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# Quality Assurance of some imported canned meat products marketed in Fayoum city, Egypt

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## Abstract:

The current study aimed to ensure the chemical and microbiological quality of imported canned meat. Random samples of canned beef, canned beef luncheon and corned beef are imported from different countries were collected from the local market in Fayoum Governorate. Chemical composition (moisture, protein, fat, ash content, carbohydrate and energy value), Quality indices (pH, Total volatile basic nitrogen and Thiobarbituric acid) and Microbiological quality (Aerobic plate counts, *Staphylococcus aureus*, *Thermophilic* bacteria and *Clostridia* count) have been estimated. The moisture content was not in conformity with the Egyptian Organization for standardization (E.O.S 1563/2005) in 50% of the samples, as well as the protein content of all samples not in conformity with the (EOS, 1563/2005). While the only fat content in which all samples were in accordance with the (EOS, 1563/2005). Also, T.V.B.N and T.B.A values for all trademark's samples passed into the allowance limits. Microbiological analysis revealed the presence of *Staphylococcus aureus* and Clostridia count in 50 and 37.5 % respectively of trademarks samples.

**Key words:** Chemical, Microbiological, Quality, Canned meat, Egypt.

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## INTRODUCTION:

Meat is one of the most essential foods, nutrients and favorites available to the masses, helping to satisfy most of the needs of the body. In human evolution, it has played a crucial role and is an important part of a healthy diet. It is a healthy source of protein, iron, zinc, selenium and phosphorus, supplemented by vitamin A and B complex vitamins. (Ahmad, *et al.* 2018).

Meat preservation became necessary to transport meat for long distances without spoiling taste, color and nutritional value. The objectives of conservation strategies are to prevent microbial spoilage and limit oxidation and enzymatic spoilage (self-autolysis) (Nychas, 2008).

The methods of meat preservation are roughly classified into three methods: (a) temperature regulation, (b) water activity control, (c) chemical or bio-preservative use (Zhou, *et al.* 2010).

Canning process was introduced about two centuries ago, and for long time, it has been one of the main means of food preservation, together with chilling and freezing . (Vergara-Balderas,. 2016).

Low-acidity food canning at 121 C° with the goal of removing all mesophilic microorganisms and *Clostridium botulinum* spores, leaving the product 'sterile commercially'. This process is very effective in maintaining the quality and safety of low-acid foods while stored at room temperature **(**Murano, 2014).

The nutritional value of canned beef is great, it is a good source of protein, vitamin B12, and it is rich in minerals, primarily sodium, and then zinc. Cooked canned beef has a high percentage of cholesterol and has high amounts of saturated fat (saturated fat). While canned meat contains a high percentage of food additives. (USDA, 2004)

Many efforts have been made to develop a product free of public health hazard pathogens and with a low microbial count to keep maintenance quality and preserve its nutritional value to be safety and high quality. (Saleh,2015).

The bacteriological status of canned meat (canned beef, corned beef and canned luncheon) marketed in Beni-Suef city was evaluated. The highest prevalence (60%) of *Clostridia* was recorded in corned beef. *S. aureus* count was found in the following rates of 20, 24 and 24% in canned beef, corned beef and canned luncheon samples. *Enterococci* was detected from 12 % canned beef, 28 % corned beef and 12 % canned luncheon Abdel-Atty,et al. (2020).

The aim of the study was to evaluate the chemical and microbiological quality of some imported canned meat.

## MATERIALS AND METHODS

### 1- Imported canned meat products:

Eight types of canned meat products manufactured abroad from different countries (of each type 5 replicates) were purchased from the local market in Fayoum Governorate and analyzed.

**These Canned products were:**

A- Luncheon meat (canned) (Jordan)
B- Luncheon meat (canned) (Brazil)
C- Corned beef (canned) (China)
D- Corned beef (canned) (Brazil)
E- Corned beef (canned) (England)
F- Beef Luncheon meat (canned) (Jordan)
G- Corned beef (canned) (China)

H- Corned beef (canned) ( Lebanon)

**2- Analytical Methods**

**A- Gross Chemical composition**:

1- Moisture content, Total nitrogen content (T.N.), Fat content, Ash content According to the method described by the A.O.A.C (2012).

2-Nitrogen Free Extract as Carbohydrates content:

Carbohydrates content was calculated by subtracting total summation of moisture, protein, fat and ash contents from 100. According to the method described by the A.O.A.C (2012).

3- Energy value:

For calculating the energy value, protein and carbohydrate contents % were multiplied by 4; while the fat content % was multiplied by 9. Energy value was presented as cal./ 100 gm. According to the method described by the A.O.A.C (2012).

**B- Quality indices**

**1- PH value:**

The PH value of meat and meat products was measured in a slurry according to the method described by **(AOAC 2012)** using Becman PH meter, with combined electrode.

**2- Total volatile nitrogen (T.V. N):**

Total volatile nitrogen as an index of protein degredation was determined according to the method described by **(AOAC 2012)** .

**3-Thiobarbituric acid value (T.B.A. Value):**

Thiobarbituric acid value as an index of fat oxidation was determined as described by **Zhang- *et al*. (2019).** Using 10 gm of ground sample Measurements were carried out calorimetrically, TBA content calculated as mg ,TBA=abs x 7.8 .

**C- Microbiological examination:**

The sample is sliced with sterilized scissors and forceps and carefully combined by a sterilized spoon. The mechanical shaker was used to homogenize aseptically ten ml of prepared samples to 90 ml of sterile 0.1 percent peptone water for one minute. one ml of the previous homogenate was applied to 9 ml of sterilized diluents. The samples prepared were subjected to the following inspections.

**1-Aerobic plate counts.**

Total mesophilic count ( cfu/g ) according to ISO, (2003a). Duplicate plates of Standard Plate Count Agar were inoculated with 0.1 ml of the previously prepared decimal dilutions, evenly spreaded onto the surface of the plates and incubated at 30 C for 72 hours.

**2-*Staphylococcus aureus* Count**.

From the previously prepared decimal dilutions, 0.1 ml was transferred onto the dry surface of duplicate plates of Baird-Parker medium supplemented with egg yolk tellurite **(Oxoid, 2010)** and spread with sterile bent glass spreader until the surface of the medium appears dry. The plates were incubated at 37$^{o}$C for 24-48 hours. Plates which contain a maximum of 150 typical and/ or atypical colonies were choosing to calculate the *Staphylococci* count.

Typical colonies (circular, smooth, convex, moist, grey to jet black, shiny greater than one mm in diameter with or without white margined surrounded by clear zone extending to the opaque medium) were counted and recorded.

**3-*Thermophilic* bacteria:**

Thermophilic bacteria counts were assayed by the method described by

**Oxoid (2010)** using Dextrose tryptone agar medium**.**

**4-*Clostridia* count:**

bacteria counts were assayed by the method described by **Oxoid (2010)** using Reinforced Clostridial agar solid medium for the cultivation and enumeration of anaerobes. especially *Clostridium* species.

## Results and Discussion

**1- Chemical composition:**

Data presented in Table (1) show the chemical composition of some imported canned meat products. It could be noticed that the moisture contents in the imported canned meat products generally fall within the range of 58.8 - 64.50 %. It was observed that moisture content of meat was decreased during canning, roasting as the temperature

increases the moisture content was decreased during high thermal time and temperature treatments (Reiser and Shorland, 1990). Our results are parallel with the results of (AL-Hisnawi, *et al*. 2010 and Ebeed, *et al*. 2015) Except samples (A,B,F and H ) who stated that the moisture % in canned beef ranged from 57 % to 61.50 %. the samples A, B, F and H are not in conformity with the Egyptian Organization for Standardization (E.O.S 1563/2005), this means that 50% of samples are not identical.

As for the protein content, sample G had the highest value (19.8 %), while sample H had the lowest value

(12.6 %). This means that all samples do not comply with (E.O.S 1563/ 2005), that allow a protein content of not less than 21 %. These findings are higher than those found by Ebeed, *et al*. (2015) who denoted that the protein % in canned beef was ranged from 5.10 to 6.22%.

The fat content was markedly low in samples F, A , B , G and E , being 9.8 , 10.6 , 11.3 , 11.4 and 11.7 % as compared with samples H , D and C which showed 12.8 , 13.6 and 13.7 % fat respective (Table, 1), which means that all samples comply with the (E.O.S 1563/2005) that allow a fat % not more than 15 %.

The ash content was ranged from 2.8 : 3.7 %.

Calculated carbohydrate content was the highest value in E and F samples (8.9%), while the lowest value was 2.9% for the sample C. Samples D, C and G showed higher energy values being 211. 2, 210.5 and 210.2 cal / 100g respectively, compared to A , B , F and H samples ( 180.6 , 187.2 , 183 and 197.7 cal. / 100 gm ). The higher energy value of samples D, C and G could be due to higher fat content as compared to other samples.

**2- Quality indices**:

**2.1. PH value.**

Meat PH is known as one of the most important technological characteristics as it changes pigment and lipid stability. PH value of imported canned meat trademarks are presented in Figure (1). As shown from the Figure sample H had highest value of pH (6.8), while sample G had the lowest

value (4.14). The final pH of muscle is a major determinant of meat quality and is largely determined by glycogen depletion and lactic acid piling up (**Kadim,** 2006). PH value of raw meat is normally in the range of 5.6 to 6.5 **(Ranken, 2000)**.

| Contents | Trademarks | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | *E.O.S |
| **Moisture %** | 64.50 | 63.82 | 61.4 | 60.8 | 59.6 | 62.9 | 58.8 | 63.2 | 62% |
| **Protein %** | 15.6 | 16.4 | 18.9 | 18.7 | 16.6 | 14.7 | 19.8 | 12.6 | 21% |
| **Fat %** | 10.6 | 11.3 | 13.7 | 13.6 | 11.7 | 9.8 | 11.4 | 12.8 | 15% |
| **Ash %** | 3.6 | 3.5 | 3.1 | 3.4 | 3.2 | 3.7 | 2.9 | 2.8 | - |
| **Carbohydrates %** | 5.7 | 4.98 | 2.9 | 3.5 | 8.9 | 8.9 | 7.1 | 8.6 | - |
| **Energy value (cal/ 100gm )** | 180.6 | 187.2 | 210.5 | 211.2 | 207.3 | 183 | 210.2 | 197.7 | - |

**Table (1) the chemical composition of imported canned meat products.**

***E.O.S(2005):Egyptian organization for standardization and quality: Egyptian standards for canned meat products**

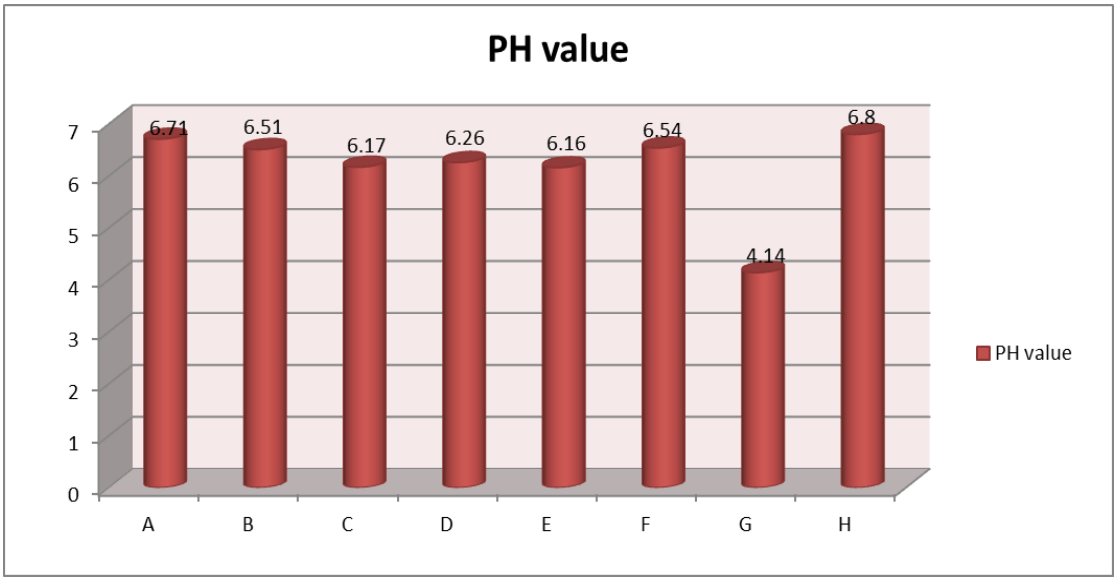


**Figure (1) PH value of imported canned meat trademarks.**

**2.2- Total volatile basic nitrogen (TVBN).**

TVBN is considered to be the most commonly used biochemical method for measuring meat spoilage (Pearson, 1976). for imported canned meat trademarks are illustrated in (Figure 2). As shown sample C had the maximum value of 17.98 mg N/100 g, while the minimum value was 5.39 mg N/100 g for sample A. It is also clear that all samples comply with (EOS 1694/2005), that determine that the highest value of TVBN values allowed is 20 mg N/100 g as a spoilage index for meat products.

**2.3- Thiobarbituric acid reactive substances (TBARS).**

The TBARS method has been widely used to determine the degree of lipid oxidation used as a lipid oxidation index during storage in meat products. (Klangpetch *et al.* 2016). Data in Figure (3) show the values of TBARS in imported canned meat trademarks, range of 0.14 to 0.21mg MDA kg-1 meat. As shown all samples were in compliance with the (EOS 1694/2005) for meat products, which recommended that the value of TBARS is less than 0.9 mg malonaldehyde / kg meat (MDA kg-1 meat).

**3- Microbiological examination in the imported canned meat samples:**

**3.1- Total aerobic viable bacterial count:**

A big product of the most recorded food poisoning outbreaks is known to be meat products. Therefore, the use of microbiological criteria is essential as it provides guidance on the acceptability of meat products and their processes of processing, handling and distribution. The results illustrated in Table (2) proved that the total aerobic viable bacterial count of imported canned meat. As shown the maximum count was 94x10 CFU/g for sample C, while sample H had the minimum count (40x10 CFU/g). these results are in agreement with (Saleh, *et al.*2015) which was found that the minimum and maximum limits for total bacteria count in canned meat corned beef and canned luncheon were ($3.95x10-3.94x10^3$ ) and ($1.44x10 – 3.15x10^3$ ) CFU/g respectively.

**3. 2- *Total Staphylococcus aureus count:***

Samples C, D, F and H contained *S. aureus*, the counts were 35x10, 15x10, 21.5x10 and 25x10 CFU/g (Table, 2), 50% of samples are not in accordance with EOS (2005), that do not allow the presence of *S. aureus* in canned meat, and the limit (20 CUF/g) recommended by Centre of Food Safety (2014). Such finding coincides with that Saleh, et al.(2015) and Abdel-Atty, et al.(2020 )who detect about twenty percent, 24% and 24% of canned beef, corned beef and canned luncheon which were examined, had *S. aureus*, However, Chekol and Ashenafi (2009) failed to detect *S. aureus* in canned meat.

**3.3- *Total Clostridia count:***

Results in Table (2) show that There were samples completely free of Clostridia count such as (A,B,E,G and H). This mean that 37.5% samples are in agreement with EOS, (2005) that decides that the canned meat are free of *Clostridium perfringens.* This result is consistent with (Hamasalim, 2012). who analyzed the imported canned meat products and found that they were free from *Clostridia* count, while, samples (C, D and F), were contain 250,320 and 220 CFU/g respectively, these results run with that published by (Abdel-Atty, *et al*.2020), who found that there are about 28, 60 and 52% of examined canned beef, corned beef and corned luncheon had *Clostridium perfringens*.

4.3- **Total Thermophilic bacteria count:**

From Table (2), it was clear that all samples were free from Thermophilic bacteria. This result agrees with (Hamasalim, 2012).

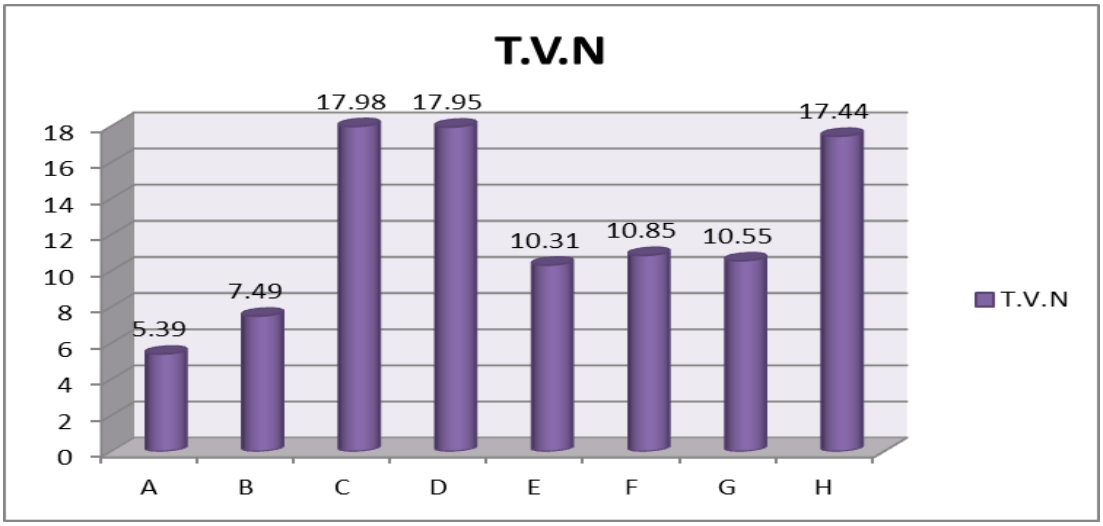


**Figure (2) Total volatile nitrogen of imported canned meat trademarks.**

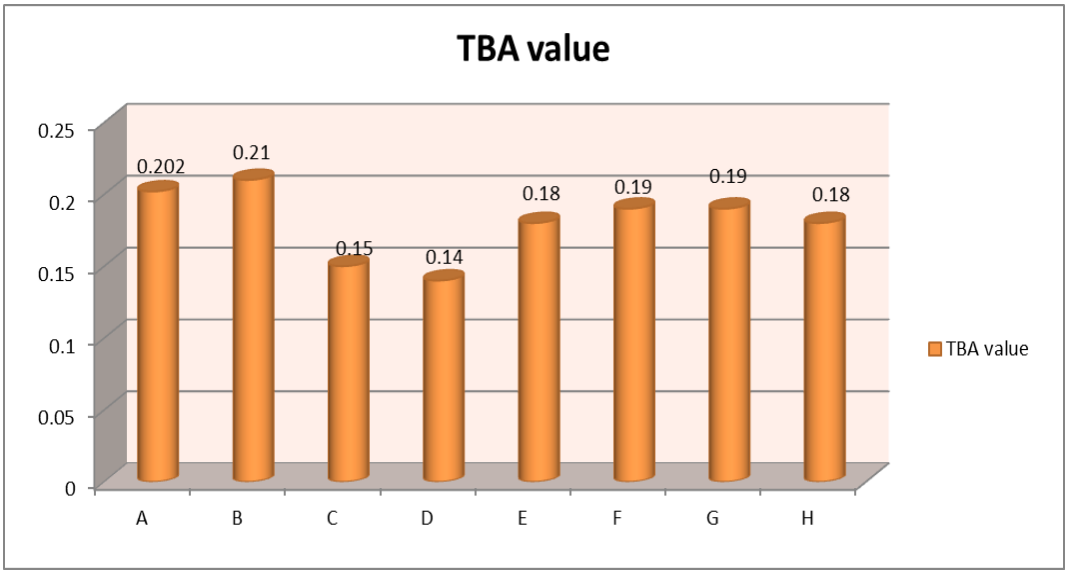


**Figure (3) TBA value of imported canned meat trademarks.**

**Table(2)Microbial analysis for imported canned meat products.**

| Contents | Trademarks | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H |
| Total Aerobic bacterial count (cfu/g) | 50x10 | 88x10 | 94x10 | 53x10 | 45x10 | 80x10 | 55x10 | 40x10 |
| Total *Staph.aureus*(cfu/g) | ٠ | ٠ | 35x10 | 15x10 | ٠ | 21.5x10 | ٠ | 25x10 |
| Total *Clostridia* count (cfu/g) | 0 | 0 | 25x10 | 32x10 | 0 | 22x10 | 0 | 0 |
| Total Thermophillic bacteria count (cfu/g) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

## REFRANCE:


Abdel-Atty, N. S., Khalafalla, F. A., and Barakat, D. A. (2020). Bacteriological Quality of Canned Meat Marketed in Egypt. Benha Veterinary Medical Journal, 39(1), 154-158.

Ahmad, R. S., Imran, A., and Hussain, M. B. (2018). Nutritional Composition of Meat. Meat Science and Nutrition,4.

AL-Khauzai, A. A. H. H., and AL-Grabi, B. G. M. (2010). Chemical qualitative and bacterial assessment for imported canned corned beef in Diwaniyah city. Al-Qadisiyah Journal of Veterinary Medicine Sciences, 9(2).

AOAC (2012). Official Methods of Analysis of the Association of Analytical Chemists. 18th Ed., Washington, D.C., USA.

Chekol, Y., and Ashenafi, M. (2009). Microbiological analysis and safety evaluation of various canned foods in Addis Ababa. J. Ethiop. Biol. Sci, 8, 53-69.

Ebeed, A. Saleh, Elsayed E. Hafez, Nabil M. Bakeer, Yasser G. El-Ghannam and Safaa H. Gorbal (2015). Quality Assurance of Imported Canned Meat. Global Veterinaria 14 (4): 511-516.

EOS: Egyptian organization for specification and Quality control (2005). Standards for minced meat. Ministy of Industry. Cairo Egyption EOS.

Hamasalim, H.J. (2012). Quality Assessment of the Imported Canned Beef Sold in Sulaimani Markets. KSU J. Nat. Sci., 15 (4): 1-6.

ISO, International Standard Organization (2003a). ISO standard DIS 4833:2003(E).Microbiology of food and feeding stuff/Horizontal method for the enumeration of

microorganisms/colony count technique at 30 oC.

Kadim, I.T., O. Mahgoub, W. Al-Marzooqi, S. Al-Zadgali, K. Annamali and Mansour, M.H., 2006. Effects of age on composition and quality of muscle Longissimus thoracis of the Omani Arabian camel (Camelus dromedaries). Meat Sci., 73: 619-625.

Klangpetch, W., Phromsurin, K., Hannarong, K., Wichaphon, J. and Rungchang, S. (2016). Antibacterial and antioxidant effects of tropical citrus peel extracts to improve the shelf life of raw chicken drumettes. International Food Research Journal, 23(2): 700-707.

Murano, E. A. (2014). HEAT TREATMENT OF FOODS| Synergy Between Treatments.

Nychas, G.J.E., P.N. Skandamis, C.C. Tassou and K.P. Koutsoumanis, 2008. Meat spoilage during distribution. Meat Sci., 78: 77-89.

Oxoid, culture media, ingredients and other laboratory services.8th edition. Published by OXOID LTD. London. Website http://www.oxoid.com 2010.

Pearson, D. (1976). The chemical analysis of foods (No. Ed. 7). Longman Group Ltd..

Ranken, M.D. (2000). Hand Book of Meat Product Technology. Black well science. Led London.

Reiser, R. and Shorland, F.B. (1990), Meat Fats and Fatty Acids , journal of food science and technology, (2)5: 21-62.

Saleh, E. A., Hafez, E. E., Baker, N. M., El-Ghannam, Y. G., & Gorbal, S. H. (2015). Quality Assurance of Imported Canned Meat. *Global Veterinaria*, *14*, 511-516.

USDA. United State department agriculture. The free encyclopedia.2009.Beef mince.

Vergara-Balderas, F. T. (2016). Canning: Process of Canning.

Zhang, Y., Holman, B. W., Ponnampalam, E. N., Kerr, M. G., Bailes, K. L., Kilgannon, A. K., ... & Hopkins, D. L. (2019). Understanding beef flavour and overall liking traits using two different methods for determination of thiobarbituric acid reactive substance (TBARS). *Meat science*, *149*, 114-119.

Zhou, G.H., X.L. Xu and Y. Liu, (2010): Preservation technologies for fresh meat-A review. Meat Sci., 86: 119-128.

**تأكيد جودة بعض منتجات اللحوم المعلبة المستوردة التي يتم تسويقها في مدينة الفيوم ، مصر.**

**نبيل السيد حافظ – خليل ابراهيم خليل – أماني أحمد عبد الحليم- سماح أحمد عبد التواب.**
**قسم علوم وتكنولوجيا الأغذية ، كلية الزراعة ، جامعة الفيوم ، الفيوم ، مصر.**

**الخلاصة**

هدفت الدراسة الحالية إلى تأكيد الجودة الكيميائية والميكروبيولوجية لبعض منتجات اللحوم المعلبة المستوردة.حيث تم أخذ عينات عشوائية من اللحم البقري المعلب واللانشون البقري المعلب والكورنيد البقري المعلب المستورد من دول مختلفة تم تجميعها من السوق المحلي بمحافظة الفيوم. تم تقديرالتركيب الكيميائي (الرطوبة ، البروتين ، الدهون ، محتوى الرماد ، الكربوهيدرات و الطاقة) ، مؤشرات الجودة (الرقم الهيدروجيني ، إجمالي المحتوي الكلي للنيتروجين القاعدي وحمض الثيوباربيتوريك) والجودة الميكروبيولوجية (عدد الميكروبات الهوائية ، المكورات العنقودية الذهبية ، البكتيريا المحبة للحرارة و الكلوستريديا ). كان المحتوى الرطوبي غير متوافق مع متطلبات الهيئة المصرية العامة للمواصفات القياسية (EOS 1563/2005) في ٥٠٪ من العينات ، وكذلك محتوى البروتين لجميع العينات غير مطابق للمواصفة (EOS، 1563/2005). بينما المحتوى الدهني الوحيد الذي كانت جميع العينات فيه مطابقة للمواصفة (EOS، 1563/2005). أيضًا كانت قيم T.V.BN و T.B.A لجميع عينات العلامات التجارية في الحدود المسموح بها. كشف التحليل الميكروبيولوجي عن وجود عدد بكتريا المكورات العنقودية الذهبية والعد الكلي للكلوستريديا في ٥٠ و ٣٧.٥٪ من عينات العلامات التجارية.

**الكلمات الدالة :** التركيب الكيميائي- التحليل الميكروبيولوجي – الجودة – منتجات اللحوم المعلبة – مصر.