6-35

EFFECT OF FRFEZING AND BOILING ON MINERAL CONTENT OF SIX EGYPTIAN BEEF ORGANS

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#### Summary

51

This investigation was carried out to study freezing boiling effect on the mineral content of organs, namely: Liver, Heart, Kidney, Spleen, Tongue and Praim six beef organs, namely: Liver, Heart, Kidney, Spleen, Tongue and Brain. Copper, Zinc, Iron, Manganese, Calcium, Magnesium, Sodium, Potassium and Phosphorus contents the afore-mentioned organs were evaluated. The results revealed that:

- Liver, heart and spleen of beef contained higher levels of copper, iron, manganese, magnesium, potassium and phosphorus than the other organs, except brain thick iron, manganese, higher potassium and phosphorus than the other organs, except brain which contained relatively higher levels of magnesium, potassium and phosphorus than torque 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 beef organs may be considered rich sources of iron, phosphorus, zinc, manganese, potassium and copper, while it may be considered good sources of sodium and magnesium in human diet, but they are poor sources of calcium.
5- Boiling, resulted in decreasing phosphorus, calcium, sodium and retreating while

5- Boiling, resulted in decreasing phosphorus, calcium, sodium and potassium contents, while zinc, copper, Iron, manganese and magnesium contents were increased in all beef 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). Saad El-Din (1979), reported that camel's heart is generally a poor source of calcium. It is evident that boiling had a little effect on calcium concentration. Saad PL-Dim (1970), stated that beiling devreased programs content in camel's heart.

Saad El-Din (1979), stated that boiling decreased phosphorus content in camel's heart. Materials and Methods

## Materials:

Three representative samples from each of the following specified beef 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.

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. It is a 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 then analysed.

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

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.

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# The second part:

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

Mineral content:

Sedium and potassium contents:

Sodium and potassium were determined by a carl-zeiss jena flame photometer. The stock electro $l_{yte}$  solution of dry ashing was used according to Jackson (1958). ?hosphorus:

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 C. Start to Gorsuch, (1959). 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 boiling 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 beef organs: The results revealed that fresh liver, heart and spleen contained larger levels of copper,

The results revealed that fresh liver, heart and spleen contained larger levels of copper, iron, manganese, magnesium, potassium and phosphorus than the other organs, except brain, which contained higher levels of magnesium, potassium and phosphorus than toungue and kidney. Generally, phosphorus values are higher in beef liver, brain and spleen. (Price and Schweigert, 1970).

Zinc levels in all organs were found to be much higher than copper, and manganese which is in agreement with Vnderwood (1977)

Steement with Vnderwood (1977).
 Highest zinc levels are found in brain followed by tongue and kidney, respectively, which coincides with Hosth (1973) and Ringena, (1971).
 Kidney, tongue, heart and spleen were significantly higher in its calcium and sodium contents than the other two organs.

Spleen and liver contained relatively more iron contents. It is noteworthy, that all organs contained relatively high mineral content than that of meat.

In general all organs may be considered as rich sources of phosphorus, iron, zinc, manganese, potassium and copper, except brain which is considered good source of copper. Moreover, all organs may be considered as good sources of sodium and more diversities of copper. Moreover, all organs may be considered as good sources of sodium and magnesium in human diet, but they are poor sources of calcium. of calcium.

On the other hand, the results showed that there is a slight decrease of copper, zinc and manganese in all organs during freeze storage. Moreover, the contents of phosphorus, calcium, magnesium, sodium, potassium and iron in all organs decreased during freeze storage.

Such finding suggested that freezing and thawing of organs may cause some loss of fluid containing a small portion of minerals, (Price and Schweigert, 1970 and John 1975).

Boiling, resulted in decreasing phosphorus, calcium, sodium and potassium content in all organs in accordance with Price and Schweigert (1970). While, zinc, copper, iron, manganese and magnesium were increased. Increasing zinc content with boiling may be due to its presence in an isoluble form and to the probable uptake of the zinc formulation with boiling may be due to its presence of m isoluble form and to the probable uptake of the zinc from water which contained 0.968 p.p.m. (Aziz, 1976).

An overall look at table 1, indicated that the correlation coefficients between freezing and boiling are seen to be almost close to 1. This indicates that freezing and boiling are strongly correlated. In other words, this means that the minerals are strongly affected during boiling by freezing. by freezing.

The population corelation coefficients are tested using the "t-test" (Table 2). In all cases it is clear that the population correlation coefficients are significantly different from zero. This supports the sample results and concerding the test to the This supports the sample results and generalizes the freezing-boiling mineral effect to the population.

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

Beef organs	Cù	Zn	Iron	Mn	Ca	Mg	· Na	K	Р
Liver	0.9843	0.9880	0.9912	0.9962	0.9591	0.9831	0.9166	0.9649	0.9995
Kidney	0.9911	0.9754	0.9983	0.9906	0.9988	0.9911	0.8725	0.9811	0.9945
Heart	0.9644	0.9963	0.9774	0.9916	0.9783	0.9977	0.9755	0.9699	0.9887
Spleen	0.9857	0.9880	0.9964	0.9965	0.9783	0.9809	0.9555	0.9857	0.9995
Tongue	0.9959	0.9828	0.9996	0.9705	0.9618	0.9943	0.9091	0.9979	0.9977
Brain	0.9983	0.9921	0.9949	0.9745	0.9332	0.9958	0.9726	0.9030	. 0.9910
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Table 2: Results of "t-test" for significant differences between the means at the 5% level of significance.

Beef organs	Cu	Zn	Iron	Mn	Ca	Mg	Na	K	Р
Liver	7.89	9.05	10.59	16.18	4.79	7.59	3.24	5.19	44.72
Kidney	10.53	6.26	24.22	10.24	27.71	10.53	2.53	7.17	13.43
Heart	5.16	16.39	6.54	10.84	6.68	20.82	6.27	5.63	9.33
Spleen	8.27	9.05	16.62	16.68	6.68	4.58	4.58	8.27	44 72
Tongue	15.57	7.53	50.01	5.69	4.97	13.19	3.09	21.79	20.82
Brain	24.22	11.18	13.95	6.14	3.67	15.38	5.92	2.97	10.47

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