

Estimation of Total Petroleum Hydrocarbon Compounds in Tissues of Five Commercial Fish Species From Tigris River near AliAl-grbi district in Misan Province /Iraq

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Abstract :

This work was carried out to estimate the levels of total petroleum hydrocarbon Compounds (TPHs) in muscles and gills tissues of five commercial fish species from Tigris River near Ali Al-grbi district in Misan Province during 2015 (autumn season). TPHs levels in the samples were measured by Spectrofluorometer equipped with recorder. Results of the present study revealed that concentrations of TPHs ($\mu\text{g/g}$ dry weight) in muscles tissues of *Carassius carassius*, *Barbus grypus*, *Liza abu*, *Capoeta trutta* and *Carinus carpio* were 12.957, 7.416, 10.872, 8.47 and 12.934 respectively, whereas in gill tissues of *C. carassius*, *B. grypus*, *L. abu*, *C. trutta* and *C. carpio* were 86.278, 12.778, 48.023, 34.528 and 21.874 respectively. Also results of this study revealed that their concentrations in gills were more than in muscles; this may be attributed to that gills expose to these pollutants more than muscles. Elevation of their levels in these commercial fishes calls for concern because the level of TPHs in these fishes are high considering the recommended value from World Health Organization which is from 0-0.001 $\mu\text{g/g}$ for human consumption. This means that these fishes have accumulated more hydrocarbons indicating a higher level of pollution in these areas which comes from surrounding cities into the river. Therefore, people in this area may be exposed to carcinogenic health risks associated with the continuous consumption of the studied fish.

Introduction:

Pollution is an ongoing problem in Iraq as with any area heavily dependent of limited water supplies, especially when much of the available water originates from outside the country (Coad, 2010). Hydrocarbons compounds are considered as an important pollutant in aquatic environment that affect the aquatic organisms (Al-Saadet *et al.*, 1998). Ingestion of contaminated food and diffusion from water across their gills and skin are the major routes of TPHs exposure to fish (Gobas *et al.*, 1999). The water column may contain toxic components of oil that affect on eggs, larvae, and juvenile stages and they may eat contaminated food, therefore might be accumulated in adipose tissues with higher concentrations (Ackman *et al.*, 1996). Fishes that are exposed to hydrocarbon compound may suffer from reduced growth, changes in

heart beats , respiratory rate, enlarged liver, fin erosion ,genetic abnormalities or cancer in sensitive species, a variety of biochemical , cellular changes and behavioral responses (Al-Saadet *et al.* , 1997 ; Deb *et al.* , 2000). Also these compounds have indirect effects on fishes during destruction or death of sea grasses ,aquatic plants ,coral reefs ,zooplankton and phytoplankton which had been for protection and growth of larvae and small fishes or used as food for these animals (Al-Saadet *et al.* , 2003) .Levels of contaminants in fish is of considerable interest because of potential effects on the fish themselves and the top level organisms that consume these contaminated fish (Ashley *et al.* 2003; Klumppet *et al.* ,2002) A large section of the world's population depends on freshwater food , especially fish because fish is recognized as one of the important source of animal protein. Food consumption has been identified as an important pathway of human exposure to many contaminants including petroleum hydrocarbon compounds (Cheung *et al.*, 2007). Despite the numerous benefits of fish as fish diet, the potential health risk arising from frequent consumption of fish is a great concern (Asuquo and Ewa-Oboho , 2004). The objectives of the study were aimed to determine the levels of total petroleum hydrocarbons (TPHs) in muscles and gills tissues in five commercially important fish species from Tigris River because fishes are good indicators of pollution in river's waters and they have been used extensively for environmental monitoring.

Materials and Methods:

Study area:

Tigris River is the second largest river in western Asia. The main source for the Tigris River is Hazar lake which is located in the south eastern region of Turkey. Tigris River is 1850 km in length, rising in the Taunus mountains of eastern Turkey. The river flows for about 400 km through Turkey before entering Iraq. The total length of the river in Iraq is 1418. (Al-Ansari *et al.*, 1987). Tigris River is the most important source of fresh water in Misan city and influenced by freshwater discharges from agricultural runoff , industrial activities , and untreated domestic sewage because several cities such as Mosul, Samara, Baghdad, Al-Kut and Amara have been built on the banks of the Tigris since the dawn of civilization (Al-Ansari and Knutsson, 2011).

Collection, preparation and extraction samples:

Fresh samples of five selected important aquatic fauna of *Carassius carassius* , *Barbus grypus* , *Liza abu* , *Capoeta trutta* and *Carinus carpio* were collected from Tigris River near Ali Al-grbi district in Misan province during 2015 by the help of local fishermen. Ten individual fishes of similar size of each species were collected, cleaned and wrapped in aluminum foils, then kept frozen in an ice box before transported to the laboratory for analysis. The fresh fish samples were rinsed thoroughly with distilled water in the laboratory ,the muscles and gills tissues were

cut to small parts and then dried. They were then ground with blender and sieved using a 63 μm metal sieve then kept in clean a glass vial to become ready for extraction process. The procedure of Grimalt and Oliver (1993) was used for the extraction of hydrocarbon compounds from fish tissues. Spectrofluorometers Shimadzu equipped with recorder type Shimadzu was used to determine the levels of total petroleum hydrocarbons (TPHs) in muscles and gills tissues at marine science center / university of Basrah.

Classification of fish species :

Family : Cyprinidae Family : Mugilidae

Sp. *Liza abu* Sp. *Capoetatratta* Sp. *Barbus grypus*

Sp. *Carassius carassius*

(Coad, 2010) Sp. *Carinus carpio*

Results and Discussion:

Concentrations of TPHs ($\mu\text{g/g}$ dry weight) in muscles of *Carassius carassius*, *Barbus grypus*, *Liza abu*, *Capoetatratta* and *Carinus carpio* were 12.957 , 7.416 , 10.872 , 8.47 and 12.934 respectively in figure 1, whereas in gills of *C. carassius* , *B. grypus*, *L. abu*, *C. tratta* and *C. carpio* were 86.278 , 12.778 , 48.023 , 34.528 and 21.874 respectively in figure 2. These levels of TPHs indicate that the fishes found at Tigris River have higher TPHs values. This means that these fishes have accumulated more hydrocarbons indicating a higher level of pollution in these areas which comes from surrounding cities into the river, therefore transported into the tissues of these fishes via water intake or come from direct contact and contaminate their gills (Jack *et al.*, 2005 ; Al-Saad *et al.* , 2015). Ability of these fresh water fishes to accumulate TPHs varies in the muscles and follow the order *Carassius carassius* > *Carinus carpio* > *Liza abu* > *Capoetatratta* > *Barbus grypus*, whereas in the gills follow the order *C. carassius* > *L. abu* > *C. tratta* > *C. carpio* > *B. grypus*, the observed difference in concentrations of TPHs among the fish species may be attributed to differences in feeding preference, general habit , the rate of movement and reproduction status (Abdolapur Monikhet *et al.* , 2014; Vuorinen *et al.* , 2006). Also the accumulation of TPHs in fish can be influenced by various factors including route and duration of exposure, lipid content of tissues, environmental factors , age and sex (Varanasi *et al.* , 1987 ; Al-Shwafi, 2008 ; Olajiet *et al.* , 2014; Al-Saad *et al.* , 2015). Also results of the present study revealed that concentrations of TPHs in gills were more than in muscles this may be attributed to that gills expose to these pollutants more than muscles (Nasir, 2007).

Since *C. carassius* , *C. carpio*, *L. abu*, *C. tratta* and *B. grypus* constitute the major food fish of the population of study area, the danger of bio-accumulation of these compounds in humans through the food chain is a great possibility and need to be

checked. Therefore, elevation of their levels in these commercial fishes calls for concern because the level of TPHs in these fishes are high considering the recommended value from World Health Organization which is from 0-0.001 $\mu\text{g/g}$ for human consumption. This indicates that Tigris River is contaminated with petroleum hydrocarbons. So that, people in this area may be exposed to carcinogenic health risks associated with the continuous consumption of the studied fish (FMENV, 1992). There is therefore the need to develop a management plan to ensure that hydrocarbon compounds contamination of this area is prevented in order to achieve good aquatic life and to avoid possible health risks through the consumption of contaminated freshwater foods, especially fish by the local communities (Al-Saadet *et al.*, 2015).

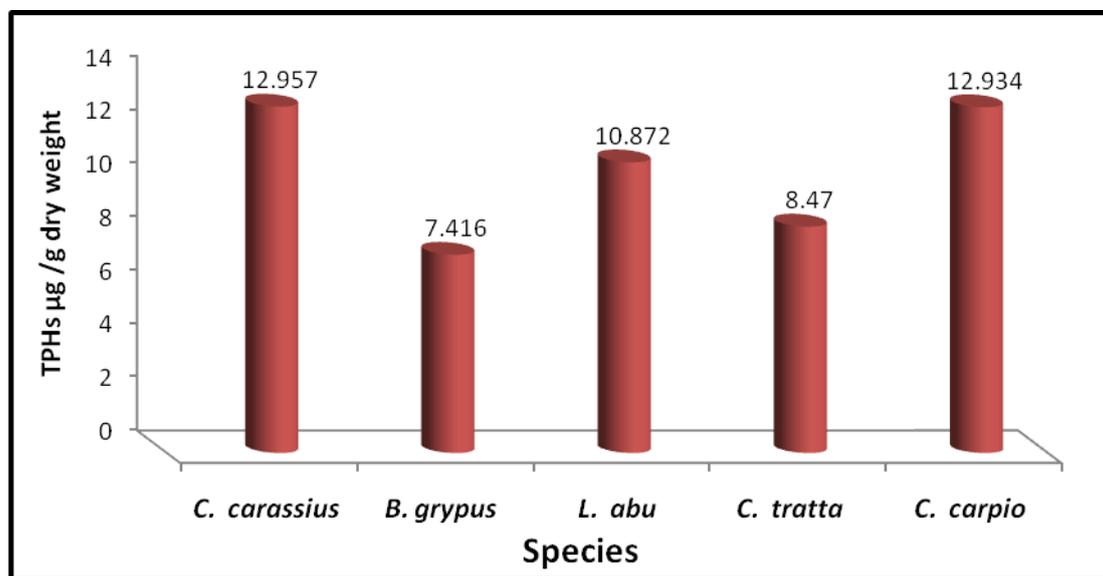


Figure (1) levels of TPHs ($\mu\text{g/g}$ d.w) in muscles tissues of selected fish species .

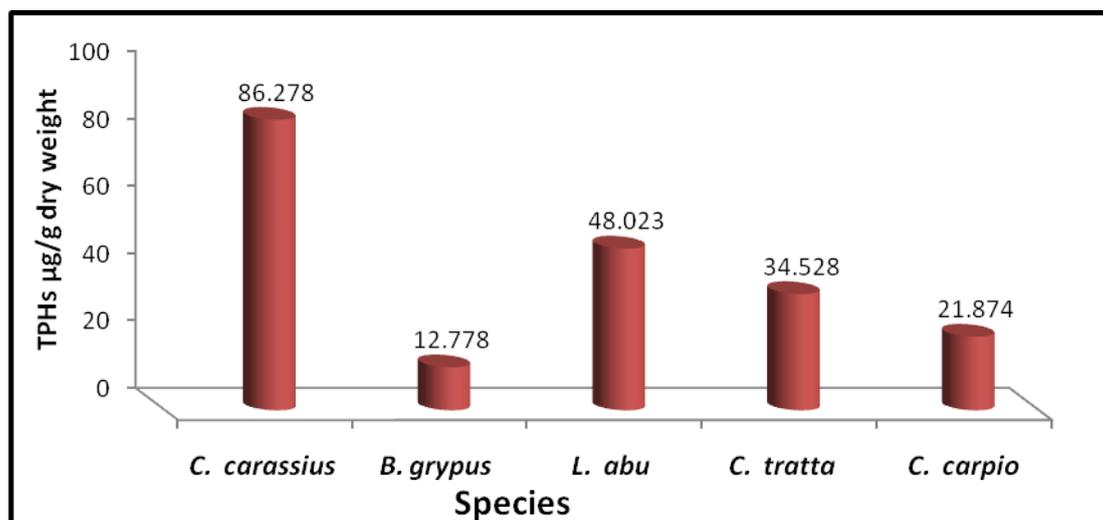


Figure (2) levels of TPHs ($\mu\text{g/g}$ d.w) in gills tissues of selected fish species .

Conclusion:

In this study, the results showed that selected fish species have accumulated more hydrocarbons in their tissues indicating a higher levels of pollution in these areas .These contaminants are brought to this river from surrounding cities. In addition, the results revealed that the observed difference in concentrations of TPHs among the fish species may be attributed to differences in feeding preference , general habit and others factors.Elevation of their levels in these commercial fishes calls for concern and continuous consumption of food from this areamay pose carcinogenic health risks on people .

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تقدير المركبات الهيدروكربونية النفطية الكلية في انسجة خمسة انواع من الاسماك الاقتصادية من نهر دجلة
قرب قضاء علي الغربي في محافظة ميسان/ العراق

صالح حسن جازع

جامعة ميسان / كلية العلوم / قسم علوم الحياة

الخلاصة :

انجز هذا العمل لتقدير مستويات المركبات الهيدروكربونية النفطية الكلية في انسجة العضلات والخياشيم لخمسة انواع من الاسماك الاقتصادية من نهر دجلة قرب قضاء علي الغربي في محافظة ميسان خلال عام ٢٠١٥ (فصل الخريف). وتم قياس مستويات المركبات الهيدروكربونية النفطية الكلية بواسطة جهاز الفلورة المزود بمسجل . اظهرت نتائج الدراسة الحالية بان تراكيز المركبات الهيدروكربونية النفطية الكلية في انسجة عضلات الاسماك *Carassius carassius* و *Barbus grypus* و *Liza abu* و *Capoetatratta* و *Carinus carpio* كانت 12.957 و 7.416 و 10.872 و 8.47 و 12.934 مايكرو غرام / غرام وزن جاف على التوالي ، بينما في انسجة خياشيم الاسماك *C. carassius* و *B. grypus* و *L. abu* و *C. tratta* و *C. carpio* كانت ٨٦,٢٧٨ و ١٢,٧٧٨ و ٤٨,٠٢٣ و ٣٤,٥٢٨ و ٢١,٨٧٤ مايكرو غرام / غرام وزن جاف على التوالي . كما اظهرت نتائج هذه الدراسة بأن تراكيزها في انسجة الخياشيم كانت اكبر منها في العضلات وربما يعود ذلك الى تعرض الخياشيم الى هذه الملوثات اكثر من العضلات ، وان ارتفاع مستوياتها في هذه الاسماك الاقتصادية يدعو الى الاهتمام الكبير بدراستها باستمرار لان مستويات المركبات الهيدروكربونية النفطية الكلية تجاوزت الحدود المسموح بها والمحددة من قبل منظمة الصحة العالمية والتي هي من ٠ الى ٠.٠٠١ مايكرو غرام / غرام وزن جاف للاستهلاك البشري ، وهذا يعني بان هذه الاسماك تمتلك قدرة المراكمة لهذه المركبات مما يدل على ارتفاع مستويات التلوث في هذه المناطق والتي تدخل النهر من المدن المحيطة به ، لذلك الناس في هذه المنطقة ربما يتعرضون الى تأثيرات مسرطنة بسبب هذه المركبات في حالة الاستمرار باستهلاك هذه الاسماك التي تمت دراستها .