CONCENTRATION OF PESTICIDES IN WATER, SEDIMENT AND FISH FROM EUHFRATES RIVER CLOSE TO SUQ AL-SHUYOUKH IN AL-NASSIRIYA CITY–IRAQ

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ABSTRACT

The current study dealt with the determination of organic pesticide residues in water, sediments and species of fish (Tilapia zilli) in three stations at the Euphrates River (Al-Fadhliah, Suq Al-Shuyoukh and Karmat Bani Saeed) in the city of Nasiriyah - southern Iraq during summer 2020. Seven organochlorine compounds were identified as Chlordane, Dieldrine, Lindane, Endrine, Heptachlore, Aldrin, and Methoxychlor insecticides.

In water lindane pesticides observed higher concentration 33.1 µg/Kg dry weight at station 3, while the maximum concentration in sediments 22.9 µg/Kg dry weight for chlordane at station 1. In fish the highest concentration was 11.8 µg/Kg dry weight in muscles for endrin.

Key words: pesticide, water, sediments, fish, Euphrates River Al-Nassiriya city – Iraq

I. INTRODUCTION:

These days, Environmental pollution is one of the important and basic topics because of its negative effects on the environment and living organisms in general. Pollution is one of the most prominent problems that the world is facing in the modern era as a result of the rapid development in industry, agriculture and other aspects of life (Al-Khafaji, 2020). For Human resistance to harmful pest have resorted using some dangerous chemical compounds, and pesticides are substances that kill insects and harmful pests to living organisms, whether they are pathogens or plant herbs (Damalas and Eleftherohorinos, 2011; Sheoran, 2008; Holvoet, 2006). Pesticides include more specialized compounds such as insecticides, herbicides and fungicides, and they can be used for many purposes, including eliminating harmful agricultural pests, weeds, fungal diseases, etc. However, they could cause harm to non-target species (Eleftherohorinos, 2011 Damalas and; Corpa et al., 2011; Sheoran, 2008; FAO / WHO, 2005). Organisms in the aquatic ecosystem, such as fish and other organisms, are exposed to pesticides directly through gills or skin, or through feeding or oral consumption of water (Guan et al., 2009).

II. MATERIALS AND METHODS:

Description of the study area:

The Euphrates River is one of the main rivers in Iraq and one of the longest rivers in the southwest of the Asia continent. Its main source from the Taurus Mountains in Turkey, its length reaches about 2,800 km of which about 1,000 km are in Turkish territory, the Euphrates River extends into Iraqi territory by 35% of its length (Al-Masoudi, 2000). The study area extends about 23 Km, as three stations were chosen, they are:

The first station:( 46.361462 E 30.960459 N) Al-Fadhlia sub-district, which is about 13 km away from the center of Suq Al-Shuyoukh district to the south of the city of Nasiriyah and is located on the Euphrates River.

The second station:( 46.466756 E 30.898114 N) Suq Al-Shuyoukh district, located to the south of Dhi-Qar governorate, about 30 km from the city center of Nasiriyah.

The third station:(46.566508 E 30.878718 N) Karma Bani Saeed sub- district, located south of Suq Al-Shuyoukh district, about 10 km away from the district center.
Figure (1) Map shown the study area

**Figure (1) map shown the study area and study station**

**Samples Collection:**

Samples of water and sediments were collected from the study stations during summer / 2020. For the fishes, they were collected along the study area from station 1 up to station 3 at the same time as follows:

Water samples were collected from the middle of the river water sub-surface by about 30 cm using opaque glass 2.5-liter bottles per bottle with a volume of 10 liters from each of the mentioned stations, after the bottles were washed with river water. Sediment samples were collected from the river bed for each station using a Van veen Grap Sampler.

Given that the fishes are mobile and unstable at a specific station of the study, therefore, they were collected throughout the entire study area and not from each station using the fishing nets with mesh size 2.5 * 2.5 cm. All samples were reserved in ice box (-30 °C) until reaching to the lab.

The extracting pesticides from water, sediments and fish was followed according to the method of (EPA, 2007). For statistical analysis it used SPSS program.

**III. RESULTS AND DISCUSSION:**

The current study dealt with the determination of organochlorine pesticide residues in water, sediments, and species of fish Tilapia zilli in three stations on the Euphrates River south of Nasiriyyah city, which included chlordane, dieldrine, lindane, endrin, heptachlor, Aldrin, and methoxychlor.

The concentration range mean values and standards deviation of organochloride pesticides in the water, sediments and Tilapia zilli samples from Euphrates River are shown in tables(1 -3) respectively.

The study found that the maximum total rate of pesticide in water was 27.4 µg/Kg dry weight for endrin, the lowest total rate was 4.79 µg/kg dry weightfor dieldrine. The highest concentration of pesticide Lindane was 33.1 µg/Kg dry weight in the third station, This is for use in hunting fish and birds in addition to its use in agriculture operation or from the sediments resulting from the air, as these pesticides are transmitted over long distances (Al-Hilfi, 2005). Also, these results were higher than what was recorded by the study (Said et al., 2008), where the maximum concentration of Lindane pesticide in Burullus Lake in Egypt was recorded at 224.1 ng/L. While these results were less than what was recorded by the study in the El Kanka River, where the highest concentration of lindane was 74.04 ng/L (Singh et al., 2012). While the current study was close to the study on the Al- Hammar Marsh in southern Iraq by (Al-Ali, 2012).
The concentration of different organochlorine residues in sediment is presented in table (2). The highest concentration of pesticide in sediment Sample was 22.9 µg/Kg dry weight for chlordane in the first station ,the lowest concentration was 2.02 µg/Kg dry weight for dieldrine in the second station , these results are close to what was found by (Al-kafaji et al., 2014). These results were high compared to the local studies DuoAbul et al., (1988) which showed that the level of chlordane was less than 1 µg/kg dry weight in the downstream sediments and in the other study DouAbul et al., (2009) on pesticide residues in the Al- Hammar Marsh sediments after drying.

In fish species T . zilli the maximum concentrations of pesticides residue was 11.8 µg/kg dry weight for endrin in the muscles , the lowest concentrations 6.1µg/kg dry weight for dieldrine in the gills (Table, 3). The results of current study were less than what was found by Al-Janabi, (2015) in her study on fish from the Euphrates River at the city of Hilla,while the results of this study were higher than what was found by Al-Ali, (2012), as it showed that the highest concentration of endrin in fish was 2.76 µg/kg in Al- Hammar Marsh in southern Iraq. The accumulation of these pesticides muscles of fish may be due to their high solubility in fats, as well as their frequent use as fishing and agricultural materials (Malik et al., 2009).

When these chemicals are taken in by the fish, they bio accumulated, bio magnify and remain in the fish till they are caught and consumed by man or eaten by bigger fishes which are eventually eaten by human .These result demonstrate an accumulation of pesticides residues through food chain (from soil- water – sediments –fish - human) which is a serious matter of concern (Osibanjo and Tango 1985).

<table>
<thead>
<tr>
<th>Pesticides</th>
<th>1st Station</th>
<th>2nd Station</th>
<th>3rd Station</th>
<th>Total Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chlordane</td>
<td>22.7 ± 1.1</td>
<td>19.2 ± 0.9</td>
<td>18.7 ± 0.9</td>
<td>20.2 ± 0.96</td>
</tr>
<tr>
<td>Dieldrine</td>
<td>1.16 ± 0.1</td>
<td>12.1 ± 1.3</td>
<td>1.12 ± 0.07</td>
<td>4.79 ± 0.49</td>
</tr>
<tr>
<td>Lindane</td>
<td>19.3 ± 1.0</td>
<td>10.3 ± 2.3</td>
<td>33.1 ± 1.0</td>
<td>20.9 ± 1.43</td>
</tr>
<tr>
<td>Endrin</td>
<td>27.8 ± 0.1</td>
<td>28.1 ± 1.3</td>
<td>26.3 ± 1.4</td>
<td>27.4 ± 0.93</td>
</tr>
<tr>
<td>Heptachlor</td>
<td>11.2 ± 0.2</td>
<td>18.0 ± 1.0</td>
<td>19.2 ± 1.2</td>
<td>16.13 ± 0.8</td>
</tr>
<tr>
<td>Aldrin</td>
<td>12.4 ± 1.0</td>
<td>17.9 ± 0.5</td>
<td>14.5 ± 0.7</td>
<td>14.93 ± 0.73</td>
</tr>
<tr>
<td>Methoxychlor</td>
<td>9.83 ± 0.9</td>
<td>5.34 ± 1.1</td>
<td>20.1 ± 1.6</td>
<td>11.75 ± 1.2</td>
</tr>
</tbody>
</table>
Table (3) Mean Concentration μg/Kg dry weight ± SD of Pesticides in organs of T. zilli during summer 2020

<table>
<thead>
<tr>
<th>Organ</th>
<th>Gills</th>
<th>Muscles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chlordane</td>
<td>11.1 ± 2.0</td>
<td>10.4 ± 2.3</td>
</tr>
<tr>
<td>Dieldrine</td>
<td>6.10 ± 1.6</td>
<td>8.73 ± 1.2</td>
</tr>
<tr>
<td>Lindane</td>
<td>11.4 ± 0.7</td>
<td>10.5 ± 1.9</td>
</tr>
<tr>
<td>Endrin</td>
<td>10.5 ± 1.3</td>
<td>11.8 ± 1.1</td>
</tr>
<tr>
<td>Heptachlor</td>
<td>8.54 ± 1.6</td>
<td>10.2 ± 2.2</td>
</tr>
<tr>
<td>Aldrin</td>
<td>10.7 ± 1.4</td>
<td>9.85 ± 1.5</td>
</tr>
<tr>
<td>Methoxychlor</td>
<td>9.90 ± 2.1</td>
<td>10.5 ± 0.7</td>
</tr>
<tr>
<td>Total</td>
<td>9.74 ± 1.52</td>
<td>10.28 ± 1.55</td>
</tr>
</tbody>
</table>

IV. CONCLUSIONS:

1. The current study showed the presence of organochlorine pesticides in all samples of water, sediments and species of fish T. zilli with varying concentrations for all stations of the study area, and this indicates the continued use of these compounds for various purposes such as fishing or use as insecticides.

2. It was observed through the study that the total rate of pesticides in the muscles is higher than that of the gills, the reason for this may be because these compounds tend to accumulate in the fatty tissues as they are lipophilic. The levels of most pesticide in water and fish are rising, and long-term use of contaminated water for drinking and other domestic purposes, as well as the use of pesticides for fishing and agriculture in these areas, will almost certainly result in dangerously high concentrations of the difficult-to-metabolize chemical in the body. The monitoring of pesticide residues in sediment, water, fish, is critical, as it will go a long way toward preventing various environmental and public health hazards, as most of the river foods sold in Al-Nassiriyia city’s markets come from the rivers.

REFERENCES:


