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Quality Assurance of Imported Canned Meat

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Abstract: The current study aimed to ensure the quality of imported canned meat. Atotal of 150 random samples of canned beef,corned beef and canned beef luncheon(50 of each)were collected from the trademarks which most commercially available in Alexandria and Behera governorates markets.The total weight of each samples was about 500 gm and were collected and kept in an icebox and transferred with aminimum of delay to the laboratory for further examination.It was achieved through physical examination include(damage,leakage of the cans and external rust), concerning chemical examination include(moisture,protein,fat,ash,pH,TVN%) and microbiological examination include(total aerobic bacterial count,total anaerobic bacterial count,total staphylococcal count).

Key words: Imported canned meat · Physical · Chemical and microbiological examination

INTRODUCTION

Meat preservation became necessary for transporting meat for long distances without spoiling of texture, colour and nutritional value after the development and rapid growth of super markets [1]. The aims of preservation methods to inhibit the microbial spoilage and minimize the oxidation and enzymatic spoilage (self autolysis).

Traditional methods of meat preservation such as drying, smoking, brining, fermentation, refrigeration and canning have been replaced by new preservation techniques such as chemical, biopreservative and nonthermal techniques [2]. Current meat preservation methods are broadly categorized into three methods (a) controlling temperature (b) controlling water activity (c) use of chemical or biopreservatives [2]. A combination of these preservation techniques can be used to diminish the process of spoilage [3].

The nutritional value of canned is excellent due to it is a good source of protein, vitamin B12, as well as rich in mineral elements mainly the main sodium and then come after zinc and contains high levels of saturated fats. cooked canned beef contains a high percentage of cholesterol. Although containment of canned meat on a high percentage of food additives, including industrial as preservatives and high content of saturated fat and cholesterol [4].As one of ways to keep food safety.

Quality improvement and control is not easy, particularly for very small manifactures who may feel isolated. Many efforts were done to produce a product free from pathogens of public health hazard and with low microbial count improve its keeping quality and keeps its nutritive value to be safe and of high quality. [5].
So this study is planned out to fulfill the following:

* Physical examination.
** Chemical examination.
*** Microbiological examination:
-Determination of total aerobic bacterial counts.
-Determination of total anaerobic count.
-Determination of staphylococcus count.

MATERIALS AND METHODS

Collection of samples [6]: A total of 150 random samples of canned beef, corned beef and canned beef luncheon (50 of each) were collected from different groceries and supermarkets in different localities at Alexandria and

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Al boheira governorates. The total weight of each sample was about 500 gm that were collected and kept in icebox and transferrd with a minimum of delay to the laboratory for further examination.

Sensory Evaluation: Sensory evaluation was carried out by a ninemember well trained panel. Panel members with ages ranging from 25 to 50 were from faculty members and graduate students of Food Hygiene Dept. Fact. Of Vet. Med. Damanhour Univ. and accredited food and feed safty lab. all were experienced in sensory evaluation of various food products. Panelists were asked to evaluate the samples of each trademark for tenderness, juiciness, flavor, color and overall acceptability. The descriptions of sensory properties and how to rate a sample for the particular sensory property were on the evaluation form

Physical Examination:

- External examination: To show (damage, leakage, external rust) of the cans.
- Incubation of cans For determination of overfilling, gelatin liquefaction
- Internal examination For examination of the content of the can as soft consistency, abnormal odour and colour.

Chemical Examination:

- Moisture content: [7]
- Ash content: Ash percentage was determined by Gravimetric method.[7]
- Measurment of pH: [8]
- Determination of total protein: [7,9]
- Determination of crude fat %: [10,11]
- Total volatile nitrogen (T.V.N.): [12]

Microbiological Examination:

- Determination of Total aerobic bacterial count: [13]
- Determination of anaerobic bacteria count (*Closteridium perfringens* and its toxins):[14,15]
- Determination of total staphylococcal count:[16]

Statistical Analysis: Statistical analysis (ANOVA) was conducted using SAS soft ware.

RESULTS AND DISCUSSION

Physical Examination: The importance of physical examination is the detection of any changes that, found in the cans of either external or internal examination.

The results of external examination observed in Table (1) cleared that, the highest incidence of damage of the cans was observed in canned and corned beef(6%) while the lowest in beef luncheon(1%). The results also, cleared that, the highest incidences of leakage observed in corned beef (8 %(followed by canned beef (4 %) and the lowest in beef luncheon (2 %).

The external rust observed in corned beef (8 %) while the lowest observed in canned beef and beef luncheon (2 %). the overfilling of the cans is higher incidences in corned beef (6 %) followed by canned beef (4 %) but in beef luncheon (2 %).

Also, the gelatin liquefaction is a higher incidences in corned beef (10 %) while the lowest in canned beef and beef luncheon (2 %). the results of internal examination that cleared in Table (2) showed that, the highest incidence of soft consistency in corned beef (10 %), canned beef (4 %) but not detected in beef luncheon. The abnormal odour defects showed a higher level in corned beef (4 %), canned beef (2 %) but not detected in beef luncheon. The abnormal colour defects only observed in corned beef (4 %).

Our results agreed with [17] where they reported that, high temperature storage leads to high vitamin losses, loss of colour and flavour, changes in appearance and higher internal corrosion rates of the can. For example, the loss of vitamin B1 from canned pork luncheon meat after 12 months' storage was 75 %, 40 % and 10 % at storage temperatures 37 C, 21 C and 7 C, respectively.

Chemical Examination of Canned Beef Products

Moisture: The moisture is one of the most important constituent of the meat and it one from the most important factors controlling the food quality. The level of moisture in meat must be not less than 70 % in fresh meat and in canned meat reached to 60 %. [7]. The results observed in Table (3) cleared that, the highest moisture level observed in canned meat with average percentage of 50.77 % followed by beef luncheon 59.47 % and corned beef 59.44 %. Our results agreed with [7,18],where they found that the moisture % in corned beef ranged from 55.65 to 60.50 %.

Protein %: The protein % in canned beef gave indications on the level of meat quality and its nutritive value. The level of protein in fresh meat must be not less than 22.28 % and in canned meat not less than 21 % [7,9].

Table (3), showed that the protein percentage values of the examined canned meat is at higher level in corned beef with a mean value of 20.34%. followed by beef luncheon 13.51%. while in canned beef 7.25 %.

Fat %: Table (3) showed Ahigher fat percentage in canned beef with a mean value 22.84% followed by beef luncheon 14.99% and corned beef 14.35 %.

Our results lower than [18], where they found that the fat % in corned beef ranged from 17.2 to 19.47 %.

Ash %: from the important factors that determine the canned meat quality is the level of ash in the canned meat [19].

Table (4) cleared that, the ash % is Ahigher level in beef luncheon with a mean value 3.95%, followed by canned meat 3.90 % and corned meat 3.80 %.

Our results agreed with [18], where they found that the ash % in corned beef ranged from 3.25 to 4.62 %, But it higher than those of where they reported that, the ash % in canned meat reached to 1.11 [20].

pH: The ultimate pH of muscle is a major determinate of meat quality and is largely determined by the depletion of glycogen and accumulation of lactic acid. [21,22].

Table (4) showed that pH values of canned beef with a mean value 6.11, corned beef 6.030 and beef luncheon 6.01.

Our results higher than which reported that, the normal fresh muscls has pH ranging from (5.3-5.7) [23]. The highest pH value may be attributed to the bad storage conditions or increasing level of bacterial load of the canned meat. Our results agreed with [24]. where they recorded that meat of high pH may attributed to high bacterial load than meat which has normal pH.

Total Volatile Nitrogen (TVN): is important for determination of the canned meat quality as its value indicated the quality of the protein that found in canned meat. [18]. The level of total volatile nitrogen (TVN) observed in table (4) showed a higher level in canned meat with a mean value of 10.88, followed by beef luncheon 9.88 and corned meat 8.00. Our results agreed with those who where they reported that, the TVN in canned meat must be not increased than 19 mg/100 gm meat[25].

Microbiological Examination

Total Aerobic Spore Former Count: the total aerobic bacterial count was the most reliable method for detection of sanitary level of proper processing, storage and marketing of food products.

It is evident from the results given in table (5) that the Aerobic Plate Count (APC) of the different examined canned meat. The highest level observed in canned beef with a mean value ($2.96 \times 10^{5)}$, followed by corned beef ($10.25 \times 10^{2)}$ and beef luncheon (4.37×10^{2}). Also there is a significant difference between the mean values of total aerobic bacterial counts of different canned meat products [26].

Total Anerobic Spore Former Count: It is evident from the results given in Table (5) that the anaerobic bacterial count differ significantly in its incidence among different types of canned meat.

The highest level of anaerobic bacterial count observed in canned beef with a mean value($7.45 \times 10^{3)}$, followed by corned beef (6.80×10^{2}) and beef luncheon (4.88×10^{2}).

Our results agreed with those of *C. perfringens* organism was isolated from all examined meat products including canned meat, corned meat, luncheon, frankfurter and sausage with variable percentages. So, it can be concluded that meat products are vehicle of C. perfringens food poisoning organisms. [27].

Similar results recorded the incidence of C. perfringens in both corned beef and canned meat [28]. While In luncheon group [29,30] gave the similar results.

Total Staphylococcal Count: Staphylococci are commonly found on the skin and in upper respiratory tract of human and animals and can easily contaminate the carcass. The presence of *staphylococcus aureus* on carcass surface may be due to contamination during preparation of canned meat and also due to contamination equipment and bucther's hand with abrasions and wounds, contaminated air from crow dress of workers and their aerosols which contaminated air with Staph. aureus during slaughtering. Therefore, the contamination of carcasses with Staph. aureus can be expected [31,32].

It is evident from the results given in Table (6) that the Staph. aureus count differ significantly in its incidence among different types of canned meat. The highest level of Staph. aureus bacterial count observed in canned beef with a mean value($2.04 \times 10^{3)}$, but its level in corned beef and beef luncheon not recorded.

The Staph. aureus only recorded in canned meat but not recorded in corned meat or beef luncheon [19]. this may be due to improper heat treatment of canned meat as Staph.aureus is mainly personal contamination.

1-Physical examination of canned beef products:

a-External examination:-Table (1): (n = 50):-

	Damage		Leakage		External rust		Overfilling		Gelatin liquifaction	
Productes	No	%	No	%	No	%	No	%	No	%
Canned beef	3	6	2	4	1	2	4	8	1	2
Corned beef	6	12	4	8	4	8	6	12	5	10
Beef luncheon	1	2	1	2	1	2	1	2	1	2

b-Internal examinationTable(2): (n = 50).

		Soft consistency		Abnormal odour		Abnormal colour	
Products	Number of samples	No	%	No	%	No	%
Canned beef	50	2	4	1	2	-	-
Corned beef	50	5	10	2	4	2	4
Beef luncheon	50	-	-	-	-	-	-

$Chi^2 = 7.24^{**}$ ** = Significant at (P < 0.01)

2-Chemical examination of canned beef products:

a-(Moisture,protein and fat) percentages in canned beef products:Table (3): (n = 50).

	Moisture			Protein			Fat		
Products	Min	max	mean±SD	Min	max	mean±SD	Min	max	mean±SD
Canned beef	57	61.55	50.77±0.22	5.10	6.22	7.25±0.12	19.88	23.44	22.84±0.18
Corned beef	56	60.44	59.44±0.20	18.33	23.50	20.34±0.19	16.44	16.44	14.35±0.15
Beef luncheon	58	62	59.47±0.20	10.11	13.15	13.51±0.11	15.44	15.44	14.99±0.10

Neans within the same column of different litters are significantly different at (P < 0.01)

b-(Ash,pH and TVN) percentages in canned beef products:Table(4)-(n=5)

	Ash			pH			TVN		
Products	Min	max	mean±SD	Min	max	mean±SD	Min	max	mean±SD
Canned beef	3.15	4.11	3.90±0.08	6.00	6.15	6.11±0.04	19.80	11.12	10.88±0.39
Corned beef	3.10	4.07	3.80±0.07	5.89	6.15	6.03±0.03	7.11	8.10	8.00±0.44
Beef luncheon	3.14	4.15	3.95±0.07	5.88	6.11	6.01±0.05	9.10	10.11	9.88±0.48

Means within the same column of different litters are significantly different at (P < 0.01).

3-Bacteriological examination of canned beef products:-

a-Total aerobic and anaerobic spore formers count in canned beef products.

Table 5: Total aerobic and anaerobic spore formers count in canned beef products. (n = 50).

	Total aerobic spore former count				Total anaerobic spore former count			
Products	Min	max	mean±SD	E.O.S	Min	max	mean±SD	E.O.S
Canned beef	2.11×10^2	2.14×10^5	A $2.96 \times 10^4 \pm 1.2 \times 10^4$	1.11×10^2	5.12 x 10	8.30×10^4	A $7.45 \times 10^3 \pm 3.23 \times 10^3$	2.15 x10
Corned beef	3.95 x10	3.94×10^3	B10.25 x $10^2 \pm 5.88 \times 10^2$	0.50 x10	5.22 x 10	5.44×10^3	B6.80 x $10^2 \pm 3.54 \times 10^2$	1.50 x10
Beef luncheon	1.44 x10	3.15×10^3	C4.37 x $10^2 \pm 9.88 \times 10$	0.20 x10	4.44×10^2	8.55×10^3	B4.88 x $10^2 \pm 3.04 \times 10^2$	0.55 x10

Means within the same column of different litters are significantly different at (P < 0.01).

b-Staphylococcus aureus count in canned beef products: Table (6): (n = 50).

Products	Number of samples	Minimum cfu/g	Maximum cfu/g	Staphylococcus bacterial count cfu/g	E.O.S
Canned beef	50	1.55 x 10	1.88×10^4	$2.04 \times 10^3 \pm 4.55 \times 10^2$	0.50X 10
Corned beef	50	0	0	0	0
Beef luncheon	50	0	0	0	0

Means within the same column of different litters are significantly different at (P < 0.01).

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