<sup>2</sup>) and attenuation (10 x 5).

The organophosphorus pesticides were separated on GC column packed with 3% silicon OV-101 on chromosorb,Q at the following condition: detector: FID (Flame ionization Detector); Inj./Det.temp. (250°C); oven temp. prog. (180-250°C, 2°C/min); carrier gas N<sub>2</sub> (0.75kg/cm<sup>2</sup>); burner gas H<sub>2</sub> (1.0 kg/cm<sup>2</sup>); air (1.0 kg/cm<sup>2</sup>) and attenuation (10 x 5).

The remained pesticides, i.e. fungicides, herbicides and pyrethroids, were separated on GC column packed with 3% silicon ov-101 on chromosorb. Q at the following condition: detector: FID (Flame ionization Detector); Inj./Det. temp. (250°C); oven temp. Prog. (170-250°C, 5°C /min); carrier gas N<sub>2</sub> (1-0 kg / cm<sup>2</sup>); burner gas H<sub>2</sub> (1.0 kg / cm<sup>2</sup>); air (1.0 kg / cm<sup>2</sup>) and attenuation (10 x 5).

The retention times (R.T.), area under peak, the weight of studied compounds and separation factors (R) were presented in **Tables (1, 2 and 3)**. Amount recovered for monitored pesticides were ranged between (74.7-91.2%). The actual amount of detected pesticides were calculated using rate of recovery of each compound.

Table 1. Separation sheet of organochlorine pesticides on gas chromatography

Compound	Rt	Area/10000	Weight (µg)	Separation factor (R)
ALPHA-HCH	8.815	16.3620	0.5128	5.00
Lindane	10.672	24.4833	0.8197	5.2
Delta-HCH	12.488	22.2330	0.5498	3.12
Aldrin	13.595	35.1722	0.4018	2.74
Heptachlor	16.138	24.6131	0.7507	5.25
Dicofol	18.157	18.0706	0.7680	3.13
Chlorodane	22.987	61.6414	0.7164	7.66
Dieldrin	24.192	55.9682	0.2283	3.04
Endrin	27.577	34.2131	0.5207	10.74
<i>o,p</i> -DDT	31.713	42.2296	0.5524	9.09
<i>p,p'</i> -DDT	37.772	5.3510	0.4027	14.95

Table 2. Separation sheet of organophosphorus pesticides on gas chromatography

Compound	Rt	Area/10000	weight ( $\mu\text{g}$ )	Separation factor ( R)
Dimethoate	10.117	45.7951	0.8455	0.99
Fenitrothion	10.843	38.3986	0.9444	0.97
Malathion	11.617	97.1024	0.8659	1.01
Chlorpyrifos-ethyl	13.143	52.4258	0.8771	2.17
Pirimiphos ethyl	14.23	145.6316	0.7695	1.56
Isofenofos	17.287	53.3239	1.01376	4.04
Profenofos	21.015	38.8434	1.2144	3.95
Ethion	36.598	145.6121	1.0393	16.28

Table 3. Separation sheet of pyrethroides and others pesticides on gas chromatography.

Compound	Rt	Area/10000	Weight ( $\mu\text{g}$ )	Separation fac- tor ( R)
Thiram	5.922	6.2030	0.1978	9.44
Pencycuron	7.64	12.7479	0.2364	9.55
Atrazine	8.675	48.0521	0.8390	2.26
Butachlor	21.513	69.4763	0.7801	19.69
Diniconazole	25.622	63.0699	0.8223	6.04
Benalaxyl	28.093	92.9892	0.8866	3.40
Fenpropathrin	34.538	58.6583	0.5385	10.57
Phenothrin	36.623	119.0990	0.9589	3.29
Permethrin	42.803	69.2817	0.7991	8.29
Cypermethrin	48.712	45.5771	0.7948	8.74
Fenvalerate	55.8325	409.6045	0.9014	9.86
Deltamethrin	61.790	47.1196	0.7818	8.39

### 3. Statistical analyses

All of the obtained data were subjected to statistical analysis to calculate the mean of replicates and their corresponding standard deviation using the computer program, Sigma Plot for Win-

dows, version 2.0. In addition, the analysis of variance (ANOVA) was also performed to calculate the significance between the detected concentrations of the pesticides monitored using the STATIS-TICA Module Switcher program for Windows, version 4.5.

## RESULTS AND DISCUSSION

### 1. Drinking and irrigation water

Data concerning the detection of pesticide residues belonging to different functional groups in drinking and irrigation water samples collected from Samadon, Ashmon and EL-Ramla sites are tabulated in **Tables (4 and 5)**. According to the detected residues, it was found that the monitored pesticides included fenitrothion, malathion, ethion and chlorpyrifos-ethyl (as organophosphorus compounds),

$\gamma$ -HCH, aldrin, lindane, heptachlor, *o,p*-DDT, endrin, chlordane and *p,p'*-DDT (as organochlorine pesticides), phenothrin, diniconazole, fenpropathrin, permethrin and deltamethrin (as synthetic pyrethroids) and others, i.e. atrazine, butachlor and benalaxyl. In general, examination of the obtained results indicated the presence of all of the detected pesticide residues in drinking and irrigation water and sediment samples in some sites while they were absent in others. Such differences were found to be related with the location, site and date of sampling.

Table 4. Monitoring of some pesticide residues (ppm) in drinking water samples collected from Samadon, Ashmon and El-Ramla districts (Menofia Governorate) during 9/2002 - 2/2003.

Pesticide residues	Location	Detected concentration (ppm)					
		Sept.	Octob.	Nov.	Dec.	Jan.	Feb.
Alpha HCH		ND	ND	ND	0.013±0.002	ND	ND
Aldrin	Samadon	ND	ND	ND	ND	0.01±0.008	ND
Chlorpyrifos-ethyl		ND	ND	ND	ND	ND	0.01±0.005
Atrazine		ND	ND	ND	0.025±0.006	ND	ND
Lindane		ND	0.01±0.0026	ND	ND	ND	ND
Heptachlor	Ashmon	ND	ND	ND	ND	0.023±0.007	ND
Fenitrothion		ND	ND	0.011±0.001	ND	ND	ND
Lindane	El-Ramla	0.015±0.003	ND	ND	ND	ND	ND
Atrazine		ND	ND	ND	ND	0.01±0.005	ND

Each value represents the mean of three replicates  $\pm$  STD. Dev., ND: Not Detected under the limit of the detection (0.01ppm)

Table 5. Monitoring of some pesticide residues (ppm) in irrigation water samples collected from Samadon, Ashmon and El-Ramla districts (Menofia Governorate) during 9/2002 - 2/2003.

Pesticide residues	Location	Detected concentration (ppm)					
		Sept.	octob.	Nov.	Dec.	Jan.	Feb.
Alpha HCH	Samadon	ND	ND	0.016±0.006	ND	ND	ND
<i>o,p</i> -DDT		ND	ND	ND	ND	0.01±0.008	ND
<i>p,p'</i> -DDT		ND	ND	0.02±0.017	ND	ND	ND
Atrazine		ND	0.01±0.003	0.014±0.008	ND	ND	ND
Phenothrin		ND	ND	ND	0.042**±0.01	ND	ND
Deltamethrin	Ashmon	ND	0.035**±0.02	ND	ND	ND	ND
Lindane		ND	0.03±0.017	ND	ND	ND	ND
Aldrin		ND	ND	ND	ND	0.014±0.005	ND
Heptachlor		ND	ND	0.015±0.014	ND	ND	ND
<i>o,p</i> -DDT		ND	ND	ND	ND	0.041**±0.014	ND
Fenitrothion		ND	ND	0.013±0.011	ND	ND	ND
Chlorpyrifos-ethyl		ND	ND	ND	ND	ND	0.012±0.002
Ethion		ND	0.017±0.005	ND	ND	ND	ND
Atrazine		ND	ND	0.013±0.011	ND	ND	ND
Fenpropathrin		ND	ND	ND	ND	0.028±0.006	ND
Phenothrin	El-Ramla	ND	0.012±0.009	ND	ND	ND	ND
Profenofos		ND	0.026±0.013	ND	ND	ND	ND
Butachlor		ND	ND	ND	0.012±0.008	ND	ND
Diniconazole		ND	0.011±0.009	ND	ND	ND	ND

Each value represents the mean of three replicates  $\pm$  STD. Dev., ND: Not Detected under the limit of the detection (0.01ppm).

According to the ANOVA results, the marked differences are significant at ( $P < 0.05$ ) ( $F = 182.30$ ).

\*\* : Moderately significant, \*\*\* : Highly significant.

In terms of figures, samples of drinking water collected from Samadon contained  $\gamma$ -HCH, aldrin, malathion and atrazine in range of 0.01 –0.02 ppm. Ashmon samples contained lindane, heptachlor and fenitrothion in the same range whereas El-Ramla samples contained only two pesticide residues (lindane and atrazine in range of 0.01 ppm).

In case of irrigation water samples collected from the same mentioned sites, it was observed that such samples contained more number and higher concentration of pesticide residues. For example, Samadon samples, contained six pesticides, i.e.  $\alpha$ -HCH, *o,p*-DDT, *p,p'*-DDT, atrazine, phenothrin, and deltamethrin in range of 0.01-0.04 ppm. Ashmon samples

contained lindane, aldrin, heptachlor, *o,p*-DDT, fenitrothion, chlorpyrifos-ethyl, ethion, atrazine, fenpropathrin and phenothrin, in range of 0.01 to 0.04 ppm. In El-Ramla samples, it was found only three pesticide residues, i.e. profenofos, butachlor and diniconazole in range of 0.01-0.02 ppm.

As shown in the obtained results, it is clear that residues of organochlorine insecticide and the herbicide, atrazine, were the most frequently detected in both of drinking and irrigation water samples collected from the three experimental sites. No relation could be obtained between the presence of the detected pesticide residues and the date of the collecting samples. The only and clear observation is related to the level of the detected pesticides and the source of water. In other words, as would be expected, the levels of pesticide residues in irrigation water were higher than that detected in drinking water. Such data are indicated to the effect of the purification treatment of water (using chemicals, e.g. aluminum salts, ferrous salts, activated silica, activated carbon, organic matter, cellulose, chlorine and/or ozone), in the water stations which act as adsorbent agents and causing degradation of the pesticide residues which lead to reduce and/or remove some of the detected pesticide residues, (WHO, 1993).

Generally, the presence of the detected concentrations of pesticide residues in the water samples, especially those belongs to the organochlorine pesticides may be due to its high persistence rate in the environment or may be due to their misuse in some of the neighbor countries. In such case, it is expected to find these substances in spite of their banned in Egypt since 1970s, but accord-

ing to their physico-chemical characteristics (insolubility in water, their non-polarity and stability), they are highly persistent in the environment.

In case of the presence of the pyrethroid residues in water samples, this may be attributed to controlling some insect pests such as the cotton bollworms in the adjacent cotton fields. Such usage of pyrethroid is so tensed especially in the summer season where higher concentration than that recommended are used to overcome the photodecomposition of such agents. Similar explanation was described by *Iwata et al (1995)*. In the same way, it could explain the existence of the herbicide atrazine in the most of the analyzed water samples, which may be attributed to its misuse. In addition, its solubility in water may make it easy to be transported. However, the majority of samples contained pesticide residues below the permissible level published by FAO/WHO Committee (WHO, 1984). In addition, the obtained results are in harmony with that obtained by *Abdel Razik et al (1988)*, *Hassan et al (1996)* and *Abd-Allah and Gaber (2003)* which explain the factors leading to the contamination of the River Nile by pesticide residues. Such factors could be summarized as drift, transfer of the sprayed pesticides and/or movement of the persistent pesticides, which in turn can easily reach the non-target area such as resources of the irrigation water. The existence of pesticide residues in such resource represents a great responsibility for water contamination. Hence, the continuing of monitoring programs is considered as one of the most important requirements to manage the pesticide residues in River Nile. However, several researchers found almost the same detected pesticide residues

of this study, especially atrazine, and the organochlorine compounds and some of the organophosphorus in the surface water of several rivers at different countries such as Belgium (**Beernaert et al 1999**), USA (**Schilling and Thompson, 2000**) and Argentina (**Rovidatti et al 2001**).

## 2. Sediment samples

Data in **Tables (6)** show the detected pesticide residues in the sediment samples collected from the three selected sites, i.e. Samadon, Ashmon and El-Ramla located at Menofia Governorate.

According to the detected residues, it is clear that sediment samples collected from Samadon contained higher number of organochlorine pesticides than that obtained in the other sites. The detected compounds and their amounts were  $\alpha$ -HCH (0.051 ppm in October), heptachlor (0.01 and 0.035 ppm in November 2002 and February 2003, respectively), chlordane (0.019 ppm in September), endrin (0.011 ppm in October) and *p,p'*-DDT (0.017 ppm in December 2002). Only two organophosphorus compounds were detected, i.e. chlorpyrifos-ethyl (0.023 ppm in February 2003) and ethion (0.014 ppm in November 2002). The only detected pyrethroid was fenpropathrin (0.033 ppm in December 2002). Also, one herbicide, atrazine (0.086 and 0.025 ppm) was detected in November and December 2002.

In Ashmon sediment samples, the detected pesticide residues were organochlorine pesticides, i.e. lindane (0.08 and 0.016 ppm in December 2002 and January 2003, respectively), aldrin (0.018 ppm in October 2002) and two isomers of DDT (*p,p'*-DDT and *o,p*-DDT at 0.014

and 0.047 ppm in September 2002 and January 2003, respectively). Also, butachlor at 0.051 ppm in November and atrazine at 0.027 ppm in December 2002 were recorded.

In case of El-Ramla sediment samples, the majority of the detected pesticide residues were found in samples collected in December 2003. In term of figures, the detected organochlorine pesticides were  $\alpha$ -HCH, heptachlor and endrin at levels of 0.01, 0.131, 0.021 ppm, while *o,p*-DDT was detected at 0.019 ppm in samples collected in January 2003. In addition, only one organophosphorus compound was found, i.e. chlorpyrifos-ethyl and one pyrethroid, i.e. permethrin in December 2002 at 0.08 and 0.018 ppm, respectively. Also, the herbicide atrazine was found in sediment samples collected from El-Ramla in January 2003 at 0.077 ppm.

Generally, the obtained results indicate that sediment samples collected from Samadon site, contained more pesticide residues especially those belongs to the organochlorine compounds (five pesticides) and organophosphates (two compounds) than the other two sites, i.e. Ashmon and El-Ramla. In addition, the most frequently recorded compound was atrazine which showed higher amounts reaching 0.086 and 0.025 ppm in Samadon samples, 0.027 ppm in Ashmon and 0.077 ppm in El-Ramla samples.

However, the detected pesticide residues in the mentioned sediment samples may be attributed to the intensive use of atrazine and organophosphorus and some of pyrethroids especially in November and December. In addition, it is clear that the sediment samples are rich in their content of organic matter, a factors that might increase the adsorption rate of the



organochlorine substances and hence their persistence in the sediment. For example, the adsorption coefficient ( $K_{oc}$ ) for DDT was found to be 243.000. Such high value may be due to the physico-chemical characteristics of the organochlorine pesticides, which make them highly persistent, comparing to the other groups of pesticides (**Hamaker, 1975 and Gfrerer *et al* 2002**).

The presence of these compounds is expected in spite of that the majority of such substances were banned from Egypt since 1972. Similar findings were reported by other investigators **Abu-El-Amayem *et al* (1979); Abdel Razik *et al* (1991); Osfor *et al* (1998); Gfrerer *et al* (2003) and Zidan *et al* (2003)** who reported and interpreted the presence of the organochlorine pesticide residues in sediment samples collected from different sites including the River Nile and El Manzala lake.

### 3. Soil samples

Data in **Tables (7)** show the detected pesticide residues in the soil samples collected from the same mentioned three selected sites, namely Samadon, Ashmon and El-Ramla. According to the detected residues, it is clear that soil samples collected from Samadon contained higher number of organochlorine pesticides. The detected compounds and their amounts were  $\alpha$ -HCH (0.037 ppm in January), aldrin (0.01, 0.03 and 0.046 in September, December 2002 and January 2003, respectively) dicofol (0.02 and 0.035 ppm in November and December 2002, respectively), *o,p*-DDT (0.012 in November 2002), *p,p'*-DDT (0.019 and 0.032 ppm in September 2002 and January 2003, respectively).

Four organophosphorus compounds were detected, i.e. fenitrothion (0.036 ppm in November 2002) chlorpyrifos-ethyl (0.051 and 0.062 ppm in December 2002 and January 2003, respectively), primiphos-ethyl (0.017 ppm in October 2002) and ethion (0.011 and 0.025 ppm in October and December 2002, respectively). Two pyrethroids were also found in these samples, i.e. fenpropathrin (0.073 ppm in September 2002) and phenothrin (0.01 ppm in February 2003). Also, it was detected one herbicide, atrazine (0.038 ppm in January 2003).

In soil samples of Ashmon, the detected pesticide residues were organochlorine pesticides, i.e. lindane (0.01 and 0.092 ppm in December 2002 and February 2003, respectively), aldrin (0.046 ppm in October November 2002) heptachlor (0.01, 0.041 and 0.021 ppm in September, December 2002 and January 2003, respectively) and *p,p'*-DDT (0.097, 0.084 and 0.033 ppm in September, October 2002 and February 2003, respectively). Also, three organophosphorus compounds were detected, i.e. dimethoate (0.061 ppm in October 2002), fenitrothion (0.033 and 0.024 ppm in November and December 2002, respectively) and profenofos (0.031 ppm in December 2002). Two pyrethroids were found, i.e. permethrin (0.033 ppm in January 2003) and cypermethrin (0.018 and 0.01 ppm) in September and October 2002. In addition, the fungicide thiram and the herbicide butachlor at 0.039 and 0.030 ppm in September and November 2002. were present.

In case of El-Ramla soil samples, only two organochlorine pesticides were detected, i.e. dicofol and *o,p*-DDT (0.021 and 0.031 ppm in November and December 2002, respectively).



Only two organophosphorus compounds were found, i.e. malathion (0.081 ppm in November 2002) and profenofos (0.021 and 0.017 ppm in December 2002 and January 2003, respectively). In addition, only one pyrethroid was found, i.e. fenprothrin (0.015 ppm in January 2003). Also, atrazine was detected at concentrations of 0.051 and 0.019 ppm in soil samples collected in October and November 2002, respectively, while butachlor was detected in samples collected in December 2002 at concentration of 0.06 ppm.

Generally, the obtained results indicate that soil samples collected from Samadon site, contained more pesticide residues especially those belonging to the organochlorine compounds (five pesticides) and organophosphorus agents (four compounds) than the two other sites, i.e. Ashmon and El-Ramla. In addition, higher concentrations of chlorpyrifos-ethyl (0.051 and 0.062 ppm) and fenprothrin (0.073 ppm) were found in samples collected from Samadon site, while in Ashmon samples, the higher detected concentration were 0.092 ppm (lindane) and *p,p*-DDT (0.097 and 0.084 ppm). In El-Ramla site, the highest detected concentration was for malathion (0.081 ppm).

However, the detected pesticide residues in the mentioned soil samples may be attributed to the intensive use of organophosphorus, pyrethroid and atrazine pesticides especially in the period of October 2002 to January 2003. In addition, in such periods, the irrigation water may be one of several factors responsible of the transfer and movement of pesticide residues from other treated areas to water resources. Moreover, the presence of such pesticides in soil samples may be due to their high persistence. It is evident that a

pesticide molecule will be adsorbed to soil as soon as it comes in to contact with the soil surface. Hence, the adsorption versus desorption is depending on the leaching and the adsorption coefficient ( $K_{co}$ ) of each pesticide and also depending on the energy of the surfaces (**Haque, 1975**).

It is clear that the mentioned soil samples are rich in their content of organic matter, a factor that may increase the adsorption coefficient of the organochlorine compounds (243.000 for DDT) and hence their persistence in the soil. Moreover, there are additional factors that may affect the sorption of pesticide molecule between the adsorbate and adsorbant which are summarized in size, shape, configuration and total area of the molecule or particle, acidity or basicity of the molecule or surface, water solubility, charge distribution, polarity, reactivity in order to undergo hydrogen bonding, chelation, conjugation, temperature, concentration and weathering (**Kenaga, 1975**).

According to the mentioned factors, the presence of these compounds is expected. In general, our finding are in agreement with those obtained by **Askar (1980)**; **Cogger & MacConnell (1991)**; **Iwta et al (1995)**; **Osfor et al (1998)** and **Zidan et al (2003)** who reported the presence of the organochlorine pesticide residues in soil samples collected from different sites including the River Nile.

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**رصد متبقيات المبيدات فى بعض العناصر البيئية بمحافظة المنوفية، مصر**

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والرى. وتبعاً لكمية وعدد المتبقيات التى تم الكشف عنها بجميع العينات، فإن عينات التربة قد إحتوت على الكمية الأكبر من المتبقيات (0.07 جزء فى المليون) تلاها فى ذلك الرسابة (0.05 جزء فى المليون) ثم مياه الرى (0.04 جزء فى المليون) ثم مياه الشرب (0.01-0.02 جزء فى المليون). كما دلت النتائج أيضاً على إختلاف فى مستويات المتبقيات فيما بين القرى الثلاثة حيث إتضح أنها كانت أعلى فى قرية سم ادون عنها فى قرية أشمون والرملة.

تم رصد متبقيات المبيدات فى مياه الشرب والرى، الرسابة والتربة بالعينات المجمعّة من ثلاث قرى هى سمدون، أشمون، و الرملة بمحافظة المنوفية، مصر خلال الفترة من سبتمبر 2002-فبراير 2003. ودلت النتائج المتحصل عليها أن متبقيات المبيدات التى تم الكشف عنها قد إختلفت بنوعياتها وتركيبها البنائى فيما بين القرى الثلاثة خلال فترة الدراسة. وكانت المبيدات الحشرية الكلورينية والمبيد العشبي أترازين من أكثر المبيدات التى تكرر الكشف عنها فى كل من عينات مياه الشرب

**الكلمات الدالة :** رصد-متبقيات المبيدات-محافظة المنوفية-التربة-الماء-الرسابة.

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