

Comparison of Metal Content of Imported and Local Red Meat in Iraqi Market by XRF Technique

Mousa Rashid ALI¹, Dalaho Dhahir Hamad^{2*}, Rabar Mohammed Hussein³

¹ KSQ Authority, Erbil, F.R.Iraq

²Department of Chemistry, Faculty of Science, Firat University, Elazig, Turkey,

³ Department of Medical Laboratory techniques, Noble Technical Institute, Erbil, Kurdistan region .Iraq.

Corresponding author: rabarmohammad@yahoo.com

Abstract

Red meat is the one of the most food and essential in the world. Therefore, it has enormous commercial value and social importance. Meat consumption continues to increase due to its physiological effects, its pleasant taste, aroma and many health benefits. This study was aimed to determine the concentrations of some major, minor and trace elements in five different red meat samples from my country (Iraq) and four another country origins (Australia, Ukraine, Paraguay, Moldova) where the red meat imported to Erbil city, Iraq. The red meat samples were analyzed for thirteen elements (Cr, Mn, Fe, Co, Ni, Cu, Zn, As, Se, Cd, Sb, Hg and Pb) by using X-Ray Fluorescence (XRF). Prior to the analysis by X-Ray Fluorescence (XRF), all red meat samples were completely used as a solid sample. According to the obtained results, the determined elements were classified into one group elements according to their concentration in different red meat samples, Statistical analysis of the results showed significant differences in the concentration of each element in different red meat samples of my country (Iraq) and different countries.

Keywords: Red meat, Trace element, Elements, Analysis, X-Ray Fluorescence (XRF)

1. Introduction

Meat is one of main products which used by human and contingent upon it to getting of animal protein, particularly the fundamental amino acids, preferably human utilization of red meat to white [1].

Despite the fact the freeze is the most excellent way but its freezing before finishing the stiffness flinging phase lead to the lower meat softness and fibers stiffness during blending and therefore impact the quality and palatable of the meat and this prompts the negative influence of the purchaser side. Due to import different sorts for meat into tje country without knowledge of the quality and condition of storage, this consider could have been guided for evaluate a part of the chemical, physical properties and evaluated physically by taste and compare it with the local red meat, and also conducted the questionnaire form to discover the consumer (client) and the problems in the consumption of red meat, which might be the first time that questionnaire problem issues in the meat accomplished for Iraq set up will figure out of the issues confronted Eventually Tom's perusing the purchaser in order decide of the problems faced by consumer in order to find replies to these problems [2].

Excess lead may bring about genuine damage of the mind, kidneys, sensory system and red platelets. Energetic children, infants and embryos would particularly vulnerable to lead harm. Us condition insurance Agency (EPA) says dat lead may make embroiled in causing leukemia [3].

High centralization of copper oxide may impact from welding operation. The rust of copper containing composites to pipe fittings may put in quantifiable sum about copper in to the water [4]. Copper substance of ordinary individual grown-up is 50-120 mg, At more than 15 mg reasons queasiness, retching, looseness of the bowels and intestinal hurt. Copper inadequacy results in iron deficiency and the inborn lack of ability discharge copper bringing about amassing and wilsons, s infection. Ecological grouping of nickel is enhanced by nickel creating and preparing industry undertaking. Vehicles deplete a broad sum from nickel which is gotten from oil. Cigarette smoking auto could assemble the took in nickel to the degree dat 4 µg for each pack from Cigarette [5].

By far most of the Mn noticeable all around in light of the flaring from fossil fuels.The point while one is exhibited of the bigger sum for Mn, it reasons "Manganese psychosis" a psychological maladjustment depicted by

uncontrolled giggling, happiness, lack of caution, sexual fervor copied by impotency. Zinc is important for typical working of cell including protein combination, sugar digestion, cell Growth and cell division [6].

Heavy Metals The term heavy metals have been generally utilized as a group name for metals and metalloids that have been related with contamination and potential toxicity or Eco toxicity. [7,8]

Different terminologies have been utilized in the definition of heavy metals. In terms of density; they are referred to as metals with density (specific gravity) bigger than 5 g/cm³ [9, 10].

2. Materials and Methods

2.1. Sample collection

A total of twenty specimens collected of dissimilar imported frozen and fresh local red meat(cow meat) were arbitrarily collected from different part in animal body in business local markets in Erbil city. Four sources-imported red meat(frozen) and one local fresh red meat. Four imported legally red meat(frozen) from four different countries (Ukraine, Paraguay, Moldova and Australia) and Iraq.

Every group was collected throughout the period of march to may 2017. These parts of red meat are often inspired by the public as differentiate upon their flavor. This test was so planned to confirm the concentration of essential and toxic metal amassing in them

2.2. Samples preparation

Only 10g ± 0.2 specimens of each part were weighed up utilizing a sensitive balance, put in an oven at 105°C overnight then grounded to be ready for analysis. Must don't have humidity in the sample.

2.3. Sample analysis of elements

The residues of Fe, Mn, Mg, Zn, Ca, and Pb were determined utilizing X-ray fluorescence spectrometer, Skyray 9000, portable XRF tool (XRF). Minimally prepared specimen size. In addition to, this technique able to be utilized for direct analysis for both solid and fluid materials.

2.4. Statistical Analysis

This data of the studying was statistically analyzed using statistical package for social science (SPSS, Version 16), which is a statical package used for statistical analysis. The contained data was expressed as (Mean ±St Dev). Differences in mean values of each element in all five group red meat samples were analyzed by one-way ANOVA and Duncant test and relationships between concentrations of the elements in analyzed red meat were assess by using the Pearson's linear correlation coefficient. The level of P - value (P < 0.05) level of significant was considered to be statistically significant.

3. Results and Discussion

3.1. Concentration of Elements in Analyzed red meat Samples

In this study, concentration of 13 elements (Cr, Mn, Fe, Co, Ni, Cu, Zn, As, Se, Cd, Sb, Hg, and Pb) were determined in red meat samples by X-Ray Fluorescence (XRF). According to the obtained results in this study the measured elements can be classified into three major group, due to their concentration, the first group will be named as macro or essential element because their concentrations are too high in red meat as compared to other elements and include five elements which are (Fe, Zn and Pb), the concentration trend of macro elements were fund to be as follows: Fe > Zn > Pb>As

Red meat is one of the important sources of some micro elements such as Co, Ni, Cu, Se and Hg. The order of mean concentrations of the micro elements in all analyzed red meat samples was found. Table 4.1.

The third and final group of elements determined is trace elements in which red meat samples contain some essential trace elements like Mn, Cr, Cd and Sb which are contain near zero concentration.

Table 1. Concentrations (mean ± standard deviation + minimum + maximum) in (mg/kg) of elements in five different red meat samples:

		N	Mean	Std. Deviation	Minimum	Maximum
Cr(mg/kg)	Iraq	4	0.0000	0.0000	0	0
	Ukraine	4	0.0000	0.0000	0	0
	Paraguay	4	0.0000	0.0000	0	0
	Moldova	4	0.0000	0.0000	0	0
	Australia	4	0.0000	0.0000	0	0
	Total	20	0.0000	0.0000	0	0
Mn(mg/kg)	Iraq	4	0.0000	0.0000	0	0
	Ukraine	4	0.0000	0.0000	0	0
	Paraguay	4	0.0000	0.0000	0	0
	Moldova	4	0.0000	0.0000	0	0
	Australia	4	0.0000	0.0000	0	0
	Total	20	0.0000	0.0000	0	0
Fe(mg/kg)	Iraq	4	0.1121	0.0063	.1027	.1162
	Ukraine	4	0.1098	0.0022	.1078	.1130
	Paraguay	4	0.1139	0.0041	.1100	.1181
	Moldova	4	0.1129	0.0053	.1076	.1194
	Australia	4	0.1126	0.0026	.1102	.1156
	Total	20	0.1122	0.0042	.1027	.1194
Co(mg/kg)	Iraq	4	1.1128	0.0883	.999	1.183
	Ukraine	4	1.1921	0.1124	1.089	1.347
	Paraguay	4	1.2166	0.0681	1.155	1.287
	Moldova	4	1.1991	0.0406	1.141	1.234
	Australia	4	1.1377	0.0459	1.079	1.189
	Total	20	1.1717	0.0787	.999	1.347
Ni(mg/kg)	Iraq	4	0.0018	0.0037	0	
	Ukraine	4	2.4247	0.4214	2	3
	Paraguay	4	0.2819	0.5638	0	1
	Moldova	4	1.3266	1.8092	0	4
	Australia	4	1.8951	3.2278	0	7
	Total	20	1.1860	1.7721	0	7
Cu(mg/kg)	Iraq	4	1.2295	0.9092	0.000	2.186
	Ukraine	4	5.0958	1.7773	3.171	6.675
	Paraguay	4	0.9481	1.6961	0.000	3.483
	Moldova	4	2.8448	3.3188	0.000	6.269
	Australia	4	1.0426	1.0801	0.000	2.086
	Total	20	2.2321	2.3809	0.000	6.675
Zn(mg/kg)	Iraq	4	469.0896	30.4756	433.0405	497.8603
	Ukraine	4	478.3351	7.5375	467.5414	484.2461
	Paraguay	4	387.4691	85.6690	266.5728	467.2845
	Moldova	4	388.5932	180.7428	144.7723	537.5874
	Australia	4	162.5233	20.5769	136.3054	180.7192
	Total	20	377.2021	142.2048	136.3054	537.5874
As(mg/kg)	Iraq	4	1.8655	0.2428	1.5044	2.0154
	Ukraine	4	2.0629	0.3047	1.8483	2.5062
	Paraguay	4	1.9068	0.2421	1.5955	2.1853
	Moldova	4	1.9310	0.2216	1.7022	2.1232

		N	Mean	Std. Deviation	Minimum	Maximum
	Australia	4	1.6683	0.1607	1.5129	1.8935
	Total	20	1.8869	0.2494	1.5044	2.5062
Se(mg/kg)	Iraq	4	0.2029	0.1349	.1200	.4045
	Ukraine	4	0.1506	0.0239	.1200	.1773
	Paraguay	4	0.2482	0.1127	.1200	.3916
	Moldova	4	0.2806	0.2030	.1200	.5757
	Australia	4	0.1290	0.0181	.1200	.1561
	Total	20	0.2023	0.1223	.1200	.5757
Cd(mg/kg)	Iraq	4	0.0000	0.0000	0	0
	Ukraine	4	0.0000	0.0000	0	0
	Paraguay	4	0.0000	0.0000	0	0
	Moldova	4	0.0000	0.0000	0	0
	Australia	4	0.0117	0.0235	0	
	Total	20	0.0023	0.0105	0	
Sb(mg/kg)	Iraq	4	0.0000	0.0000	0	0
	Ukraine	4	0.0000	0.0000	0	0
	Paraguay	4	0.0000	0.0000	0	0
	Moldova	4	0.0000	0.0000	0	0
	Australia	4	0.0000	0.0000	0	0
	Total	20	0.0000	0.0000	0	0
Hg(mg/kg)	Iraq	4	0.0414	0.0120	.0327	.0590
	Ukraine	4	0.0254	0.0121	.0150	.0366
	Paraguay	4	0.0264	0.0145	.0150	.0454
	Moldova	4	0.0244	0.0125	.0150	.0414
	Australia	4	0.0203	0.0105	.0150	.0360
	Total	20	0.0276	0.0133	.0150	.0590
Pb(mg/kg)	Iraq	4	39.7994	11.9600	30.3731	55.4661
	Ukraine	4	42.8097	14.2434	25.0560	59.7794
	Paraguay	4	41.9980	8.0102	34.8099	51.0876
	Moldova	4	43.6021	5.3318	35.6795	47.2695
	Australia	4	43.5059	8.3927	34.2958	54.6104
	Total	20	42.3430	9.0781	25.0560	59.7794

3.2. Statistical Analysis on the Result

One Way Variance Analysis (ANOVA)

The obtained results were analyzed by one way analysis of variance(ANOVA), and Duncan test to show the elements which have large variations and significant and nonsignificant differences in their concentration levels in different red meat samples. And the results showed that there are significant and nonsignificant differences were observed for different red meat samples.

Table 2. Concentration (mg/kg) and standard deviation value of thirteen elements in red meat samples, different matching letters in a column mean significant differences according to Duncan test (P<0.05)

		Sum of Squares	df	Mean Square	F	Sig.
Cr(mg/kg)	Between Groups	0.000	4	0.000		

	Within Groups	0.000	15	0.000		
	Total	0.000	19			

Cr (mg/kg)	Between Groups	0.000	4	0.000		
	Within Groups	0.000	15	0.000		
	Total	0.000	19			
Mn (mg/kg)	Between Groups	0.000	4	0.000		
	Within Groups	0.000	15	0.000		
	Total	0.000	19			
Fe (mg/kg)	Between Groups	0.000	4	0.000	0.483	0.748
	Within Groups	0.000	15	0.000		(NS)
	Total	0.000	19			
Co (mg/kg)	Between Groups	0.031	4	0.008	1.354	0.296
	Within Groups	0.086	15	0.006		(NS)
	Total	0.118	19			
Ni (mg/kg)	Between Groups	17.107	4	4.277	1.507	0.250
	Within Groups	42.561	15	2.837		(NS)
	Total	59.668	19			
Cu (mg/kg)	Between Groups	50.579	4	12.645	3.320	0.039
	Within Groups	57.130	15	3.809		(S)
	Total	107.709	19			
Zn (mg/kg)	Between Groups	259973.344	4	64993.3	7.846	0.001
	Within Groups	124248.426	15	8283.22		(HS)
	Total	384221.770	19			
As (mg/kg)	Between Groups	0.326	4	0.082	1.429	0.272
	Within Groups	0.856	15	0.057		(NS)
	Total	1.182	19			
Se (mg/kg)	Between Groups	0.065	4	0.016	1.114	0.386
	Within Groups	0.219	15	0.015		(NS)
	Total	0.284	19			
Cd (mg/kg)	Between Groups	0.000	4	0.000	1.000	0.438
	Within Groups	0.002	15	0.000		(NS)
	Total	0.002	19			
Sb (mg/kg)	Between Groups	0.000	4	0.000		
	Within Groups	0.000	15	0.000		
	Total	0.000	19			
Hg (mg/kg)	Between Groups	0.001	4	0.000	1.705	0.201
	Within Groups	0.002	15	0.000		(NS)
	Total	0.003	19			
Pb (mg/kg)	Between Groups	38.978	4	9.744	0.096	0.982
	Within Groups	1526.83	15	101.789		(NS)

Total	1565.8	19			
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3.3. Correlation

Correlation between Elements in red meat between Iraq and other four countries.

To determine a correlation between concentrations of elements in red meat samples, Dunnett t-tests treat one group as a control and compare all groups against it coefficient were assessed, this table (Table 3) shows us the difference between Iraq and other countries, most of them nonsignificant

Table 3. Dunnett t-tests treat one group as a control, and compare all others groups against it

Dunnett t (2-sided) ^a				
Dependent Variable		Mean Difference (I-J)	Std. Error	Sig.
Fe(mg/kg)	Ukraine	-.0023000	0.0031	0.870
	Paraguay	.0018000	0.0031	0.939
	Moldova	.0008500	0.0031	0.996
	Australia	.0004750	0.0031	1.000
Co(mg/kg)	Ukraine	.079300	0.0537	0.413
	Paraguay	.103750	0.0537	0.208
	Moldova	.086225	0.0537	0.344
	Australia	.024850	0.0537	0.971
Ni(mg/kg)	Ukraine	2.423	1.1910	0.175
	Paraguay	.280	1.1910	0.998
	Moldova	1.325	1.1910	0.642
	Australia	1.893	1.1910	0.353
Cu(mg/kg)	Ukraine	3.866300*	1.3800	0.043
	Paraguay	-.281400	1.3800	0.999
	Moldova	1.615325	1.3800	0.603
	Australia	-.186850	1.3800	1.000
Zn(mg/kg)	Ukraine	9.2455250	64.3554	1.000
	Paraguay	-81.6204500	64.3554	0.540
	Moldova	-80.4964250	64.3554	0.551
	Australia	-306.5662500*	64.3554	0.001
As(mg/kg)	Ukraine	.1974750	0.1689	0.604
	Paraguay	.0413500	0.1689	0.997
	Moldova	.0655500	0.1689	0.985
	Australia	-.1971250	0.1689	0.606
Se(mg/kg)	Ukraine	-.0522750	0.0854	0.927
	Paraguay	.0453000	0.0854	0.954
	Moldova	.0776500	0.0854	0.774
	Australia	-.0738750	0.0854	0.801
Cd(mg/kg)	Ukraine	0.000	0.0070	1.000
	Paraguay	0.000	0.0070	1.000
	Moldova	0.000	0.0070	1.000
	Australia	.012	0.0070	0.357
Hg(mg/kg)	Ukraine	-.0160000	0.0088	0.247
	Paraguay	-.0150500	0.0088	0.292
	Moldova	-.0170500	0.0088	0.203
	Australia	-.0211750	0.0088	0.089
Pb(mg/kg)	Ukraine	3.0102750	7.1340	0.979
	Paraguay	2.1986000	7.1340	0.993
	Moldova	3.8027000	7.1340	0.953
	Australia	3.7065500	7.1340	0.957

*. The mean difference is significant at the 0.05 level.

a. Dunnett t-tests treat one group as a control, and compare all other groups against it.

2. Conclusion

Meat is one of the major food daily used for eating people, In this experiment, the researcher has collected the import meats formally in different borders come to the Erbil province from international country when compared to the local animal meats also the researcher choose 13 elements randomly style these elements consists of the 13 elements in different countries include: (Cr, Mn, Fe, Co, Ni, Cu, Zn, As, Se, Cd, Sb, Hg and Pb) (Iraq- Ukraine- Paraguay- Moldova- and Australia) also of this experiment have difference between countries and Iraq –Erbil city by XRF instruments have done the test.

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