All Sciences Proceedings

1st International Conference on Scientific and Innovative Studies

April 18-20, 2023 : Konya, Turkey

ICSIS

All Sciences Proceedings
http://as-proceeding.com/

https://as-proceeding.com/index.php/icsis

Evaluation Of Mercury And Lead In Edible Tissue Of Red Mullet From Retail Shops, Tirana

Enkeleda Ozuni[*1], Luljeta Dhaskali [1], Doriana Beqiraj [1], Egon Andoni[1]

[1]*Faculty of Veterinary Medicine, Agricultural University of Tirana, Albania*

[*]*(enkeleda.ozuni@gmail.com) Email of the corresponding author*

Abstract – These study aims to evaluate the concentration levels of mercury and lead in edible tissue of Red mullet (*Mullus barbatus*) with different size. Fish samples were collected from the retail fresh fish shops of Tirana whereas a total of 82 sample muscle tissue were evaluated by using atomic absorption spectrophotometer (AAS). The results of the investigation showed that, mercury and lead concentration levels does not showed any significant statistical difference ($p>0.05$) between fish sample size of Red mullet. According to the results concentration levels of mercury and lead resulted within the maximum permitted levels for human consumption set by EC legislation.

Keywords – Heavy metals, red mullet, Mullus barbatus, muscle tissue, mercury, lead

I. Introduction

Sea products are rich with essential amino acids, fatty acids, proteins, carbohydrates, vitamins, and minerals [2], [9]. Among them, fish are widely consumed all over the world because they have a high content of proteins as well low saturated fatty acids which supports consumer's health [5]. Fish production in Albania is growing up, due to increase of fish consumption by Albanian consumers. Moreover, the main sources of fishery products are Adriatic and Ionian Sea part of the Mediterranean Sea.

Besides the health benefits consumption of fish may pose a real threat to consumers by eating them. According to literature the main source of heavy metal contamination are fish, mainly benthic species that lives into near contact with the sediment. Many studies local and international confirmed heavy metals pollution of Mediterranean Sea and fish species ho lives there [7], [9], [2]. Heavy metals are considered as the main important pollutant of aquatic animals due to their toxicity, bioaccumulation and non-biodegradable properties in the food chain. Among them, mercury and lead have no biological function in humans and they are harmful even at low concentration. For that reason fish muscle is randomly analysed to determine the concentration levels of heavy metals such as mercury and lead.

Mediterranean Sea is reach with a large variety of wild fish species such as red mullet [8]. Red mullet is a fish species with high economically and scientifically interest in European countries and Albania too. Recent researches used Red mullet as an important indicator of heavy metal contamination of Mediterranean Sea.

The aim of the study was to verify the concentration level of mercury and lead in edible tissue of red mullet (*Mullus barbatus*), and compare the results with EC regulation limits for human consumption.

II. Materials and Method

Fish species named Red mullet (*Mullus barbatus*) was collected and purchased during summer 2015.

The study included 82 samples of muscle tissue of Red mullet with different size (small fish size, mean weight 15 gr, and large fish sized, mean weight 40 gr). The fish samples were first, identified, weighed, catalogued and conserved at - 18°C and then they were sent for further investigation to the Laboratory of Toxicology, Institute of Veterinary and Food Safety, Tirana.

Samples muscle tissue of Red mullet was evaluated for the concentration level of mercury and lead by using an Atomic Absorption Spectrophotometer (AAS). Fish tissue was homogenized in a blender; and then they were dried at 100 ºC. One g of sample was weighed and then treated with 10 ml of HNO_3 and 5 ml of concentrated H_2SO_4 and let in overnight. The next day they were dried at 150º C for at least, 30 minutes and 50 ml of it were put into a normal flask, and filled with tap water. The heavy metals were measured by ICP-OES, Optima 2100 Dv produced by Perkin Elmer.

A. *Statistical evaluation*

The statistical evaluation of the data were evaluated by using SPSS (Statistical Package for Social Sciences) 25.0. The level of significance was set as ($p \leq 5\%$). The comparison values between groups were performed by using student test. The statistical data on the below table comprised average, standard deviation, standard error, p value and interval of confidence.

III. RESULTS AND DISSCUSSION

The concentration level and (SD) of mercury and lead (mg/kg wet weight) in muscle sample tissues of red mullet samples are given in the below tables (Tab. 1 and Fig.1). The results of the study show that mercury and lead are present at different concentration levels in all sample tissues of red mullet according to weight.

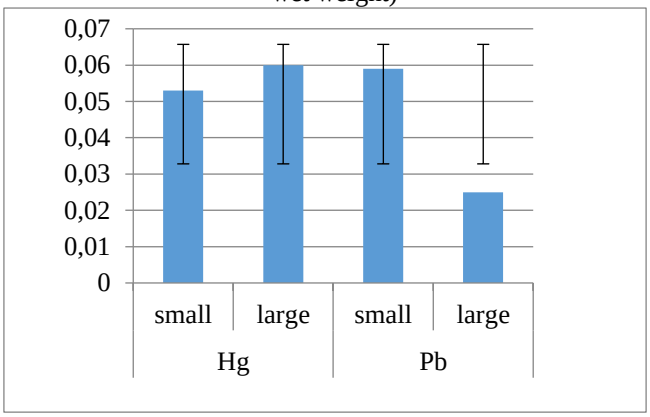
According to the results the concentration level (mg/kg ww) of mercury (Hg) and lead (Pb) in sample muscle tissue of small fish size and large fish size of Red mullet resulted within the maximum permitted level for human consumption (Hg – 1.0; Pb - 0.30 mg/kg wet weight, [3],[4]), set by EC legislation. The order of heavy metals ranged as follows, Hg>Pb.

Tab. 1. Average mean value of mercury and lead in muscle sample tissue of Red mullet with different weight (mg/kg wet weight)

Heavy metals		N	Mean	SD	t	df	p value
Hg	small	41	.053	.089	-.425	80	.672
	large	41	.060	.076			
Pb	small	41	.059	.110	1.796	80	.078
	large	41	.025	.051			

The average mean concentration and (SD) of mercury (mg/kg ww) in small fish size of Red mullet was 0.052 ±0.089 and 0.060 ± 0.076 in large fish size. The average mean concentration and (SD) value of lead (mg/kg ww) was 0.059± 0.110 in small fish size and 0.0255 ± 0.051 in large fish size.

Fig.1. Average means concentration levels and SD of mercury and lead in muscle samples of Red mullet (mg/kg wet weight)



The results of the study indicate that mercury and lead concentration level ($p>0.05$) doesn't showed significant statistical difference between small and large fish size samples of fish.

Even mercury accumulation in red mullet is considered as an important health risk; in our case all muscle sample tissue of fish contained mercury below the permitted levels in this study. Likewise, many authors in their studies ([6], [10], [2], [8]) reported mercury concentration lower than the legal limits for human consumption.

According to lead our data of the study are in total accordance with similar studies (mean: < 0.06 mg/kg ww, [2], [8]).

The differences in heavy metals concentration in fish is related not only to origin of species and behavior, but also to others factors as nature of aquatic environment [1] feeding habits, sex, weight. It was also reported that the differences in metal concentrations of the tissues might be a result of their capacity to induce metal-binding proteins such as metallothionein [1].

IV. CONCLUSION

In terms of food safety all muscle sample tissue of Red mullet collected from retail shops of Tirana are considered suitable for human consumption. The data of the study revealed that mercury and lead concentration levels in all cases resulted within the permissible levels for human consumption set by EC legislation.

REFERENCES

[1] Canli. M and Atli. G. The relationships between heavy metal (Cd, Cr, Cu, Fe, Pb, Zn) levels and the size of six Mediterranean fish species. *Environmental Pollution*, 121(1):129-136, 2003.

[2] Copat. C, Bella. F, Castaing. M, Fallico. R, Sciacca. S and Ferrante. M. Heavy metals concentrations in fish from Sicily (Mediterranean Sea) and evaluation of possible health risks to consumers. Bulletin of *Environmental Contamination and Toxicology*, 88(1):78-83, 2012.

[3] E.C. (2006). *Setting maximum levels for certain contaminants in foodstuffs.* European Commission Regulation https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=celex%3A32006R1881.

[4] E.C. (2008). *Amending Regulation (EC) No 1881/2006 setting maximum levels for certain contaminants in foodstuffs.* European Commission Regulation https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32008R0629&from=ES

[5] Ikem. A, Egiebor. N. Assessment of trace elements in canned fishes marketed in Georgia and Alabama. Journal of Food Composition and Analyses, 18:771-778, 2005.

[6] Kucuksezgin. F, Altay. O, Uluturhan. E and Kontas. A. Trace metal and organochlorine residue levels in red mullet (*Mullus barbatus*) from the eastern Aegean, Turkey. *Water Research*, 35(9):2327-2332, 200.

[7] Ozuni. E, Beqiraj. D, Dhaskali. L & Andoni. E. Monitoring of heavy metals concentration in European Hake. *The Eurasia Proceedings of Health, Environment and Life Sciences (EPHELS)*, 6, 6-10, 2022.

[8] Ozuni. E, Andoni. E, Beqiraj. D & Sulce. M. Heavy metals in edible tissue of red mullet from Tirana market. *The Eurasia Proceedings of Health, Environment and Life Sciences (EPHELS*), 4, 1-4, 2021.

[9] Storelli. M. M. Potential human health risks from metals (Hg, Cd, and Pb) and polychlorinated biphenyls (PCBs) via seafood consumption: estimation of target hazard quotients (THQs) and toxic equivalents (TEQs). *Food and Chemical Toxicology*, 46(8):2782-2788, 2008.

[10] Storelli. M. M and Marcotrigiano. G. O. Bioindicator organisms: heavy metal pollution evaluation in the Ionian Sea (Mediterranean Sea—Italy*). Environmental Monitoring and Assessment*, 102(1):159-166, 2005.