STUDIES ON SOME PESTICIDE RESIDUES IN FROZEN BEEF MEAT AND FRESH FISH "TILAPIA NILOTICA" IN QENA GOVERNORATE

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SUMMARY

The organochlorine pesticide residues "DDT, aldrin, dieldrin and lindane) were measured in thirty samples of frozen beef meat and thirty samples of fresh fish "tilapia nilotica" which were collected from Qena markets. The samples were analyzed by using high performance liquid chromatography.

It was found that the mean values of DDT, aldrin, dieldrin and lindane residues in frozen beef meat samples were 2.0± 0.145, 0.48 ± 0.065, 0.52 ± 0.032 and 1.47 ± 0.064 ug/kg, respectively while the mean values of these residues in fresh fish "tilapia nilotica" were 2.56 ± 0.029, 0.26 ± 0.009, 0.16 ± 0.006 and 0.0020 ± 0.00008 ug/kg, respectively.

The obtained data were compared with the standard limits. It was found that all frozen beef samples were within the permissible limits of WHO (1989) and also fish samples were within the permissible limits of FAO/WHO (1987)

The public health importance and the toxic effects for these pesticide residues on human health and the preventive measures for decreasing these residues in meat and fish were discussed.

INTRODUCTION

Today, the environmental pollution is considered as one of the most serious problems in the world. The deleterious effect of the environmental pollution by pesticides has been considered as one of the principal research activities (David et al. 2008). The problem of pesticide residues in food has been addressed at international level through several Committees sponsored by

The wide spread usage of pesticides in Egypt led to Many problems and constituted hazard in animals. In recent years pesticides in food arises as an important problem of serious public health hazards which may lead to acute or chronic hepatic toxicity for human being (HASSOUBA et al, 2007).

Organochlorine pesticides (OCPs) are a class of non polar toxic chemical compounds classified as dichlorodiphenylethane cyclodienes and chlorinated benzenes (Ademoroti, 1996). OCPs are ubiquitous environmental contaminant which have spread globally and have been detected in food stuffs, meat, drinking water and sediments as well as wide range of biota including fish. (Ize-Iyamu et al., 2007). Numerous studies on both human and laboratory animals provide strong evidence of the toxic potential of the exposure to OCPs. The health effects associated with OCPs include reproductive failures, birth defect, endocrine disruption immune system dysfunction and cancer. (Bouman et al., 1990; winter, 1992 and Olea et al., 1998).

Studies also revealed that OCPs have strong potential to cross placental barriers even in minute concentration and cause serious neonatal damage. (Saxena et al., 1981; Jurewicz and Hanke, 2008).

Pesticides have been used in the public health sector for disease vector control and in agriculture to control and eradicate crop pests. OCPs are widely used by farmers because of their effectiveness and their broad-spectrum activity (Ntow et al, 2006; Darko and Acquaah, 2007; Ashujohri et al., 2008). They are very resistant to microbial degradation and employed to control ecto- parasites of farm animals and pets. They may concentrate in the adipose tissues and in the blood serum of animals leading to environmental persistence, bioconcentration and biomagnification through the food chain (Ntow et al., 2001). Acute hepatic and renal toxicity as well as the long term effect of organochlorine and organophosphorous pesticides are responsible for non specific symptoms like dizziness, headache, nausea, weakness, disturbance of vision, nervous symptoms,
rashes, alternation of genes, disturbances of fertility and promotion or induction of cancer (Clark and Clark, 1978; Gergis, 1983; Beise, 1992 and Hashim, 2002 and Pathuk et al., 2009).

Meat may contain high levels of pesticide residues as a result of concentration of residues in the tissues following cattle dipping or vector control or when they feed on feedstuffs contaminated with these chemicals. Because these chemicals are toxic to living organisms, increased accumulation in the food chain may pose serious health hazards to the general populace (Jeyashree and Vasudevan, 2007).

The purpose of this study was to determine the levels of organochlorine pesticide residues such as (DDT, Aldrin, Dieldrin and Lindane) in frozen beef and some species of fish (Tilapia nilotica and Mugil Cephalus) samples which were collected from Qena governorate by using High Performance Liquid Chromatography (H.P.L.C).

MATERIALS AND METHODS

1. Samples collection:

A total of sixty samples (30 frozen beef and 30 fresh fish “Tilapia nilotica”) were collected from markets located in Qena. The average weight of frozen beef samples was 250 gm and the average weight of fish samples was 130 ± 10 gm. The collected samples were packed separately in steril polyethylene bags in ice box and transferred immediately to laboratory to be cut into small pieces, thoroughly mixed and kept in aluminum foil, lapelled and frozen at –20°C until analysis. The collected samples were examined for determination the levels of DDT, Aldrin, Dieldrin and Lindan residues (ug/ kg) by using HPLC.

2. Determination of organochlorine pesticide residues:

Frozen beef and fish samples were extracted according to A.O.A.C (1980) and Pesticide Analytical Manual (1978). Fifty
grams of each sample "frozen beef and fish muscles" were ground with 100 gm of anhydrous sodium sulphate in presence of 150 ml of petroleum ether for two minutes, the extract was decanted through 500 ml Buchnur funnel containing two Whattman filter papers. The extract was poured through 40×25 mm column of anhydrous sodium sulphate and eluent was collected in 500 ml flask and placed in rotary evaporator to concentrate the extract. The pesticide residues were extracted from fat by using acetonitrile saturated with petroleum ether and clean up on florisil adsorbent. Extraction with 6% diethylether in petroleum ether. The elute was concentrated in rotary evaporator, after which it was dried in a test tube at 50°C. The dried extract was dissolved in 0.5 ml n-hexane before injection in HPLC apparatus (ISCOmodel 2350) HPLC and 205 UV / vis detectors with hyper sil HPLC column 250×4.6 mm B DS. 180 SM.

3. Statistical analysis:

The obtained data were statistically analyzed according to the method recommended by Petrie and Watson (1999).

RESULTS

The levels of organochlorine pesticide residues (DDT, Aldrin, Dieldrin and Lindane) in examined frozen beef samples (ug/kg) were illustrated in table (1) and the levels of organochlorine pesticide residues in examined fresh fish samples (Tilapia nilotica) (ug/kg) were recorded in table (2).
Table (1): levels of organochlorine pesticide residues in examined frozen beef samples (ug/kg)

<table>
<thead>
<tr>
<th>Organochlorine pesticides</th>
<th>Min.</th>
<th>Max.</th>
<th>X ± S.E</th>
</tr>
</thead>
<tbody>
<tr>
<td>DDT</td>
<td>0.90</td>
<td>4.20</td>
<td>2.00 ± 0.145</td>
</tr>
<tr>
<td>Aldrin</td>
<td>0.04</td>
<td>1.10</td>
<td>0.48 ± 0.065</td>
</tr>
<tr>
<td>Dieldrin</td>
<td>0.10</td>
<td>0.80</td>
<td>0.52 ± 0.032</td>
</tr>
<tr>
<td>Lindane</td>
<td>0.70</td>
<td>1.80</td>
<td>1.47 ± 0.064</td>
</tr>
</tbody>
</table>

Min: Minimum value.  
Max: Maximum value.  
X: Mean value.  
± S.E: Standard Error.  
No. of examined samples = 30 samples.

Table (2): levels of organochlorine pesticide residues in examined fresh fish samples ug/kg (*Tilapia nilotica*)

<table>
<thead>
<tr>
<th>Organochlorine pesticides</th>
<th>Min.</th>
<th>Max.</th>
<th>X ± S.E</th>
</tr>
</thead>
<tbody>
<tr>
<td>DDT</td>
<td>2.30</td>
<td>2.85</td>
<td>2.56 ± 0.029</td>
</tr>
<tr>
<td>Aldrin</td>
<td>0.19</td>
<td>0.38</td>
<td>0.26 ± 0.009</td>
</tr>
<tr>
<td>Dieldrin</td>
<td>0.11</td>
<td>0.23</td>
<td>0.16 ± 0.006</td>
</tr>
<tr>
<td>Lindane</td>
<td>0.0011</td>
<td>0.0032</td>
<td>0.0020 ± 0.00008</td>
</tr>
</tbody>
</table>

Min: Minimum value.  
Max: Maximum value.  
X: Mean value.  
± S.E: Standard Error.  
No. of examined samples = 30 samples.
DISCUSSION

The existence of the organochlorine pesticides with varying concentrations reflects the intake of pesticides by the animals and may be attributed to way of nutrition (graze in different pastures) and continuously exposure to the spraying with insecticides to control external parasites. The persistence of DDT in the environment means that much of the material used for control of insect borne diseases and elimination of agricultural pests still contaminates soil, water and air (Ralls and cortes, 1972; Darko and Acquaah, 2007 and Hassouba et al., 2007).

DDT is still ubiquitous in the environment due to its past wide use and its chemical and physical characteristics DDT persists for more than 10 years in the soil and accumulates in the organisms through the food chain. After absorption, a part of the DDT is metabolized, the products in mammals being DDE, DDA and DDT (Batrik and Piskac, 1980).

The obtained data in table (1) showed that the mean values of DDT, Aldrin, Dieldrin, and Lindane in frozen beef samples were 2 ± 0.145, 0.48 ± 0.065, 0.52 ± 0.032 and 1.47 ± 0.064 ug/kg, respectively. The recorded data were lower than the maximum permissible limits established by WHO (1989) which was 5PPm in meat for DDT, 1.01 PPm for Aldrin, Dieldrin and 1.1 PPm for Lindane. The concentrations of DDT in frozen beef were lower than those detected by Gadalla (1999) in cattles meat, Darko and Acquaah (2007) in beef meat, Hassouba et al. (2007) in frozen beef and Shrestha et al. (2009) in buffalo meat.

The obtained data of Aldrin and Dieldrin in frozen beef in table (1) were higher than those recorded by El-Shafi (1988) and Falandyeze and Kannan (1992) in frozen beef and lower than those detected by Darko and Acquaah (2007) in beef meat, Hassouba et al. (2007) in frozen beef.

The levels of Lindane in frozen beef in table (1) were nearly similar with those reported by Zasadowski et al. (1991) in cattle's meat, Darko and Acquaah (2007) in beef meat and lower than those recorded by Hassouba et al. (2007) in frozen beef.
Results in table (2) showed that the mean concentrations of DDT, Aldrine, Dieldrin and Lindane in fresh fish “*Tilapia nilotica*” were 2.56 ± 0.029, 0.26 ± 0.009, 0.16 ± 0.006 and 0.0020 ± 0.0008 ug/kg, respectively. The obtained data were within the permissible limits of FAO/WHO (1987) and were nearly in accordance with those reported by Hashem and Salem (2006) in cultured and wild fish *Tilapia* and *Mugil* species.


The concentrations of Aldrin in fresh fish were lower than those recorded by Hashem (2002) fish products. Also the Lindane concentrations in fresh fish were lower than those detected by Kipcic et al. (2002) in domestic fish. Meanwhile the levels of Dieldrin in fresh fish in table (2) were lower than those reported by Ejobi et al. (2007) in *Lates nilotica* and david et al. (2008) in *Tilapia zille* (red belly Tilapia) and higher than those recorded by Therdteppitak and Yammeng (2003) in Nile Tilapia “*Oreochromis niloticus*”.

The detectable level of such residues were varied in quantities dependent on the way of nutrition and the fat content of particular species of fish, type of tissue examined and exposure of examined fish to different pesticides before catching and processed as well as the degree of accumulation of these compounds in examined samples.

**REFERENCES**


دراسات على بقايا بعض المبيدات الحشرية في اللحم البقرى المجمد وأسماك البلطى الطازجة في محافظة قنا

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الملخص العربي

تم قياس بقايا بعض المبيدات الحشرية (مركبات الكلورين العضوية مثل الـ-د.د.د، ألدين، داى إلدين، وليندان) في عدد ثلاثون عينة من اللحم البقرى المجمد ومدد ثلاثون عينة من السمك البلطي الطازج الذين تم تجميعهم من أسواق محافظة قنا وقد تم تحليل العينات باستخدام جهاز التحليل الكروماتوغرافي السائل ذو الضغط العالي وقد وجد أن القيم المتوسطة لبقايا الـ-د.د.د، ألدين، داي إلدين، ليندان في عينات اللحم البقرى المجمد كانت 2 ± 1,45 ± 0,48, 0,05 ± 0,37 ± 0,06, 0,007 ± 0,007 ميكروجرام/كم على التوالي بينما كانت القيم المتوسطة لهذه البقايا في عينات سمك البلطي الطازج 2 ± 0,02 ± 0,02 ± 0,02 ± 0,02 ± 0,02 ميكروجرام/كم

/ كجم على التوالي.

وقد تم مقارنة النتائج بالمواصفات القياسية وقد وجد أن عينات اللحم البقرى المجمد كانت جميعها مطابقة للمواصفات القياسية طبقًا لمنظمة الصحة العالمية عام 1989 وأيضاً عينات سمك البلطي كانت مطابقة لمواصفات منظمة الأغذية والزراعة / منظمة الصحة العالمية لعام 1989.

وقد تم مناقشة الأهمية الصحية والتآثرات الخطيرة لبقايا هذه المبيدات على صحة الإنسان والإجراءات الوقائية المتبعة للإخلال من بقايا المبيدات الحشرية في اللحوم والأسماك.