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Minerals Composition of Seven Egyptian Beef and Buffalo Organ Meats

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ABSTRACT

The aim of this study was the evaluation of both chemical and nutritional qualities of seven organs, namely; liver, heart, kidney, brain, tongue, spleen, and lung of both beef and buffalo by-products.

The average age of the cows and buffaloes from which samples were with-drawn was the normal commercial age between two and two and half years.

The samples were medically examined and were found free from infectious diseases.

Total phosphorus was determined colorimetrically by the sulphomolypdic acid method. While, the O-phenanthroline colorimetric method was used for iron determination. The versine (disodium dihydrogen ethylene diamine tetra acetic acid) titration method was used for calcium determination.

All the data were statistically analysed and revealed that high significant differences between beef and buffalo organs were recorded in their phosphorus and iron contents as well as in their calcium content.

There were no significant differences between animals in their phosphorus, iron and calcium contents.

The total phosphorus content of buffalo's organs were higher than that of beef's except, liver, kidney, and brain.

Beef's and buffalo's brain, liver, and spleen had higher phosphorus content than that of other studied organs.

Beef's and buffalo's spleen had higher iron content than that of other studied organs.

Besides, iron is present in high concentration in beef's and buffalo's kidney, liver and lung.

Both beef's and buffalo's kidney had higher calcium content than that of other studied organs. Calcium is present in relatively high concentration in spleen and heart of buffalo and spleen, lung, and brain of beef.

Generally, the seven studied organs of beef and buffalo may be considered as rich sources of phosphorus and good sources of iron in human diet. However, they are apparently poor sources of calcium.

INTRODUCTION

While the mineral elements occupy nearly a small amount of the body weight, but they are very necessary for the most physiological processes of the body. The mineral elements have several functions: (1) It is important in building skeleton and teeth of body. (2) It regulates and maintains the chemical reactions of the body. (3) It also maintains the osmotic pressure which is necessary for most of the physiological functions.

For theses functions, the body is in need of eight elements, i.e. sodium, potassium, calcium, phosphorus, magnesium, sulpher, iron and chlorine. These occupy 60:80% of total amount of the mineral elements of the body. Phosphorus is very important for metabolism, storage and transformation of energy. Most of the calcium element present in the skeleton and teeth, so, its absence leads to poor development, lower growth and osseous abnormalities. Calcium ions are very essential for blood clot formation, most of the physiological function of heart muscles, nerves and in permeability of different types of membrane.

Kidney, liver, and heart are a good source of the iron. (Mohamed, et al., 1965). Calcium, phosphorus and iron have received the most attention in the research related to minerals in meat. However, meat is a good source of dietary phosphorus and iron meanwhile it is quite poor in calcium.

MATERIALS AND METHODS

a- Materials:

Three representative samples were taken from each of the specified beef and buffalo organs, namely: Liver, Heart, Kidney, brain, Tongue, spleen, and Lung, were obtained immediately after sloughtering from Assiut abattoir. The average age of the cows and buffaloes from which the samples were withdrawn was the normal commercial age (between 2-2.5 years).

b- Methods:

Total phosphorus was determined colorimetrically by the sulphomolypdic acid method as described by Jackson (1958). Using a Beckman colorimeter at a wave length of 660 mμ.

The 0,phenanthroline colorimetric method was used for iron determination as outlined by Jackson (1958).

The versine (disodium dihydrogen ethylene diamin tetra acetic acid) titration method was used for calcium determination according to Jackson (1958).

Table (1) represents the average values of minerals content of seven studied organs of beef, and buffalo. The statistical analysis of variance of each data is tabulated in table (2).

a. Phosphorus:

Both beef and buffalo brain recorded the highest phosphorus content studied followed by the spleen and liver, more than that of other studied organs.

Table (1): The mineral content of fresh organs of beef and buffalo[(a)].

Variety meats	Kind of animal					
	beef			buffalo		
	P	Fe	Ca	P	Fe	Ca
Liver	11.32^{b}	36.81^{d}	31.52^{c}	11.14^{c}	34.33^{c}	31.32^{cd}
Heart	7.56^{c}	20.92^{e}	29.82^{cd}	9.72^{cd}	24.98^{d}	35.37^{b}
Kidney	11.27^{b}	46.08^{b}	66.32^{a}	10.44^{cd}	46.58^{b}	64.50^{a}
Brain	16.78^{a}	12.49^{f}	36.65^{b}	14.99^{a}	11.53^{e}	33.83^{bc}
Tongue	4.88^{d}	7.98^{g}	27.67^{d}	4.90^{e}	7.74^{f}	29.96^{d}
Spleen	12.21^{b}	98.81^{a}	39.51^{b}	12.98^{b}	101.87^{a}	37.34^{b}
Lung	8.69^{c}	39.54^{c}	37.95^{b}	9.57^{d}	35.33^{c}	34.54^{bc}

(a) Calculated on dry weight basis.

(a,b,c,d,e,f,g): Symbols indicating the result of dunken test.

Table (2): Analysis of variance of data given in table (1).

S.V.		D.F.	M.S.		
			Ca	Fe	P
Between organs	A	6	918.546**	5770.866**	70.831**
Between kind of animal	B	1	1.410	0.010	0.226
A x B		6	15.665**	12.755**	2.451*
Error		28	4.428	2.317	0.736

S.V. = Source of variance.
D.F. = Degrees of freedum.
M.S. = Mean of squares.
* = Significant.
** = Highly significant.

Amif, (1970), reported that the mean values for phosphorus are generally higher in liver, kidney and spleen.

The increase of phosphorus in brain, spleen, and liver for beef and buffalo may be due to the phosphorus fractions, (acidic phosphorus, inorganic phosphorus, lipophosphorus, protein phosphorus, and acidic organic phosphorus), which were higher in these organs than that of the other studied organs. Such finding confirmed the results of El-Sayad (1979), and are in agreement with those previously reported by: Wright and Forsyth (1927), Watt and Merrill (1950), Schweigert and Payne (1956), Watt and Merrill (1963), and McCance and Widdowson's (1978).

Results shown in table (2) indicate that there were highly significant differences in phosphorus content between organs of each animal. However, the interaction between organs and animals in the phosphorus content recorded significant differences.

Meanwhile, no significant differences between beef and buffalo in phosphorus content were detected.

b- Iron:

Table (1), shows that spleen contains the highest iron content among all studied organs in both beef and buffalo. Likewise iron is present in high concentrations, in beef and buffalo kidney, liver, and lung.

Results given in table (2) indicate that there were highly significant differences in iron content between organs of each animal as well as in the interaction between organs and animals. Meanwhile, there were no significant differences in iron content between beef and buffalo.

According to (Pyanovskaya, et al., 1969), iron mainly accumulates in the spleen and thyroid gland. While Amif, (1970), reported that iron levels in kidney, liver and spleen are substantially higher than in the other variety organs.

Results obtained in this investigation are in agreement with those reported by: Watt and Merrill (1950), Schweigert and Payne (1956), Kizlaitis, et al. (1962), Watt and Merrill (1963), and McCance and Widdowson's (1978).

c- Calcium:

Results given in table (1) indicate that, kidney contains the highest calcium content, while tongue contains the lowest calcium content in both beef and buffalo in comparison with the other studied organs.

The statistical analysis given in table (2) indicate that there were highly significant differences in calcium content between organs of each animal.

Meanwhile, there were no significant differences in calcium content between beef and buffalo organs. However, the interaction between organs and animals was highly significant.

Such results are in agreement with those previously reported by: Watt and Merrill (1950), Schweigert and Payne (1956), Watt and Merrill (1963), McCance and Widdowson's (1978), and Osborne and Voogt (1978).

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