European Scholar Journal (ESJ)
Available Online at: https://www.scholarzest.com
Vol. 4 No.07, July 2023
ISSN: 2660-5562

CHEMICAL AND MICROBIAL TESTS OF IMPORTED CANNED BEEF IN BASRA CITY

Alaa Kadhim Mousa
Department of Animal Production / College of Agriculture / University of Basrah
alaa.mousa@uobasrah.edu.iq

Article history:

Received: 28th May 2023
Accepted: 28th June 2023
Published: 30th July 2023

Abstract:

The current study aims to estimate some chemical and bacterial properties of canned beef imported in Basra city. The results of the chemical analysis showed that the meat of Turkish origin marked 7 recorded the highest percentage of moisture 1.70%, while Lebanese meat recorded the lowest percentage of moisture 55.65%, and meat of Iranian origin K score the highest percentage of ash 4.02%, while the lowest percentage of ash in meat of Turkish origin mark 7 3.27%, and meat of Brazilian origin mark S recorded the highest percentage of protein 14.805, while the lowest percentage of protein in meat of Lebanese origin mark T13.90%. The percentage of fat was in meat of Lebanese origin T mark 19.97%, while the lowest percentage of fat in meat of Iranian origin mark K was 17.05%. Toric for meat imported of various origins is under study. The results showed that it was within the permissible limits of the Iraqi standard specifications, although the Brazilian meat of S brand significantly outperformed 5% in the percentage of total volatile nitrogen and the percentage of free fatty acids over the rest of the imported meat under study, while no significant differences appeared in the concentration of (TBA)between imported meat of various origins. The results of the study indicated that the bacterial tests for imported meat of various origins were within the permissible limits according to international standards, as the total number of anaerobic bacteria ranged from 0-7×1 10 /g meat, while the number of clostridiu bacteria 0-5×^{1} 10 /g meat.

Keywords: Chemical, microbial tests, canned beef.

INTRODUCTION

Beef is one of the animal products that are widely consumed by humans because of its high nutritional value, as it contains a high percentage of protein characterized by containing essential amino acids necessary for the human body (1).

The percentage of protein in fresh beef differs from that in canned meat, where the percentage of protein in fresh beef ranges between 60-80% of dry matter (2), while (3) indicated that the percentage of protein in fresh beef reached 22.3% and this percentage in canned beef should not be less than 21%.

Fatty substances in meat play a vital role in the body's metabolism because of its content of essential fatty acids, cholesterol and vitamins dissolved in phospholipids and unsaturated fatty acids in meat fat constitute 1% of the nutritional needs of humans per day (5).

The fat content of fresh beef is 3.66% and this percentage in canned beef does not exceed 16% (6). The storage and freezing process affects meat proteins and nitrogenous compounds, so total and volatile nitrogen (T.V.N) values should not exceed 20 mg nitrogen/100 g meat and thiobartoric acid (T.B.A) values should not exceed 1 mg malonaldehyde/kg meat (7).

The calculation of total volatile nitrogen and the concentration of (TBA) are important qualitative tests for meat to indicate the degree of rancidity of the meat and the occurrence of changes in meat proteins (8). Microorganisms in meat increase as a result of contamination during slaughter and manufacturing processes and environmental grief conditions lead to increased microbial contamination in meat (9).

The estimation of anaerobic macrobacteria as well as *Clostridium bacteria* in canned meat is one of the measures for determining standard specifications in microbial limits for quality determination (10). The economic openness in Iraq and the absence of control bodies have led to the import of many types of canned meat and from different origins.

This study aims to evaluate some chemical and bacterial properties of some canned and imported beef in Basra city.

MATERIAL AND METHODS

The samples of canned beef included four different marks from origins: Iranian K, Turkish 7, Brazilian S and Lebanese T, 13.90 and the total number of samples reached 20 samples and 5 repeats for each mark and all samples were close in the date of production.

Chemical analysis of meat

The percentage of moisture in meat samples was estimated by using (11) electric ovens at a degree of 105 m to dry one gram of each sample according to the following equation:

$$\% \text{ Humidity} = \frac{\text{Weigh the sample before drying} - \text{Weighing after drying}}{\text{Weigh the sample before drying}} \times 100$$

Ash percentage

The percentage of ash was estimated, where 0.5 g of meat was weighed for each sample and the eyelid was placed in the incinerator at a temperature of 600 m for three hours, after which the eyelids were left to cool and weighed, and the percentage of ash was estimated according to the following equation:

$$\% \text{ Ash} = \frac{\text{ash weight}}{\text{Sample weight before incineration}} \times 100$$

Fat content

The percentage of fat in the meat samples was calculated using the Soxhlet apparatus, where 1 gram of meat was weighed per sample and coated with filter paper and placed

$$\% \text{ Fat} = \frac{(gm)\ fatty\ extract\ weight}{(\text{gm}) \text{ the sample weight}} \times 100$$

Protein content

The percentage of protein of the meat samples was estimated using the Semi-micro Kiel dahl method by digesting one gram of meat per sample using 5 ml of concentrated sulfuric acid and two drops of $HClO_4$ until the solution becomes clear, then the distillation process was performed for the samples by adding 10 mm of 0.1 standard sodium hydroxide and then collecting the liberated ammonia in a 50 mm flusk containing 25 ml of uric acid 2% with two drops of Methyl red evidence After that, the samples were brushed using HCl 0.1 standard acid and the protein was calculated according to the following formula:

$$\% \text{ Protein} = \frac{\text{amount of HCl consumed} \times 0.05 \times 0.014 \times \text{N } 0.1}{Weight\ of\ Sample} \times 100$$

Determination of Total Volatile Nitrogen

Estimated total volatile nitrogen according to the method mentioned before (12), as 10 g of meat was weighed from each sample after mixing well and 10 ml of distilled water was added and then mashed in a ceramic lid and then transferred to the distillation flask and added to it 2 g of magnesium oxide and 250 ml of distilled water and connected the distillation flask to the Caldhal device , which ends with the receiving flask containing 25 ml of uric acid 2% with two drops of methyl red reagent After 30 minutes of distillation, the mixture was blown with 0.1 carats dilute sulfuric acid and the total volatile nitrogen intake was withdrawn on the basis of mgg/100 g meat.

Determination of (TBA) values

The acid value was estimated according to the mentioned method (13) using 10 g of meat from each sample and soaked for two minutes in 50 ml of distilled water and 5 ml of hydrochloric acid 4 caratat solution was added to reduce the pH to 1.5 and complete the volume to 100 ml by distilled water, transfer the mixture to a 100 ml distillation flask and add paraffin oil and 1 g dry stone to regulate the boiling point and then connect the distillation device and heat until the collection of 50 ml and prepare the plaque solution of distilled water The absorption was then estimated by the optical spectrometer at a wavelength of 538 nm and the (TBA)was calculated on the basis of Malondialdehyde(MDA) /kg meat by multiplying the absorption reading by the coefficient of 7.8.

Determination of free fatty acids

Free fatty acids were estimated by method (12). I took 10 g of meat from each sample and added 25 ml of ether, 25 of 95% ethanol and 1 ml of phenol naphthalene reagent and treated with 0.1 carats sodium hydroxide until the solution became pink.

Bacterial examination

All tests were conducted on meat samples under sterile conditions according to method (14) and the number of anaerobic bacteria and the number of *Clostridia bacteria* were estimated.

Statistical analysis

The results were analyzed statistically to find the differences between the coefficients using the ready-made statistical program (15) and the differences between the averages of the two different transactions were compared using the lowest significant difference (RLSD) at the level of ($P<0.05$) (16).

RESULTS AND DISCUSSION

The chemical composition of meat

Table (1) shows some properties of the chemical composition of canned beef samples and shows from the table that there are significant differences ($P\leq0.05$) between the parameters in the percentage of moisture, where the meat of Turkish origin 7 recorded the highest percentage of moisture 61.7%, while the meat of Lebanese origin Tmark recorded the lowest percentage of moisture 55.65% compared to the rest of the canned meat under study, and showed

significant differences (P≤0.05) Among the transactions in the ash percentage, where meat of Iranian origin K recorded the highest ash percentage at 4.02%, while meat of Turkish origin 7 recorded the highest ash percentage at 3.27% compared to the rest of the transactions. The results in the same table show significant differences (P≤0.05) in the percentage of fat, where the meat of Lebanese origin recorded the mark T The highest percentage of fat is 19.97%. While the lowest percentage of fat in meat of Iranian origin was K, the mark of K, was 17.05%. The results also showed that there were no significant differences between the protein values of the different markers of the imported meat under study, and the Brazilian meat of S score recorded the highest percentage of protein at 14.8%, while the meat of Iranian origin K, Turkish origin 7 and Lebanese origin T mark Protein values were 14.25%, 14.12% and 13.9% respectively. The results show that there is a clear variation in some chemical properties (moisture, ash, fat) between the imported meat under study. It also showed that meat high in fat content was low in protein and this depends on the nature of the animals from which the meat was taken, as fattened animals are characterized by high fat content and low protein content (1). It is clear from Table (1) that the moisture content of canned meat of various origins is under the study did not exceed the permissible limits previously (17) and this indicates that there was no commercial fraud of the imported product, while the protein content in all imported canned meat under study was below the minimum protein percentage of 21% (3). As for the percentage of fat for the imported canned meat under study, it exceeded the permissible limits according to Iraqi specifications, especially the meat of Lebanese origin Tmark, where the percentage of fat reached 19.97%. From Table (1), it is clear that the percentage of ash in the imported canned meat under study was high, especially in meat of Iranian origin K mark. Where it reached 4.02%, as the ash percentage is an indicator of the content of the substance of salts. From the results of the table, it is clear that the imported canned meat under study contains preservatives in the form of salts and in concentrations higher than specified according to Iraqi specifications.

Table (1). Chemical analysis of canned and imported beef in Basra Governorate (mean – standard error)

Origin and brand	Moisture	Ash %	Fat %	Protein %
Turkish (7)	61.70a ± 0.112	3.27c ± 0.67	17.10c ± 1.14	14.12 ± 0.74
Iranian (K)	60.8b ± 0.115	4.02a ± 0.07	17.05c ± 1.40	14.22 ± 0.67
Barzillan (S)	56.32c ± 0.115	3.95ab ± 0.09	17.90b ± 1.50	14.80 ± 0.59
Labanese (T)	55.65d ± 0.117	3.72b ± 0.127	19.97a ± 1.41	13.90 ± 0.69
p Value	**.001***	**.028***	**.001***	**NS.**

***Different letters indicate significant differences between the means (p≤ 0.05)**
NS: not significant

Chemical Qualitative Tests

1- Total volatile nitrogen values (T.V.N)

Table (2) shows significant differences (p≤0.05) between the total volatile nitrogen values of imported and canned beef, with Brazilian meat samples S recording the highest total volatile nitrogen value of 16.9mg/100 g meat, while Turkish meats with a mark of 7 The lowest value of total volatile nitrogen amounted to 15.4 mg / 100 g meat, and from the table it is clear that there are no significant differences in the values of total volatile nitrogen between the meat of Turkish origin mark 7 and Iranian origin mark K, where it amounted to (15.4, 15.2 and 15.5) mg / 100 g meat respectively. These values for all imported meat under study within the permissible limits according to the Iraqi specifications (7 and 3), which gives an indication The absence of chemical changes in imported canned meat of different origin. The reason for this is due to the presence of estimation components such as salts and nitrates, which are used as preservatives, which contribute to maintaining the quality of canned meat and not being subjected to chemical degradation, and it is known that the value of total volatile nitrogen should not exceed 20 mg / 100 g meat (18).

2- (TBA)concentration values

From Table (2), it is clear that there are no significant differences between the values of thiobartürk acid concentration between imported canned meat by origin and the acid concentration values ranged between (0.79-0.82) mg MDA /kg meat. Turkish meat metcha had the highest acid concentration of 0.82 mg MDA /kg meat, while Lebanese meat Thad the lowest acid concentration of 0.79 mg MDA /kg meat. The results of the study for the concentration of (TBA)were acceptable as indicated by (18) and did not exceed the values for the concentration of (TBA).

Table (2). Average valus of total volatile nitrogen (TBA)and free fatty acids in **imported canned beef in Basra Governorate (mean – standard error)**

Origin and brand	Volatile total nitrogen meat gm100/mailgram	Malondialdehyde (MDA) /k gm meat	Free fatty acids %
Turkish (7)	15.4b ± 0.08	0.82 ± 0.07	0.73b ± 0.03
Iranian (K)	15.2b ± 0.09	0.81 ± 0.06	0.76b ± 0.04

Barzillan (S)	16.9a ± 0.07	0.08 ± 0.06	0.83a ± 0.07
Labanese (T)	15.5b ± 0.08	0.79 ± 0.08	0.75b ± 0.05
p Value	**.001***	**NS.**	**.001***

***Different letters indicate significant differences between the means (p≤ 0.05)**
NS: not significant

In all canned and imported meat under study about 2 mg MDA / kg meat according to international standards, this is an indication that samples of canned and imported meat of different origin will not be exposed to the phenomenon of rancidity, and the reason for this may be due to the fact that these canned meats contain nitrate salts and ascorbic salts, which are antioxidants. The results of the study were consistent with the results obtained (10).

3- Concentration of free fatty acid % (F. Accordingly, the State party is not A)

Table (2) shows the existence of significant differences (p≤0.05) in the percentage of free fatty acids in canned and imported meat, and the Brazilian meat of origin S mark outperformed the rest of the imported canned meat, reaching a value of 0.83%, while there were no significant differences in the percentage of free fatty acids between the meat of Turkish origin mark 7 and Iranian origin K and Lebanese origin mark T It amounted to (0.77, 0.76 and 075) %. The ratios for all canned meat under study were within the Iraqi specifications (17) and the American specifications (3), which indicates that there is no decomposition of meat fat.

Bacterial tests

Table (3) indicates the results of the bacterial examination of canned and imported meat under study (the number of total anaerobic bacteria and *Clostridia bacteria*) and from the table it is clear that there are no significant differences between canned and imported meat under study in the total numbers of anaerobic bacteria and the numbers ranged (0-7×1 10) g / meat to (0-3 × 1 10) g / meat for meat of Turkish origin mark 7 and Lebanese origin mark T respectively The results of the study came within the permissible limits according to the Iraqi (17) and American (3) specifications for the preparation of total and anaerobic bacteria in canned meat, and this is an indicator that canned and imported meat under study by different origin is suitable for human consumption. The number of anaerobic total bacteria is an indicator of the presence of *Clostridia bacteria*, which are the causes of food poisoning, and the numbers of *Clostridia bacteria* ranged from (0-2×1 10) g / meat to (0-5 × 1 10) g / meat in meat of Brazilian origin S and Turkish origin mark 7 respectively. That all values of the numbers of *Clostridia bacteria* Canned and imported meat under study falls within the permissible limits according to the Iraqi standard specifications (17) and specified (^{1}10-4 10) g/meat. From this we conclude that it is necessary for imported meat to undergo chemical and qualitative evaluation to provide meat of good nutritional value and fit for human consumption, thus preserving the general health of the consumer.

Table (3). Average total number of anaerobic bacteria and the number of *Clostridia bacteria* in imported canned beef Basra Governorate

Origin and brand	The total number of bacteria anaerobic bacteria-cell/gm	The total number of bacteria clostridia-cell/gm
Turkish (7)	^{1}10 × 7-0	^{1}10 × 5-0
Iranian (K)	^{1}10 × 5-0	^{1}10 × 3-0
Barzillan (S)	^{1}10 × 6-0	^{1}10 × 2-0
Labanese (T)	^{1}10 × 3-0	^{1}10 × 3-0
p Value	**NS.**	**NS.**

NS: not significant

REFERENCES

1. Allanc, Holstp and Campbell, M. (2015). Hand book of meat, 3rd edn, Meat and Livestock. Australia/Dep. of Agriculture NSW.
2. Edey, J. R.; Phillip, L. M. and Paul, B. A. (2010). Wildricel ground beef Mixtures.
3. USDA, United States Department of Agriculture Washington (2004). Nutrition Facts and food composition analysis for corned beef brisket (raw-cooked). Chttpllwww.nutrition daka.com). 1-4.
4. Mustafa, T., Karakaya, M. and Nesimi Aklats (2010). Composition and thermal properties of cattle fats. Eur. J. Lipid Sci. Technol., 112, 410-416.
5. Gunstone, F. (2002). Animal fat, tallow, lard and butter. INFORM, 13. 485.
6. Badiani, A., Stipa, S. S., Bitossi, F. Pip., Catta, V. G. and Chizzolinj, R. (2002). Lipid composition, retention and oxidation in fresh and completely trimmed beef muscles as affected by common culinary practices. Meat Sci. V., 60 P 169-186.
7. Central Organization for Standardization and Quality Control (1988). Standard specifications for fresh and chilled-frozen beef and buffalo. 2/1185.

8. Gersen, T. G. Arnesen, J. F., Nilsen, B. N. and Hildrum, K. I. (2003). Online prediction of chemical composition of semi-frozen ground beef by non-invasive NIR.
9. Makka, G. A. (2019). Detedion of microbial and heavy metals contamination in cooked poultry meat and dis played in local markets in Basrah Govern orate. Iraq.
10. Sallam, K. I. and Samjima, K. (2007). Microbiological and chemical quality of ground beef treated with sodium lactate and sodium chloride during refrigerated storage.
11. A.O.A.C. (1975). Official methods of analysis, 13th. Association of official analytical chemists washing ton, DC.
12. Egan, H., Kirk, R. S. and Sawyer, R. (1981). Pearson' s chemical analysis of food Churchill Livingstone.
13. Pearson, D. (1970). The chemical analysis of food. National collage of food technology, University of Reading. Weybride, Surrey, U.K.
14. 14- Ap. H.A. American Public Health Associatio (1984). Standard methods for the examination of food 14th New York.
15. SPSS. (2008). Statistical package for social science. User Guide for Statistics.
16. 16- Al-Rawi, Muhammad Khasha Al-Rawi and Khalaf Allah Muhammad Abdul Aziz (2000). Design and analysis of agricultural experiments. Dar Al-Kutub for Printing and Publishing, University of Mosul, Iraq, pp. 98-103.
17. 17- Central Organization for Standardization and Quality Control (1988). Canned bacon beef. Standard No. 1342, Republic of Iraq.
18. Pearson, D. (1973). Laboratory Techniques in food analysis butter worth Co. London.