

CHEMICAL AND HISTOLOGICAL EXAMINATION OF SOME EGYPTIAN MEAT PRODUCTS

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SUMMARY

Chemical and histological examination of 75 samples of meat products in Egypt including (frozen ground beef, frozen kofta and frozen sausage) were analyzed. The quantitative analysis of major components in the three types of meat products such as protein, fat, moisture, ash, carbohydrates and the energy value were carried out. The histological examination was carried out to determine the percentages of connective tissue, skeletal muscle, fat and plant tissues.

The relationship between histological and chemical examination of meat products to determine the nutritive value of the three types of meat products and control the adulteration of meat products were discussed.

INTRODUCTION

Meat is an excellent source of high quality protein, it is easily digested, in which the composition of lean muscles obtained from different animal species is relatively constant in terms of protein, fat, moisture and ash, while the different retail cuts of meat which vary in amount of inter- and -intramuscular fat and external fat may differ considerably in composition, meat products such as sausage contain more fat and less protein than muscle (Rice, 1971).

The chemical evaluation mostly failed to detect the relative quantities of different tissues used in the manufacture of meat products. Therefore, histological examination is fundamentally performed to control adulteration of meat products in which it is impossible to detect the finely minced constituents by the naked eye.

The aim of the present investigation is to study the chemical and histological properties of frozen ground beef, frozen kofta and frozen sausage, as examples of meat products widely available in Egypt markets.

MATERIALS AND METHODS

A total of 75 samples, 25 each of frozen ground beef, frozen kofta and frozen sausage were collected from different supermarkets in Assiut, El-Giza and Cairo cities. These samples were brought immediately to the laboratory in a closed container to be examined.

Chemically

All determination were run in triplicate and averages calculated. Moisture, protein, fat and ash were determined as stated in AOAC (1975). Carbohydrates were calculated by difference. Energy values were estimated using At water factors (Pearson, 1976).

Histologically

The histological technique for preparation samples adopted is that recommended by Prandl (1961). Several stains have been recommended by different authors.

- 1 - Harris Hoematoxylin and Eosin, after Harris, 1960.
- 2 - Calleja-stain, Lillie and Fullmer, 1976.
- 3 - Crossman's modification of Mallory's Trichrome method for specific differentiation, 1937.

Table (1) The proximate composition and energy value of some important frozen Egyptian meat products.

Determination	ground beef			Kofta			Sausage		
	Minimum	Maximum	Mean	Minimum	Maximum	Mean	Minimum	Maximum	Mean
Protein %	07.70	09.40	08.70	16.70	18.10	16.70	04.00	15.70	10.10
Fat %	23.40	27.47	25.29	22.30	26.80	25.00	20.60	36.26	27.60
Moisture %	62.95	68.00	65.20	55.60	58.20	57.00	57.00	67.30	60.98
Ash %	00.30	00.30	00.30	00.40	00.20	00.30	00.30	00.40	00.30
Carbohydrate %	----	01.12	00.60	00.50	01.20	00.90	00.70	01.00	00.97
Energy value "Cal/100 gm"	234.80	284.83	264.81	277.90	312.90	295.40	232.60	345.05	292.68

Table (2). The percentage of the different tissue components found in some important frozen Egyptian meat products.

Percentage (%)	ground beef			Kofta			Sausage		
	Minimum	Maximum	Mean	Minimum	Maximum	Mean	Minimum	Maximum	Mean
Connective tissue	23.01	24.60	23.80	10.70	15.80	13.40	12.70	18.90	15.40
Skeletal muscle	38.04	56.60	50.40	35.50	51.60	44.40	30.30	48.20	45.40
Fat	20.50	37.30	24.80	14.30	29.60	19.90	19.10	28.00	24.90
Plant tissue	----	----	----	16.10	25.70	22.30	10.10	16.00	14.30

RESULTS AND DISCUSSION

Table 1 shows the mean proximate analysis percentages and energy values per 100 g meat product sample from the various types of meat product (frozen ground beef, frozen kofta and frozen sausage) studies. Concerning the composition of frozen ground beef it is clear that the average percentage of protein fat, moisture, ash, carbohydrates and energy were (8.7%, 25.29%, 65.2%, 0.3%, 0.6% and calories 264.81%) respectively. Lushbough and Schweigert (1960) reported that, for purposes of comparison, lean muscle meat has the following average proximate value: protein 20%, fat 9%, moisture 70%, ash 1%, carbohydrates less than 1%, calories 160/100 g. A comparison of the data given in this study with those given by the above authors shows that the frozen ground beef contained less protein and more fat. This led to increase the energy value and indicates the adulteration, in which the minced meat must be manufactured from the lean muscle meat. On the other hand due to decrease the moisture (57%) and increase fat (25%) in case of frozen kofta (which is the most popular meat product in Egypt, and available in restaurants or small shops in poor districts and generally prepared from minced lean beef which mixed with minced fat "beef prenephric or tail sheep fat", common salt and additives such as spices, vegetables, El-Khateib et al., 1985) the protein increased to (16.7%) when compared with frozen minced meat. The proximate composition and energy value of frozen sausage were: (4 - 15.70%) with mean 10.1% protein; (20.6-36.26%) with mean (27.60%) fat; (57-67.3%) with mean (60.98%) moisture; (0.3-0.4%) with mean (0.3%) ash; (0.7-1.0%) with mean (0.97%) carbohydrates and (232.6-345.05) with mean (292.63) cal/100 g energy value. Fat may be substituted for moisture, however, in general the presence of high proportion of fat lowers the quality of the product.

The results of the chemical analysis of frozen ground beef, frozen kofta and frozen sausage indicated great variation of their constituents.

The results given in Table 2 revealed the percentage of the different tissue components found in the examined samples:

$$\frac{(\text{Mean of each tissue in one sample} \times 100)}{\text{Mean of all tissues in one sample}}$$

It is clear that the frozen ground beef having the highest connective tissue percentage and skeletal muscle, in which the average percentage were: (23.80 and 50.40) respectively. While in case of frozen kofta and frozen sausage were: (13.4% and 44.40%) and (15.4% and 45.4%) respectively. The average percentage of fat in the three meat products mentioned before were (24.80%; 19.90% and 24.90%) respectively. On the other hand plant tissues such as onion, garlic, bean were not detected in frozen ground beef, and have the average percentage 22.30% in case of frozen kofta, and 14.30% in frozen sausage.

In all examined samples of frozen ground beef, skeletal muscles and connective tissues constituted the highest components. The skeletal muscles and connective tissue differ fundamentally in their biological value. The proteins of connective tissue are, in comparison to muscle proteins, of lower nutritional value because they lack or have lower content of some essential amino-acids and are less readily assimilated by human.

From the results obtained, it is clear that the frozen meat products exposure for sale in Egypt had low nutritive value due to increase the C.T.% or fat%. On the other hand the histological examination is more efficient than other methods for detection and quantitative determination of different tissues in comminuted meat products, (Refai, 1982).

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