

Estimation of some heavy metals in canned tuna fish found in local markets of Hilla City/Iraq

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Abstract

This study was conducted to determine the concentration of heavy metals (Fe, Cu, Zn, Ni, Cd, Cr and Pb) in canned tuna found in the local market of Hilla city, the results show that the concentrations of iron were above the limits and were ranged between 57.41 ppm to 101.55 ppm, while the concentration of copper was within the limits and was ranged between 5.43 ppm to 6.48 ppm, the concentration of zinc was also within the permitted limits and was ranged between 17.5 ppm to 37.5, while all of nickel, cadmium, chromium and lead were not detected in all the samples.

Keywords; heavy metals, canned tuna, food pollution, fish.

Introduction

The quality of food has become a major concern in every part of the world, in order to do that many studies have tackled the important aspect of studying the toxic effect of the pollutants in food. The heavy metals represent the most important one of these impurities and that due to their ability to accumulate by marine organisms which raise a big health concern [1].

According to the American health association, it is important to have fish in our daily diet at least 2-3 times a week, since that fishes can reduce cholesterol, high blood pressure, in addition to that the fishes contain a high quality protein and low calories, as well as, fishes have the important Omega-3 fatty acids which reduce the risk of coronary artery disease [2].

The different industries attributed mainly in the increase of heavy metals in water, and these heavy metals can accumulate in the aquatic organisms and make their way in the food chain until it reaches and settles inside the human body causing different health issues, and scenes that most of the sea goods are canned in order to make them available to peoples that live away from the seas and oceans [3].

Tuna fish as a predator, can concentrate a large amount of heavy metals which can be a health concern, since it is a major canned sea food and can be consumed by human directly, and these heavy

metals can be divided into two types (a) toxic (such as aluminum, arsenic, cadmium, lead, and mercury), (b) probably essential (such as cobalt and nickel), (c) essential metals (such as copper, iron, zinc and selenium), with keeping in mind that toxic elements can be very harmful even at low concentration when consumed over long period [4].

Many studies have been conducted to determine the concentration of heavy metals in the canned tuna and their effects [5,6,7,8,9].

The present study was carried out in order to provide information about the heavy metals load in the canned tuna, which will generate data base need for the assessment of toxic metals intake from this food source that available for public consumers.

Materials and methods

Sampling

Five types of canned tuna (with 3replicates for each type) were collected from different supermarkets found, in Hilla province center to determine the concentration of heavy metals as shown in table 1.

	Commercial name	Origin	Manufacturer	Production date	Expire date	type of medium
1	American Garden	Thailand	USA	7\11\2012	6\11\2014	In oil
2	Maxim's	Thailand	Liberia	4\2013	4\2015	In water
3	Salsa	Vietnam	Syria	6\2012	6\2014	In oil
4	Catch of the day	Thailand	Kuwait	4\2012	4\2014	In oil
5	Altunsa	Turkey	Turkey	22\2012	12\2012	In oil

Heavy metals determination (procedure)

the heavy metals were evaluated according to [10], be putting the fish tissues in electric ferns on 105C° for 24 hours, then 1 gm of the dried tissues and digested by using HNO₃ 65% and HCl 10%, with H₂O₂ . then the heavy metals concentrations were evaluated by using Flame Atomic Absorption Spectrophotometer and by using the following equation:

$$\text{Element concentration} = \frac{\text{dillution factor X concentration of elemint in the devise}}{\text{dried wieght}}$$

Results and discussions

In this study we measure the concentration of heavy metals (Fe, Cu, Zn, Ni, Cd, Cr and Pb) as follow:

For the concentration of iron in canned tuna, the results show high concentration of iron (as Shown in table 2), the average concentration of Fe range from 57.41ppm (in maxim's canned tuna) to 101.55 ppm (in salsa canned tuna) as illustrated in fig 1, there's no maximum limit for iron set by WHO, but the republic of

turkey ministry of agriculture proposed 15 mg/L as limit for canned tuna[11]. All the samples tested in this study acceded this limit. iron is an essential element for humans and other organisms and dose not cause any type of nutritional loss in the product , however; it may alter the sensory properties of the food, it also important to mention that the concentration of iron can increases respectively with increase of storage period due internal erosion [12]. The results of this study was similar to the results mentioned by [11, xx].

Table 2:the concentration of iron in canned tuna

	Sample	Iron concentration (ppm)
1	American Garden	64.91
2	Maxim's	57.41
3	Salsa	101.55
4	Catch of the day	89.66
5	Altunsa	61.30

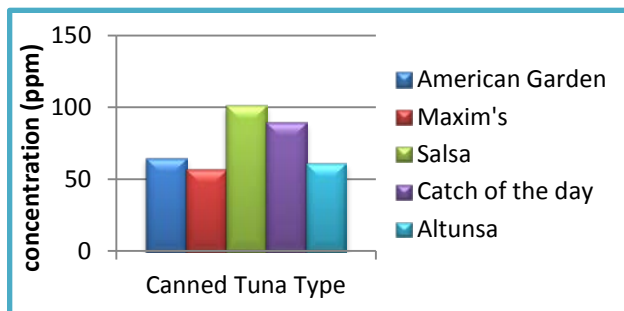


Fig. 1: the concentration of iron in canned tuna

* Fe limits=15ppm

For the concentration of copper the results show that Cu concentration was below the prohibited limits for this element , which is 30 mg/ kg as given by FAO[11], while the KSA standers give it as 20 ppm[13],the results ranged from 5.43ppm in Maxim’s canned tuna to 6.48 ppm in Altunsa canned tuna as shown in table 3 , the complete results are illustrated in fig.2, copper can enter the aquatic environment from different source such as waste water treatment projects, mining and factories waste water[14]the copper had show a good effect on human health within the permitted limits but it can cause different diseases to both liver and kidney[15], the results were similar to the results reported by[13, 14, 15].

Table 2: the concentration of copper in canned tuna

	Sample	copper concentration (ppm)
1	American Garden	5.90
2	Maxim's	5.43
3	Salsa	6.36
4	Catch of the day	6.06
5	Altunsa	6.48

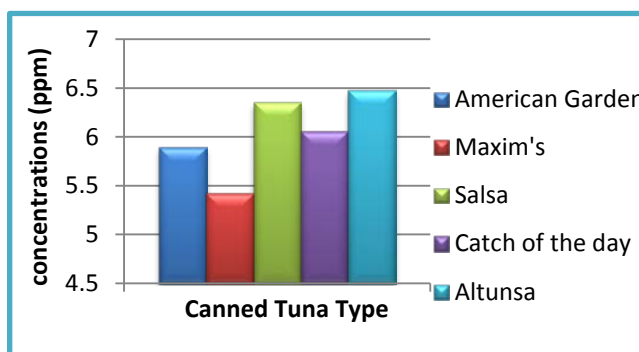


Fig.2: the concentration of cu in canned tuna

* Cu limits=30ppm

The results show that for zinc concentration ranged from 17.5 ppm in Maxim's canned tuna to 37.5 ppm in Salsa canned tuna as shown in table 4, the Zn concentrations were within the permitted limits the complete concentration of Zn is illustrated in fig. 3, zinc is beneficial for human, since it is an important in the metabolic pathways, and the decrease in the zinc can cause zinc deficiency, loss of appetite, growth retardation, changes in the skin and an immunological problems, the maximum level of Zn in fishes was 50 mg/kg [16], the results of this study is similar to the results of [11, 17].

Table 2: the concentration of copper in canned tuna

	Sample	Zinc concentration (ppm)
1	American Garden	22.05
2	Maxim's	17.50
3	Salsa	29.86
4	Catch of the day	37.50
5	Altunsa	21.38

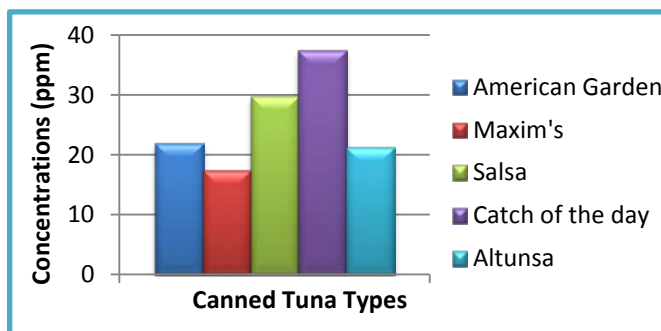


Fig.3: the concentration of zinc in canned tuna

* Zn limits=50 ppm

It's worth mention that for all of nickel, chromium and lead their concentrations were not detected in all the samples.

Conclusions

The results of this study concluded that for all the samples the concentration of Ni, Cd, Cr and Pb was not detected while the concentration of Cu, Zn, but the concentrations of Fe were much higher than the permitted limited.

Acknowledgement

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