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Effect of Freezing and boiling on minerals content of six Egyptian buffalo organs.

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Abstract

This investigation was carried out to study freezing boiling effect on the nineral content of six buffalo organs, namely: Liver, Heart, Kidney, Spleen, Tongue and Brain.

These organs were obtained immediately after slaughtering from Assiut slaughter house. The avarage age of the animals was the normal commercial age. These ages rated between 2-2.5 years. Samples of organs were transfered without delay to the Food Technology Laboratory, Assiut University.

Copper, Zinc, Iron, Manganese, Calcium, Magnesium, Sodium, Potassium and Phosphorus contents in the aforementioned organs were evaluated as follows:

Sodium and potassium contents were determined by a carl-zeiss jena flame photometer. The stock electrolyte solution of dry ashing was assessed.

Phosphorus was determined colorimetrically by the ammonium molybdate method. While the versine titration method was used for calcium determination. Copper, Iron, Zinc, Manganese and Magnesium were determined using Unicam SP 1900 atomic absorption spectrophotometer. The results revealed that:

1- Liver, heart and spleen of buffulo contained higher levels of copper, iron, manganese, magnesium, potassium and phosphorus than the other organs, except brain which contained relatively higher levels of magnesium, potassium and phosphorus than tongue and kidney.

2- Zinc levels in all organs were found to be much higher than other minerals.

3- Spleen and liver were of relatively higher iron content.

4- In general, all studied buffalo organs may be considered as rich sources of iron, phosphorus, zinc, manganese, potassium and copper, wile they may be considered as good sources of sodium and magnesium in human diet. Meanwhile they are reckoned as poor sources of calcium.

5- Boiling, resulted in decreasing phosphorus, calcium, sodium and potassium contents, accompanied by an increment in zinc, copper, iron, manganese and magnesium contents in all studied buffalo organs.

Introduction

Edible offals (variety meats or meat organs) such as brain, kidney, liver, lung and spleen are among meat by-products and can be considered as a nutritionally rich meal as they contain sufficient amounts of high quality animal proteins, minerals and vitamins. Moreover, they are easily digested and their extract provokes the flow of gastric juice. (El-Moudy, 1979).

The influence of various cooking and heating treatments on the minerals content of some food-stuffs typical to the American diet was investigated by Higgs et al. (1972). They found that baking, broiling had little or no effect on the amounts of the minerals in meat by-products.

Minerals are not destroyed during cooking of meat organs, so the method of preparation will affect the mineral content of the meat organs only if drip losses are excessive or cooking water is discarded (McCance and Widdowson, 1960; Adams, 1975; Chruch and Church, 1975).

Seed El-Din (1979), reported that Canel's heart is generally a poor source of calcium. It is evident that boiling had a little effect on calcium concentration.

Saad El-Din (1979) stated that boiling decreased phosphorus content in canel's heart.

Materials and Methods

I- Materials:

Three representative samples from each of the following specified buffalo organs namely: Liver, heart, kidney, spleen, brain and tongue were obtained immediately after slaughtering from Assiut Slaughter house.

The average age of the cows from which the samples were withdrawn was the normal commercial age (between 2-2.5 years).

Samples of organs were transfered without delay to the Food Technology Laboratory, Assiut University.

II- Methods:

A. Technological methods:

The samples of each organ were divided into four groups. Three groups were placed in polyethlene bags, frozen at -20°C, and further-stored at -20°C for 2,4 and 6 months.

At the end of every freezing period, samples were drawn at random, thawed at room temperature and than analysed.

The fourth group was divided into two parts, and every part was subjected to different treatments as follows:-

a) The first part (RAW):
Cut-into small pieces, mixed, chopped twice in a meat chopper, than kept as control in glass containers and stored at +4°C for chemical analysis.

b) The second part:
The samples were sliced (5x2.5x2 cm.) and blanched in boiled water for three different periods. The samples were minced, thoroughly mixed, then kept in glass containers and stored at +4°C for chemical analysis.

B. Chemical Methods:

Mineral content:

Sodium and potassium contents:

Sodium and potassium were determined by a Carl-Zeiss jena flame photometer. The stock electrolyte solution of dry ashing was used according to Jackson (1958).

Phosphorus:

Phosphorus was determined colorimetrically by the ammonium molybdate method as described by Jacobs, (1962).

Calcium:

The versine titration method was used for calcium determination, (Jackson, 1958).

Copper, Iron, Zinc, Manganese and Magnesium:

These minerals were determined using unicam SP 1900 atomic absorption spectrophotometer according to Gorsuch, (1959).

C. Statistical Methods:

The data were statistically analysed according to the method described by Steel and Torrie, (1960). According to this method the correlation coefficient(r) between freezing, as an independent variable and boilling as dependent variable is computed on the basis of four data values.

Results and Discussion

Effect of freezing and boiling on mineral's content of buffalo organs:

Tables (1-2) represent the statistical analysis the averages mineral contents of buffalo liver, kidney, heart, spleen, tongue and brain.

An over look at these Tables showed that fresh spleen contained higher levels of iron, manganese, calcium and magnesium than other studied organs.

The phosphorus values are generally higher in liver, followed by brain and spleen, while, heart, tongue and kidney contained lowest levels of phosphorus.

The data showed that heart, kidney and spleen had much lower zinc ontent than the other studied organs. While brain and tongue had much higher zinc content than the latter. Liver might have an intermediate zinc content between tongue and spleen.

On the other hand, liver contained the highest copper and phosphorus levels and the lowest levels of calcium and sodium. While brain had the lowest levels of copper, iron and manganese.

Heart recorded the highest potassium level, while tongue contained the lowest level of phosphorus, potassium, calcium, iron and copper.

During freeze storage periode it is interesting to note that there is a slight decrease of copper, zinc and manganese in all studied organs.

The rate of decrement of sodium, potassium and phosphorus are higher than the other minerals.

It is also noticed from above mentioned results that copper, zinc, iron, manganese and magnesium contents were increased during boiling, while phosphorus, sodium, potassium and calcium were decreased in all studied organs.

Such results are in agreement with Price, (1970) and John, (1975).

The results tabulated in Table (1), indicated that the correlation coefficients between freezing and boiling of buffalo organs are seen to be almost to I. This indicates that freezing and boiling are strongly correlated. This means that the mineral contents are strongly affected during boiling by freezing.

The population correlation coefficients are tested using the "t-test" (Table 2). It is clear that in all cases the population correlation coefficients are significantly different from zero.

This supports the sample results and generalizes the freezing-boiling mineral effect to the population.

Table (1): Correlation Coefficients(r) between Freezing-Boiling.

Buffalo organs	Cu	Zn	Iron	Mn	Ca	Mg	Na	K	P
Liver	0.9967	0.9997	0.9969	0.9843	0.9426	0.9817	0.9766	0.9985	0.9980
Kidney	0.9718	0.9985	0.9983	0.9910	0.9948	0.9803	0.9768	0.9873	0.9821
Heart	0.9939	0.9690	0.9953	0.9284	0.9478	0.9714	0.9950	0.9946	0.9378
Spleen	0.9964	0.9987	0.9971	0.9951	0.9997	0.9963	0.9482	0.9966	0.9685
Tongue	0.9971	0.9821	0.9987	0.9953	0.9942	0.9695	0.9642	0.9708	0.9992
Brain	0.9878	0.9976	0.9807	0.9962	0,9843	0.9499	0.9936	0.9947	0.9876

Table (2): Results of "t-test" for significant differences between the means at the 5 % level of significance.

Buffalo organs	Cu	Zn	Iron	Mn	Ca	Mg	Na	K	P
Liver	17.36	57.73	17.91	7.89	3.99	7.29	6.42	25.77	22.33
Kidney	5.83	25.79	24.22	10.47	13.81	7.02	6.45	8.79	7.37.
Heart	12.75	5.55	14.54	3.53	4.20	5.79	14.09	13.55	3.82
Spleen	16.62	27.71	18.53	14.23	57.72	16.39	4.22	17.11	5.50
Tongue	18.53	7.37	27.71	14.54	13.08	5.59	5.14	5.72	35.34
Brain	8.97	20.39	7.09	16.18	7.89	4.29	12.44	13.68	8.89

References

Adams, C.F. (1975). Nutritive value of American Foods. Agriculture Handbook No. 456, USDA, ARS, Washington, D.C.

Church, C.F. and Church, H.N. (1975). "Food values of portions commonly used" 12th ed. J.B. Lippincott Co., New York.

El-Moudy, R.A.E. (1979). Studies on chemical constituents of edible offals. M.V.Sc. (Meat Hygiene) Thesis, Faculty of Vet. Med. Cairo University.

Gorsuch, T.T. (1959). The destruction of organic matter. Analyst., 48, 135.

Higgs, D.J., Morris, V.C. and Levander, O.A. (1972). Effect of cooking on selenium content of food. J. Agric. Food Chem. 20: 678.

Jackson, M.L. (1958). Soil chemical Analysis. Constable and Co. L.T.D. London.

Jacobs, M.B. (1962). The chemical Analysis of foods and food products. D. Van Nostrand Co. Inc., Princeton, New Jersey.

John, M., (1975). Principles of food chemistry, 2nd, Ed., The Avi publishing company, L.N.C. Westport, Connecticut.

McCance, R.A. and Widdowson, E.M. (1960). The composition of foods. Medical Research Council Special Report. Series No. 297, London.

Price, J.F. and Schweigert, B.S., (1970). The science of meat and meat products. 2nd. Ed. W.H. Freeman and Company, Sanfrancisco.

Saad El-Din, A.M. (1979). Biochmeical analysis of Egyptian camel's heart and the effect of different cooking processes on it's nutrative value. M.Sc. Thesis, Faculty of Science, Al-Azhar Univ. Egypt.

Steel, R.G.D. and Torrie, J.H. (1960). Principles and procedures of statistics with special reference to the biological sciences. Mc.Graw Hill Book Comp.