

EVALUATION OF PESTICIDE RESIDUES IN WATER AND FISH TISSUE SAMPLES COLLECTED FROM THREE LOCATIONS AT SHARKIA GOVERNORATE, EGYPT

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Abstract

Pesticide residues in fish water pond, water resource (inlet) and drainage water (outlet) samples collected from three different locations Diarb-Negm, Abo-Hamad and Hehya at Sharkia governorate were monitored during July, August, September and October 2005.

In the drainage water samples, the dominance of organophosphorous such as monocrotofos, chlorpyrifos-methyl and profenfos was noticed in Hehya, Diarb-Negm and Abo-Hamad respectively. While the high level of abamectin was detected in the drainage water (outlet) samples collected from Hahya, Diarb-Negm and Abo-Hamad. But the high level of pesticides was detected in the fish gills. On the contrary the fentrothion, carbofuran and acetampride were not detected in fish tissues while, acetampride, dicofoi, fentrothion and carbofuran were not detected in water samples collected from Hahya but acetampride, fentrothion and carbofuran were not detected in water samples collected from Abo-Hamad, while, carbofuran was not detected in different water samples (outlet, inlet and fish water pond). Water samples collected from Diarb-Negm at Sharkia governorate.

INTRODUCTION

The pollution of soils and water resources by pesticides, detergents, solvents and a variety of industrial organics is a pressing world wide problem. The indiscriminate use of pesticides in agriculture can cause environmental problems especially to aquatic system by altering the quality of water and so affecting the physiology and biochemistry of non target organism such as fish, (Shakoori, *et al* 1996). Several publications revealed the existence of pesticide residues mainly organochlorine compounds in various aquatic ecosystems components, (Badawy 1998), El-Kabbany *et al.*, 2000, Gupta *et al.*, 2002 and Radwan and Atalla (2005).

The objectives of the present work were to study and evaluate some of the pesticides residues in fish water pond, water resource (inlet) and drainage water (outlet) samples collected from three different locations Diarb-Negm, Abo-Hamad and Hehya at Sharkia governorate were monitored during July, August, September and October 2005. On October 2005, the pesticides residues were evaluated in muscles,

gills and brain of Tilapia (*Oreochromis niloticus*) grown in drainage water collected from three different locations at Sharkia governorate in Egypt during 2005.

MATERIALS AND METHODS

Fish samples:

Twenty five Tilapia (*Oreochromis niloticus*) growing in drainage water were collected from each location (Diarb-Negm, Abo-Hamad and Hehya) at Sharkia governorate.

Water samples:

Drainage water, water resources and fish water pond samples of two liters were collected from Diarb-Negm, Abo-Hamad and Hehya locations during July, August, September and October 2005.

Extraction and clean up:

The extraction procedure adopted by Mann (1981) was followed with water samples while samples of fish tissues were extracted and clean up according to the official methods of analysis Anonymous (1990).

RESULT AND DISCUSSION

Data in tables (1, 2 and 3) indicate the presence of negligible residues of pesticides in fish water pond, water resources and drainage water samples from Diarb-Negm, Abo-Hamad and Hehya on July 2005 respectively. The average of the detected pesticide residues in these locations were as follows Diarb-Negm water samples contained methomyl (0.4591, 0.1521 and 0.6912 ppm), monocrotofos (0.2819, ND and 0.3005 ppm), malathion (0.1643, 0.1521 and 0.4456 ppm), chlorpyrifos-methyl (0.6993, ND and 0.8341 ppm), profenfos (0.4051, ND and 0.6133 ppm), scor (0.044, ND and 0.1107 ppm), thiobencarb (0.0677, ND and 0.0803 ppm), acetampride (0.4631, 0.1521 and 0.8148 ppm), abamectin (0.3261, 0.0195 and 0.6341 ppm), glyphosate (0.1761, 0.0187 and 0.2576 ppm), dicofof (0.3667, 0.0917 and 0.7231 ppm) and fentrothion (0.3660, 0.1211 and 0.4312 ppm) in fish water pond ,water resources and drainage water respectively on July 2005. While the detected pesticides residues in Abo-Hamad, water samples contained methomyl (0.0400, ND and 0.0482 ppm), monocrotofos (0.0410, ND and 0.0588 ppm), malathion (0.0910, ND and 0.1003 ppm), chlorpyrifos-ethyl (0.0173, ND and 0.1303 ppm), chlorpyrifos-methyl (0.0195, ND and 0.1051 ppm), profenfos (0.6141, ND and 0.4146 ppm), scor (0.0305, ND and 0.0359 ppm), thiobencarb (0.0556, ND and 0.4566 ppm), abamectin (0.0737, ND and 0.5103 ppm), glyphosate (0.0141, ND and 0.0167 ppm) and dicofof (0.0440, 0,0017 and 0.0465 ppm) in fish water pond ,water resources and drainage water respectively on July 2005, and the detected pesticides residues in Hehya water samples contained methomyl (0.0651, ND and 0.0738 ppm), monocrotofos (0.6665,

ND and 0.7443 ppm), malathion (0.0133, ND and 0.0301 ppm), chlorpyrifos-ethyl (0.0016, ND and 0.4356 ppm), chlorpyrifos-methyl (0.0363, ND and 0.5344 ppm), profenfos (0.0183, ND and 0.0803 ppm), scor (0.0104, ND and 0.0139 ppm), thiobencarb (0.0871, ND and 0.0916 ppm), abamectin (0.3733, ND and 0.6756 ppm) and glyphosate (0.3503, ND and 0.5677 ppm) in fish water pond, water resources and drainage water respectively.

The detected pesticides residues on August 2005 in Diarb-Negm water samples contained methomyl (0.5426, 0.1519 and 0.6611 ppm), monocrotofos (0.2171, 0.0131 and 0.3602 ppm), malathion (0.2686, 0.0206 and 0.2809 ppm), chlorpyrifos-methyl (0.6512, ND and 1.1031 ppm), profenfos (0.4161, 0.0131 and 0.7303 ppm), scor (0.0456, 0.0091 and 0.0703 ppm), thiobencarb (0.0841, ND and 0.0886 ppm), acetampride (1.0062, 0.0936 and 1.2051 ppm), abamectin (0.6653, 0.0193 and 0.6835 ppm), glyphosate (0.2813, 0.0791 and 0.3347 ppm), dicofol (0.3969, 0.1103 and 0.8811 ppm) and fentrothion (0.1190, 0.5354 and 0.5693 ppm) in fish water pond, water resources and drainage water respectively. While the detected pesticides residues in Abo-Hamad, water samples contained methomyl (0.0427, ND and 0.0443 ppm), monocrotofos (0.0313, ND and 0.0756 ppm), malathion (0.0991, ND and 0.1383 ppm), chlorpyrifos-ethyl (0.0104, ND and 0.1706 ppm), chlorpyrifos-methyl (0.0197, ND and 0.1079 ppm), profenfos (0.1191, ND and 0.5465 ppm), scor (0.0529, ND and 0.0467 ppm), thiobencarb (0.0308, 0.0116 and 0.6630 ppm), abamectin (0.0634, ND and 0.4106 ppm), glyphosate (0.0436, ND and 0.0527 ppm) and dicofol (0.1022, 0.0023 and 0.0488 ppm) in fish water pond, water resources and drainage water respectively on August 2005, but the detected pesticides residues in Hehya water samples contained methomyl (0.0703, ND and 0.0884 ppm), monocrotofos (0.8317, ND and 0.9838 ppm), malathion (0.0113, ND and 0.0674 ppm), chlorpyrifos-ethyl (0.0336, ND and 0.5536 ppm), chlorpyrifos-methyl (0.0687, ND and 0.5913 ppm), profenfos (0.0201, ND and 0.0926 ppm), scor (0.0116, ND and 0.0176 ppm), thiobencarb (0.0731, ND and 0.1053 ppm), abamectin (0.5477, ND and 0.7936 ppm) and glyphosate (0.4110, ND and 0.6377 ppm) in fish water pond, water resources and drainage water respectively on August 2005.

The detected pesticides residues in Diarb-Negm water samples on September 2005 contained methomyl (0.7022, 0.1392 and 0.7753 ppm), monocrotofos (0.3940, 0.0163 and 0.4351 ppm), malathion (0.1883, 0.0103 and 0.2377 ppm), chlorpyrifos-ethyl (0.1662, 0.0053 and 0.3871 ppm), chlorpyrifos-methyl (0.7614, ND and 1.0913 ppm), profenfos (0.4136, 0.0577 and 0.8055 ppm), scor (0.0633, 0.0073 and 0.8158 ppm), thiobencarb (0.7889, ND and 0.9931 ppm), acetampride (0.2859, 0.0331 and 0.3479 ppm), abamectin (0.3365, 0.0123 and 0.6291 ppm), glyphosate (0.2362,

0.1536 and 0.3961 ppm), dicofol (0.4743, 0.1193 and 1.0197 ppm) and fentrothion (0.5693, 0.1362 and 0.6756 ppm) in fish water pond ,water resources and drainage water respectively while the detected pesticides residues in Abo-Hamad water samples contained methomyl (0.0428, ND and 0.0583 ppm), monocrotofos (0.0351, ND and 0.0870 ppm), malathion (0.1281, ND and 0.1604 ppm), chlorpyrifos-ethyl (0.0108, ND and 0.2748 ppm), chlorpyrifos-methyl (0.0188, ND and 0.1953 ppm), profenfos (0.2710, ND and 0.6563 ppm), scor (0.0571, ND and 0.0472 ppm), thiobencarb (0.0336, ND and 0.6539 ppm), abamectin (0.0657, ND and 0.5472 ppm), glyphosate (ND,ND and 0.0405 ppm) and dicofol (0.0477, 0.0107 and 0.0483 ppm) in fish water pond ,water resources and drainage water respectively. But the detected pesticides residues in Hehya water samples contained methomyl (0.0786, ND and 0.0896 ppm), monocrotofos (0.6683, ND and 0.9803 ppm), malathion (0.0103, ND and 0.0786 ppm), chlorpyrifos-ethyl (0.0406, ND and 0.7667 ppm), chlorpyrifos-methyl (0.0803, ND and 0.6008 ppm), profenfos (0.0366,ND and 0.1055 ppm), scor (0.0152, ND and 0.0197 ppm), thiobencarb (0.0821, ND and 0.2313 ppm), abamectin (0.6773, ND and 0.9010 ppm) and glyphosate (0.5830, ND and 0.6706 ppm) in fish water pond ,water resources and drainage water respectively.

The detected pesticides residues in these locations were as follows Diarb-Negm water samples on October 2005 contained methomyl (0.6941, 0.1694 and 0.8773 ppm), monocrotofos (0.6153, 0.0093 and 0.5111 ppm), malathion (0.1588, 0.0115 and 0.3652 ppm), chlorpyrifos-ethyl (0.2115, 0.0069 and 0.4356 ppm), chlorpyrifos-methyl (0.7761, ND and 1.2120 ppm), profenfos (0.3571, 0.0107 and 1.0221 ppm), scor (0.0916, 0.0116 and 1.0133 ppm), thiobencarb (0.7791, ND and 0.9365 ppm), acetampride (0.3361, 0.0461 and 0.5280 ppm), abamectin (0.7833, 0.0959 and 0.9686 ppm), glyphosate (0.4099, 0.1163 and 0.4571 ppm), dicofol (0.6963, 0.1216 and 1.2313 ppm) and fentrothion (0.7020, 0.1341 and 0.7719 ppm) in fish water pond, water resources and drainage water respectively. The detected pesticides residues in Abo-Hamad water samples contained methomyl (0.0636, ND and 0.0771 ppm), monocrotofos (0.0414, ND and 0.0971 ppm), malathion (0.1368, ND and 0.1935 ppm), chlorpyrifos-ethyl (0.0166, ND and 0.2400 ppm), chlorpyrifos-methyl (0.0241, ND and 0.3103 ppm), profenfos (0.3119, ND and 0.6133 ppm), sco: (0.0418, ND and 0.0632 ppm), thiobencarb (0.0619, ND and 0.7484 ppm), abamectin (0.1316, ND and 0.6933 ppm), glyphosate (ND, ND and 0.0332 ppm) and dicofol (0.0696, 0.0139 and 0.1141 ppm) in fish water pond ,water resources and drainage water respectively. While the detected pesticides residues in Hehya water samples contained methomyl (0.0854, ND and 0.1435 ppm), monocrotofos (0.8436, ND and 1.1198 ppm), malathion (0.0336, ND and 0.8376 ppm), chlorpyrifos-ethyl (0.2493, ND and

0.8863 ppm), chlorpyrifos-methyl (0.1356, ND and 0.6131 ppm), profenfos (0.0435, ND and 0.1163 ppm), scor (0.0124, ND and 0.1006 ppm), thiobencarb (0.0878, ND and 0.3373 ppm), abamectin (0.7810, ND and 0.9681 ppm) and glyphosate (0.4996, ND and 0.7900 ppm) in fish water pond ,water resources and drainage water respectively on October 2005.

Pesticides residue in fish tissues:

Data in table (4) showed the pesticide residues in muscles, gills and brain of fish grown in drainage water collected from Diarb-Negm, Abo-Hamad and Hehya at Sharkia governorate in Egypt during year 2005.

Data concerning the existence of detected pesticides in Diarb-Negm fish muscle samples were (0.2046, 0.1177, 0.2935, 0.2877, 0.4444, 0.3836, 0.3169 and 0.1113 $\mu\text{g} / 100 \text{ g}$ muscle of fish) of methomyl, monocrotofos, malathion, chlorpyrifos-ethyl, chlorpyrifos-methyl, profenfos, thiobencarb and abamectin respectively in fish muscles samples collected from Diarb-Negm while the pesticides residues in fish muscles samples collected from Abo-Hamad were (0.3851, 0.2275, 0.5525, 0.5686, 0.8829, 0.7584, 0.0399, 0.5189, 0.0511 and 0.5373 $\mu\text{g} / 100 \text{ g}$ muscle of fish) of methomyl, monocrotofos, malathion, chlorpyrifos-ethyl, chlorpyrifos-methyl, profenfos, scor, thiobencarb, abamectin and dicofol respectively, and the residues of pesticides in fish muscles samples collected from Hehya were (0.3035, 0.2535, 0.3621, 0.5065, 0.5362, 0.5631, 0.1352, 0.4231, 0.0776 and 0.0852 $\mu\text{g} / 100 \text{ g}$ muscle of fish) of methomyl, monocrotofos, malathion, chlorpyrifos-ethyl, chlorpyrifos-methyl, profenfos, scor, abamectin and glyphosate respectively.

The pesticides residues analysis in gill of fish samples collected from Diarb-Negm were (0.3848, 0.2213, 0.5520, 0.8822, 0.1566, 0.2842, 0.1072, 0.1753 and 0.3208 $\mu\text{g} / 100 \text{ g}$ gill of fish) of methomyl, monocrotofos, malathion, chlorpyrifos-methyl, profenfos, scor, thiobencarb, abamectin and dicofol respectively, and the pesticides residues analysis in gill of fish samples collected from Abo-Hamad were (0.2204, 0.1267, 0.3161, 0.2821, 0.5051, 0.3765, 0.0518, 0.2576, 0.0823 and 0.5298 $\mu\text{g} / 100 \text{ g}$ gill of fish) of methomyl, monocrotofos, malathion, chlorpyrifos-ethyl, chlorpyrifos-methyl, profenfos, scor, thiobencarb, abamectin and dicofol respectively. While, the pesticides residues analysis in gill of fish samples collected from Hehya were (0.2545, 0.0961, 0.4235, 0.1931, 0.4975, 0.1853, 0.0258, 0.1652, 0.1262 and 0.03161 $\mu\text{g} / 100 \text{ g}$ gill of fish) of methomyl, monocrotofos, malathion, chlorpyrifos-ethyl, chlorpyrifos-methyl, profenfos, scor, thiobencarb, abamectin and glyphosate respectively.

The pesticides residues analysis in brain of fish samples collected from Diarb-Negm were (0.3542, 0.2037, 0.5080, 0.2896, 0.8119, 0.3863, 0.0881 and 0.2643 $\mu\text{g} /$

100 g brain of fish) of methomyl, monocrotofos, malathion, chlorpyrifos-ethyl, chlorpyrifos-methyl, profenfos, scor and thiobencarb respectively. The residues of pesticides in brain of fish samples collected from Abo-Hamad were (0.4083, 0.2348, 0.5857, 0.3142, 0.9359, 0.4191, 0.0296, 0.2861 and 0.2523 μg / 100 g brain of fish) of methomyl, monocrotofos, malathion, chlorpyrifos-ethyl, chlorpyrifos-methyl, profenfos, scor, thiobencarb and dicofol respectively. While the pesticides residues analysis in brain of fish samples collected from Hehya were (0.3961, 0.2748, 0.0613, 0.2254, 0.5463, 0.2737, 0.0166, 0.2153, 0.0083 and 0.0031 μg / 100 g brain of fish) of methomyl, monocrotofos, malathion, chlorpyrifos-ethyl, chlorpyrifos-methyl, profenfos, scor, thiobencarb, abamectin and glyphosate respectively.

These results are in agreement with those obtained by Hassan *et al.* (1996) and Radwan and Atalla (2005) who monitored the pesticide residues in drainage water samples collected from different governorate (Sharkia, Menofya, Giza and Kalyobia) during 2003 in Egypt. The samples contain appreciable amounts of organochlorine residues. The same trend was found by several investigators Iwata *et al.* (1995) who considered the maximum residues level of pesticides in water. It could be mentioned that such levels are available only for drinking water (WHO, 1984), while there is no available data for drainage water.

Table 1. Monitoring of some pesticide residues (ppm) in fish pond, inlet water and outlet (drainage) water samples collected from Diarb-Negm at Sharkia governorate

Sample source Pesticide	July			August			September			October		
	Pond	Inlet	Outlet	Pond	Inlet	Outlet	Pond	Inlet	Outlet	Pond	Inlet	Outlet
Methomyl	0.459	0.152	0.691	0.543	0.152	0.661	0.702	0.139	0.775	0.694	0.169	0.877
Monocrotofos	0.282	ND	0.301	0.217	0.013	0.36	0.394	0.016	0.435	0.615	0.009	0.511
Malathion	0.164	0.011	0.446	0.269	0.021	0.281	0.188	0.01	0.238	0.159	0.012	0.365
Chlorpyrfos-ethyl	ND	ND	ND	ND	ND	ND	0.166	0.005	0.387	0.212	0.007	0.436
Chlorpyrfos-methy	0.699	ND	0.834	0.651	ND	1.103	0.761	ND	1.091	0.776	ND	1.212
Profenfos	0.405	ND	0.613	0.416	0.013	0.73	0.414	0.058	0.806	0.357	0.011	1.022
Scor	0.044	ND	0.111	0.046	0.009	0.07	0.063	0.007	0.816	0.092	0.012	1.013
Thiobencarb	0.068	ND	0.08	0.084	ND	0.089	0.789	ND	0.993	0.779	ND	0.937
Acetampride	0.463	0.152	0.815	1.006	0.094	1.205	0.286	0.033	0.348	0.336	0.046	0.528
Abamectin	0.326	0.02	0.634	0.665	0.019	0.084	0.337	0.012	0.629	0.783	0.096	0.969
Glyphosate	0.176	0.019	0.258	0.281	0.079	0.335	0.236	0.154	0.396	0.41	0.116	0.457
Dicofol	0.367	0.092	0.723	0.397	0.11	0.881	0.474	0.12	1.02	0.696	0.122	1.231
Fentrothion	0.366	0.121	0.431	0.471	0.119	0.535	0.569	0.136	0.676	0.702	0.134	0.772
Carbofuran	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table 2. Monitoring of some pesticide residues (ppm) in fish pond, inlet water and outlet (drainage) water samples collected from Abo-Hamad at Sharkia governorate

Sample source Pesticide	July			August			September			October		
	Pond	Inlet	Outlet	Pond	Inlet	Outlet	Pond	Inlet	Outlet	Pond	Inlet	Outlet
Methomyl	0.04	ND	0.048	0.043	ND	0.044	0.043	ND	0.058	0.064	ND	0.077
Monocrotofos	0.041	ND	0.059	0.031	ND	0.076	0.035	ND	0.087	0.041	ND	0.097
Malathion	0.091	ND	0.1	0.099	ND	0.138	0.128	ND	0.16	0.137	ND	0.194
Chlorpyrfos-ethyl	0.017	ND	0.13	0.01	ND	0.171	0.011	ND	0.275	0.017	ND	0.24
Chlorpyrfos-methy	0.02	ND	0.105	0.02	ND	0.108	0.019	ND	0.195	0.024	ND	0.31
Profenfos	0.614	ND	0.415	0.119	ND	0.547	0.271	ND	0.656	0.312	ND	0.613
Scor	0.031	ND	0.036	0.053	ND	0.047	0.057	ND	0.047	0.042	ND	0.063
Thiobencarb	0.056	ND	0.457	0.031	0.012	0.663	0.034	ND	0.654	0.062	ND	0.748
Acetampride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Abamectin	0.074	ND	0.51	0.063	ND	0.411	0.066	ND	0.547	0.132	ND	0.693
Glyphosate	0.014	0.016	0.017	0.044	ND	0.053	ND	ND	0.041	ND	ND	0.033
Dicofol	0.044	0.002	0.047	0.102	0.002	0.049	0.048	0.011	0.048	0.07	0.014	0.114
Fentrothion	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbofuran	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table 3. Monitoring of some pesticide residues (ppm) in fish pond, inlet water and outlet (drainage) water samples collected from Hehya at Sharkia governorate

Sample source Pesticide	July			August			September			October		
	Pond	Inlet	Outlet	Pond	Inlet	Outlet	Pond	Inlet	Outlet	Pond	Inlet	Outlet
Methomyl	0.0651	ND	0.0738	0.0703	ND	0.0884	0.0786	ND	0.0896	0.0854	ND	0.1435
Monocrotofos	0.6665	ND	0.7443	0.8317	ND	0.9838	0.6683	ND	0.9803	0.8436	ND	1.1198
Malathion	0.0133	ND	0.0301	0.0193	ND	0.0674	0.0103	ND	0.0786	0.0336	ND	0.8376
Chlorpyrfos-ethyl	0.0116	ND	0.4356	0.0336	ND	0.5536	0.0406	ND	0.7667	0.2493	ND	0.8863
Chlorpyrfos-methy	0.0363	ND	0.5344	0.0687	ND	0.5913	0.0803	ND	0.6008	0.1356	ND	0.6131
Profenfos	0.0183	ND	0.0803	0.0201	ND	0.0926	0.0366	ND	0.1055	0.0435	ND	0.1163
Scor	0.0104	ND	0.0139	0.0116	ND	0.0176	0.0152	ND	0.0197	0.0124	ND	0.1006
Thiobencarb	0.0871	ND	0.0916	0.0731	ND	0.1053	0.0821	ND	0.2313	0.0878	ND	0.3373
Acetampride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Abamectin	0.3733	ND	0.6756	0.5477	ND	0.7936	0.6773	ND	0.901	0.781	ND	0.9681
Glyphosate	0.3503	ND	0.5677	0.411	ND	0.6377	0.583	ND	0.6706	0.4996	ND	0.79
Dicofol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Fentrothion	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbofuran	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

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تقييم متبقيات بعض المبيدات الزراعية فى المياه وأنسجة الاسماك من ثلاث مناطق بمحافظة الشرقية-مصر

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المعمل المركزى للمبيدات الزراعية- مركز البحوث الزراعية- الحيزة - مصر
المعمل المركزى لبحوث الثروة السمكية- العباسة- شرقية - مركز البحوث الزراعية- مصر

- تم تجميع عينات مياه كلا من مياه الأحواض السمكية والترع والصرف الزراعي من ثلاث مناطق مختلفة هي ديارب نجم وابوحماد وهيا (محافظة الشرقية) خلال شهر يوليو وأغسطس وسبتمبر وأكتوبر عام ٢٠٠٥
- لوحظ في مياه الصرف الزراعي ثبات المبيدات الفسفورية مثل مونوكروثوفوس وكلوربيريفوس ميثيل وبروفينفوس في كلا من هيا وديارب نجم وأبوحماد.
- كذلك لوحظت التركيزات العالية من الاباتكتين في مياه عينات الصرف المجمعة من هيا وديارب نجم وابوحماد.
- لكن التركيزات العالية من المبيدات تم الكشف عنها في خياشيم الأسماك علي العكس لم تظهر كلا من الفينيتروثيون والكاربوفوران والسيتامبيريد في أنسجة الأسماك
- إما الاسيتامبيريد والديكوفول والفينيتروثيون والكاربوفوران لم تظهر في عينات المياه المجمعة من هيا إما الاسيتامبيريد والفينيتروثيون والكاربوفوران فلم يظهر في عينات المياه المجمعة من ابوحماد
- إما الكاربوفوران فلم يظهر في عينات المياه المختلفة المجمعة من الأحواض السمكية والصرف الزراعي.