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Detection of Organochlorine Pesticides Residues in Fish in Qena City

Ph.D. Thesis

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SUMMARY

The present study was designed to detect fifteen of organochlorine pesticides in a total 200 sample: 50 of Nile tilapia, 50 of African catfish and 50 of long fin catfish which were collected from Qena city. The prepared samples were analyzed for:

1- Determination of level of contamination by organochlorine pesticides which include Dichlorodiphenyltrichloroethane group, Cyclodienes group and Hexachlorocyclohexane group in most common fish in Qena city Nile Tilapia (*Oreochromis niloticus)*, African catfish (*Clarias gariepinus*) and Long fin catfish *(Chrysichthys auratus)*by using gas mass chromatography.
2- Trials for reduction and/or elimination of OCP residues in fish by heat treatment.
3- Comparison of the measured levels of OCP residues with maximum permissible limits (Egyptian & International) in fish samples and discussion of the potential health hazard effect of OCP residues on human.

The obtained results revealed that the mean value of a-BHC, b-BHC, lindane, heptachlor, heptachlor epoxide, aldrin, dieldrin, endrin, chlordane, methoxychlor, endosulfan, endosulfan sulfate and total DDTs varied from 2.21-11.89, 4.14-5.27, 18.18-29.11, 4.14-5.03, 2.37-2.53, 5.59-11.73, 0.5-3.53, 1.99-25.02, 24.17-

82.27, 0.79-6.98, 12.74-15.89, 34.28-47.82 and 193.72-234.93 ppb respectively in all examined fish species. Nile tilapia fish significantly ($P < 0.05$) had the highest concentration of DDD, endrin, methoxychlor, DDE and endosulfan sulfate with mean±SD concentration 6.27±0.68, 25.02±0.01, 6.98±1.88, 33.35±1.76 and 47.82±12.51 ppb respectively. Long fin catfish significantly had the highest concentration of D-chlordane, a-BHC and aldrin with mean±SD concentration 82.27±0.45, 11.89±0.56 and 11.73±0.48 ppb respectively. Finally African catfish significantly had the highest concentration of dieldrin with a mean concentration of 3.53±0.03 ppb and had significant lowest concentration of endrin 1.99±1.39 ppb. OCP residues in all examined raw fish species were below maximum permissible limits (MPL) set by Food and Drug Administration and Codex Alimentarius.

The contaminated fish samples with OCP residues undergo heat treatment to study the effect of pan-frying on OCP residues in fish species.

In Nile tilapia**:** dieldrin and endosulfan sulfate cannot be detected after heat treatment that record 100% R.R. The lowest R.R was recorded in DDD, DDE, heptachlor epoxide, b-BHC and methoxychlor with rate varied from 0.12 to 6.59%.

In African Catfish: dieldrin, methoxychlor and endosulfan sulfate were undetected after pan frying with 100% R.R. The

reduction rate of heptachlor epoxide, endrin, a-BHC, lindane, aldrin, endosulfan, D chlorodan, DDT, b-BHC and heptachlor varied from 22.42% up to 90.72 %. The lowest R.R was 0.07% and 3.93% for DDD and DDE respectively.

In Long fin catfish: pan frying reduced five organochlorine pesticides with 100% R.R including dieldrin, endrin, heptachlor epoxide, methoxychlor and endosulfan sulfate. The R.R for a-BHC, aldrin, D chlorodan, lindane, DDT and b-BHC were 92.01, 81.93, 72.32, 68.04, 38.35, 14.07% respectively. The lowest R.R was 0.09, 0.48 and 8.81% for DDD, heptachlor and DDE respectively.

From the above results it was clear that there is a significant reduction of OCP residues (Significant at $P < 0.05$) by pan frying. The reduction rate of dieldrin, endosulfan sulfate was 100% in all examined fish species. Methoxychlor reduction rate was 100% in both African catfish and Long fin catfish. Heptachlor epoxide was reduced with a rate 100% in long fin catfish and 96.2% in Nile tilapia. Endrin reduction rate reach up to 100% in Long fin catfish only. The lowest reduction rate was detected in DDD, DDE, DDT, b-BHC in all examined heat treated fish species.

The hazard ratio (HR) of all studied OCP in all examined raw fish species was less than 1 that ensures consumption of these fish has no potential hazard risk to human health in Qena city.

Carcinogenic risk (CR) measured in examined raw fish species and its value considered acceptable risk (more than 10^{-6}) for b-BHC in all examined raw fish species, dieldrin in Long fin catfish, chlordane in Nile tilapia and a-BHC in both Nile tilapia and African catfish. The studied CR is considered level of concern (between 10^{-6} and 10^{-4}) for heptachlor epoxide, total DDTs, lindane and total heptachlor in all examined raw fish species. In addition to a-BHC in Long fin catfish, dieldrin in both Nile tilapia and African catfish, chlordane in both African catfish and Long fin catfish also considered level of concern. There is no level of OCP in examined raw fish witch was considered non acceptable risk (less than 10^{-4}).