

CHEMICAL ANALYSIS OF CANNED MEAT PRODUCTS IN RELATION TO PUBLIC HEALTH ASPECTS

BY

F.A. EL-NAWAWI* ; A. EL-SHERIF* ; Z. NIAZI** AND K. EL-KHAWAS**

* Faculty of Veterinary Medicine, Cairo University

** Animal Health Research Institute, Dokki, Egypt

SUMMARY

Sixty samples of imported and locally manufactured meat products, representing: 20 samples each of imported corned beef & canned luncheon, and 10 samples each of locally manufactured canned meat & canned sausage, were randomly collected from different markets in Egypt. Collected samples were chemically analyzed to determine their pH value, moisture, protein, fat, sodium chloride, nitrite, phosphate, and hydroxyproline content. The results indicated that high percentage of the examined samples did not comply with the legal requirements of the Egyptian standard specification of canned meat products. The technological and public health importance of chemical additives was discussed.

low distribution over a wide area and with sufficient appeal to the eye and taste of the consumer to arouse and satisfy his appetite is essential.

Canned meat products are accepted as safe and convenient sources of animal protein for building and maintaining the body health, in addition to their content of broad groups of carbohydrates, fats and vitamins.

The manufacture of many comminuted meat products depends upon the ability of lean meat in the presence of salt, water and aids such as polyphosphates and other ingredients, to form mixtures or emulsions with fat which are relatively heat stable, as well as, to provide the widest spectrum of nutrient composition. Recently, there is an intensification of focus upon the safety of food supply, particularly with respect to intentional and unintentional chemical additives (17).

INTRODUCTION

The needs of the food industry and its efforts to produce foods with sufficient shelf life to al-

In canned meat products, the use of chemical additives, within the permissible limits, as pre-

servatives, flavor or color enhancer is required. Although, the utilization of small amounts of some of these chemicals proves safe, however, their mis-use may be hazardous to health, as nitrite, which is responsible for the development of nitrosemine, which is considered as a predisposing factor for cancer (4, 8, 13).

As one of the principal responsibilities of the food scientists and technologists is to preserve food nutrients through all phases of food processing, storage and preparation. Therefore, this study was planned to estimate the nutritional quality of some canned meat products, with regard to the public health aspect.

MATERIAL AND METHODS

Collection of samples:

Sixty samples of imported and locally manufactured canned meat products, representing: 20 samples each of imported corned beef & canned luncheon, and 10 samples each of locally manufactured canned meat & canned sausage, were randomly collected from different markets in Egypt. Collected samples were subjected to chemical examination as follow:

1- Preparation of samples: AOAC (2)

The entire content of each can was mixed 3 separate times in a food chopper with adequate mixing after each time. Well mixed content was chilled and kept in such a way to prevent loss of water and sample decomposition.

2- Chemical analysis:

2. 1- Determination of pH: was carried out using pH meter (Digital, Jenes, 609). AOAC (2).
2. 2- Determination of the moisture content. AOAC (2).
2. 3- Determination of the protein content: using Kjeldahl's method. AOAC (2).
2. 4- Determination of the crude fat content: by extraction using Soxhlet extraction apparatus. AOAC (2).
2. 5- Determination of sodium chloride content. AOAC (2).
2. 6- Determination of nitrite content. AOAC (2).
2. 7- Determination of starch content. AOAC (2).
2. 8- Determination of phosphate content: using the technique recommended by (15).
2. 9- Determination of hydroxyproline content: ISO (9).

RESULTS

Table (1): Results of the examined samples based on their pH value, Moisture and Sodium chloride content.

Type of samples	pH value					Moisture %					Sodium chloride %				
	Min.	Max.	Mean	S.E.M.±		Min.	Max.	Mean	S.E.M.±		Min.	Max.	Mean	S.E.M.±	
<u>Imported products:</u> Corned beef	6.0	6.4	6.195	0.02		46	67.5	58.4	0.9		1.2	2.6	2	0.08	
Canned luncheon	6.0	6.4	6.185	0.02		55	66	57.6	0.6		1.7	2.7	2	0.05	
<u>Local products:</u> Canned meat	6.0	6.3	6.130	0.02		64	69.5	67.2	0.5		1.3	1.7	1.52	0.03	
Canned sausage	6.2	6.4	6.330	0.02		65	75	68.6	0.9		2.1	2.6	2.2	0.05	

Table (2): Results of the examined samples based on their Protein, Fat and Hydroxyproline content.

Type of samples	Protein %					Fat %					Hydroxyproline %				
	Min.	Max.	Mean	S.E.M.±		Min.	Max.	Mean	S.E.M.±		Min.	Max.	Mean	S.E.M.±	Mean C.T. %*
<u>Imported products:</u> Corned beef	19.5	24	21.98	0.40		12	20	15.6	0.41		0.078	0.120	0.0989	0.03	0.335
Canned luncheon	16	24	19.88	0.64		15	21	18.33	0.44		0.081	0.120	0.1019	0.02	0.968
<u>Local products:</u> Canned meat	13.5	20	17.20	0.92		11	13	11.93	0.16		0.093	0.115	0.104	0.02	0.3
Canned sausage	13.5	18.2	15.69	0.66		8.4	9	8.84	0.093		0.085	0.112	0.097	0.003	0.285

* Calculated from the mean of hydroxyproline % and the mean fat % in examined samples.

Table (3): Results of the examined samples based on their Starch, Nitrite and Phosphate content.

Type of samples	Starch %			Nitrite content (ppm)			Phosphate %					
	Min.	Max.	Mean	S.E.M.±	Min.	Max.	Mean	S.E.M.±	Min.	Max.	Mean	S.E.M.±
<u>Imported products:</u>												
Corned beef	0	0	0	0	35	62.7	49.76	2.3	0.15	0.55	0.40	0.030
Canned luncheon	4	7.5	5.7	0.24	23	85	45.50	4.3	0.50	0.61	0.55	0.006
<u>Local products:</u>												
Canned meat	2	5	4.2	0.40	21	39.5	27.90	2.5	0.26	0.40	0.32	0.010
Canned sausage	1.8	4.5	3	0.34	20	49	30.90	3.7	0.16	0.26	0.22	0.010

Table (4): Samples accepted or rejected according to the Egyptian standards (5)

Chemical parameter	Corned beef		Canned luncheon		Canned meat		Canned sausage	
	A	R	A	R	A	R	A	R
Moisture %	19	1	19	1	1	9	2	8
NaCl %	20	0	20	0	10	0	0	10
Protein %	13	7	20	0	0	10	5	50
Fat %	19	1	15	5	100	0	10	0
starch %	20	0	6	14	10	10	10	0
Nitrite %	8	12	20	0	100	0	10	0
Phosphate %	-	-	0	20	-	-	10	0

A = accepted

R = rejected

DISCUSSION

Results given in Table (1) revealed that the mean pH values of both imported and local canned meat products were nearly similar where they ranged from 6.13 ± 0.02 to 6.33 ± 0.02 , these results are nearly similar to those reported by (1), while comparatively higher figures were recorded by (14).

Results presented in Table (1) showed that the mean values of moisture % in local products (67.2 ± 0.5 and 68.6 ± 0.9) were higher than those of imported products (58.4 ± 0.9 and 57.6 ± 0.6). Nearly similar results were recorded by (10, 14), while lower figures for canned luncheon and canned meat were recorded by (6). With regard to the water content, 5 %, 5 %, 90 % and 80 % of the examined samples of corned beef, canned luncheon, canned meat and canned sausage respectively did not comply with the Egyptian standards (5) (Table 4).

Salt is the most common non meat ingredient added to meat products in a percentage varied from 1 to 8 %. In addition to enhancing the solubilization of myofibrillar protein, salt gives flavor and has a preservative effect. This effect of ionic strength on meat protein solubilization plays a major role in the production of both sectioned and formed, minced and finely comminuted meat products (10). Results given in Tables (1&4) reveal that all the examined samples of corned beef, canned luncheon and local canned meat proved to contain < 3 % NaCl which comply with the permissible

limits (5). On the other hand, all the examined canned sausage samples have > 2 % NaCl which does not comply with the standards (5). Nearly similar findings were obtained by (6 & 14).

Results presented in Table (2) revealed that the mean protein % of the imported products was comparatively higher than that of the local products, where it was 21.98 ± 0.4 and 19.88 ± 0.64 for the imported corned beef and canned luncheon, while it was 17.2 ± 0.92 and 15.69 ± 0.66 for the local canned meat and canned sausage respectively. Nearly similar results for corned beef and canned sausage, while lower results for canned luncheon and higher results for canned meat were reported by (14). Results given in Table (4) showed that 35 % and 100 % of the examined corned beef and canned meat samples respectively proved to contain < 21 % protein, while 50 % of the examined canned sausage samples found to contain < 15 % protein, these results did not comply with the Egyptian standards specification (5).

It is evident from the results given in Table (2) that imported products proved to have higher mean values of fat % than local products. These results are in agreement with those recorded by (6 & 11). With regard to the legal requirements of the fat content, 95 % the examined samples of corned beef and 75 % of canned luncheon, as well as, all the locally produced samples meet with the standards (5) (Table, 4).

Generally, animal proteins have high biological

value as they contain all the essential amino acids in amounts and proportions to maintain life and support growth. An exception is gelatin due to its limited content of isoleucine, threonine, methionine and lack of tryptophan (17). The connective tissue proteins contain the greatest quantities of the amino acid hydroxyproline, which is used as an indicator for the quantity of connective tissues (12). If meat cuts rich in collagen, as tendons and ligaments, are subjected to long term heating during processing, collagen will be hydrolyzed to gelatin, and unacceptable gelatin pocket may be developed.

The mean value of hydroxyproline % was 0.0989 ± 0.03 , 0.1019 ± 0.02 , 0.104 ± 0.02 and 0.097 ± 0.003 in the examined samples of corned beef, canned luncheon, canned meat and canned sausage respectively. Depending upon the hydroxyproline % in different tissues stated by (FAO, 7), and the obtained mean value of fat % in examined samples, the hydroxyproline % corresponded to connective tissue % was 0.335 %, 0.968 %, 0.30 % and 0.285 % in the examined samples of corned beef, canned luncheon, canned meat and canned sausage respectively (Table 2). These results are in agreement with those recorded by (6), while higher figures were reported by (14).

The importance of determination of hydroxyproline appeared specially in homogenized products as luncheon and sausage where the connective tissue can not physically recognized.

Starch is widely used as an extender in many meat products. During heat sterilization of canned products, starch is gelatinized and the water uptake is enhanced (3). Inspection of the results given in Table (3) indicates that all the examined samples of corned beef proved to be free from starch, while it could be detected in canned luncheon, canned meat and canned sausage. Nearly similar results were recorded by (14). Results given in Table (4) show that 100 %, 30 %, and 100 % of the examined samples of corned beef, canned luncheon and canned sausage samples comply with the standard specifications (5), while all the examined canned meat samples do not agree with those specifications. It is worth mentioning that starch was added to canned meat product to compensate their low protein content.

Nitrite is an active curing agent, its addition to meat products is necessary. It has the following functions: stabilizing the color of the lean meat, contributes to the characteristic flavor of the product, inhibits the growth of a number of food poisoning and spoilage microorganisms and retards the development of rancidity (16 & 18). The mean values of nitrite content in imported products were comparatively higher than those of the local products (Table 3). Regarding, the permissible limits of nitrite content given by (5), 60 % of the examined imported corned beef samples found to violate these standards, while the rest of samples comply with them (Table 4).

In spite of the high nutritive value of meat products, they may constitute public health hazards due to the high residues of nitrite and presence of nitrosemine (4, 8, 13).

Commercially, Phosphate is added to canned meat products, as it increases the amount of bound water and decreases the loss of drip, decreases the shrinkage during processing and improves tenderness. Moreover, sodium acid pyrophosphate is permitted as a cure accelerator in some sausages, as it improves the overall color by lowering the pH. Also it makes the chopped meat better less viscous (3, 13). Generally, phosphate level is restricted to an amount that will not result in more than 0.5 % in the finished product.

The obtained results in Table (3) revealed that the mean values of phosphate content in imported products were comparatively higher than those of the locally produced products. All the examined samples of imported canned luncheon proved to contain > 0.3 % which violates the standards (5). On the other hand, all the examined samples of canned sausage were within the permissible limits (< 0.5 %) (Table 4).

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