Quality indices of Fresh and Frozen Oriental sausage

Abdelrahman, hosny Abdellatief[1], Ismail S.A. S[1], Mohamed F. A[2]
1 Suez Canal University, Faculty of Veterinary Medicine, Food Hygiene and Control Department, Ismailia, Egypt.
2 Suez Canal University, Faculty of Veterinary Medicine, Central lab, Ismailia, Egypt
Corresponding author: *Prof Dr. hosny Abdellatief Abelrahman*
Email: hrahman69@yahoo.com

Abstract
A total of 100 of fresh and frozen oriental beef sausage samples (50 of each) were collected from local markets and analyzed for their quality indices through bacteriological and chemical examinations. The bacteriological profile of fresh sausage samples revealed that the mean Log values of Psychrotrophic, Enterobacteriaceae and Coliforms count were 7.164 ±0.131, 5.393 ±0.140 and 5.2308 ±0.1504 log_{10} CFU/g., respectively. While the mean log values for frozen sausages were 3.404 ±0.589, 3.193 ±0.199 and 3.2973 ±0.2385 log_{10} CFU/g respectively. Salmonella were detected in 10 (20%) of fresh oriental beef sausage, meanwhile it could not be detected in all examined frozen sausage. The chemical examination showed that the mean values of pH, Total Volatile Nitrogen (TVN mg/100g) and Thiobarbituric acid value (TBA mg malondhyde /kg) were 5.480±0.066, 8.263±0.348 and 0.2346 ±0.0078; 6.503±0.067, 4.399 ±0.082 and 0.4064 ±0.0348 for fresh and frozen and sausage samples respectively.

Keywords: Oriental Sausage, Psychrotrophic, Enterobacteriaceae, Coliforms, Salmonella, PH, TVN, TBA.

Introduction

Meat products are one of the most delicious and popular foods, as they are a vital source of animal protein, essential amino acids, fat, minerals, vitamins and other nutrients ***(Zafar et al., 2016).*** Meat products are thought to provide a suitable medium for the growth of a variety of microorganisms because of large proportion of nitrogenous compounds, their high moisture, abundant supply of minerals, a number of fermentable carbohydrates and favorable pH for the majority of microorganisms causing their spoilage, economic losses, foodborne related infections in human and health hazard **(*Aymerich et al., 2008)***. Oriental beef sausage is very popular meat product items due to its quick preparation and it also solve the shortage issue of high-priced fresh

meat that may be out of reach to limited income families ***(Saad et al., 2018b).*** Microorganisms contaminate sausage through spices, raw meat and other components, also from equipments, environment and handlers throughout processing influence the microbiological profile of the sausage**,** (***Sachindra et al., 2005).*** These microorganisms differ with the manufacture method, quality of sausage additives, and contamination degree throughout the processing chain, packaging and storage **(*Borch and Arinder, 2002).*** Regarding frozen sausage, freezing is a method for increasing the shelf life of meat products and protects it from being rapid spoilage. It has been practiced for many years to maintain its quality throughout storage, distribution and marketing ***(Abdel-Aziz 2000).*** Bacterial load and sanitary measures throughout meat manufacture and unsuitable storage conditions for frozen meat products can be assessed by the total Psychtrophic, Enterobacteriaceae and total Coliforms ***counts (Hamed et al., 2015).***

Psychtrophic bacteria are the main cause of spoilage of meat products which are kept under refrigeration temperature due to their ability to grow at low temperature. Their count can provide useful information about the keeping quality of some meat products ***(Mousa et al., 2014).*** The Enterobacteriaceae group has an epidemiological significance as some numbers of its members are pathogenic and might cause serious infections and food poisoning. Furthermore, during the absence of coliforms the total number of Enterobacteriaceae is considered as a sign of possible enteric contamination***, (Mercuri et al., 1978).*** The incidences of Coliform bacteria in examined food samples indicate contamination by animal or human fecal throughout meat products and meat processing chain. They are not themselves pathogenic but are inhabitant of the digestive systems of animals, and thus plentiful in feces **(*Hamza and Elshrek 2019).*** Salmonellosis is a worldwide health issue, and considered the second foremost bacterial food-borne gastroenteritis. Despite the fact that Salmonella has over 2,500 different serotypes, only a few of these serotypes have been associated to food-borne diseases on a regular basis **(*Mahmoud 2012*)**.The Total Volatile Nitrogen (TVN) content is extensively used as a benchmark for microbial decomposition of protein and also throughout the storage period, tissue proteolytic enzymes continue in breaking down the proteins **(*Gibriel et al., 2007*).** Lipid oxidation occurs when pro-oxidant agents exceed the antioxidant compounds and factors naturally or deliberately added to meat products. A number of oxygenated products are generated during lipid oxidation as hydroperoxides and peroxyl which may cause major impacts in the

characteristics of meat products throughout storage period. The TBA assays indicate the level of the secondary products resulted from lipid oxidation ***(Lorenzo et al., 2018).*** In recent years, consumer awareness has risen for bacteriological quality of sausages. Bacteriological and chemical criteria are a good approach to learn more about the quality and safety of oriental sausage. Therefore, this study was conducted to evaluate the bacteriological and chemical quality of fresh and frozen oriental beef sausages samples collected from local markets, via determination of Psychrotrophic, Enterobacteriaceae, Coliforms count and assessment of pH, TVN and TBA.

Material and methods

1 Collection of samples

A total of one hundred samples of fresh and frozen oriental beef sausages (fifty of each) collected from local markets. The fresh samples were transferred without delayed to the Food Hygiene laboratory, Faculty of Veterinary Medicine, Suez Canal University where prepared for the microbiological evaluation. Frozen samples were thawed in the refrigerator overnight at 4^{o}C.

2 Preparation of samples *APHA (2002)*

Twenty-five grams from each sample were transferred under aseptic condition to a sterile polyethylene bag containing 225mL of sterile buffered peptone water 0.1%. The bag content was then homogenized using stomacher (*Lab. Blender 400, Seward Lab, London*) to have a dilution of 10^{-1}. From the original dilution, 1 ml was aseptically transferred to a test tube containing 9 ml sterile buffered peptone water (*w/v*) 0.1% to prepare a dilution of 10^{-2}, then from which further tenth fold serial dilution up to 10^{-7} were prepared to cover the expected range of sample contamination which could be easy counted.

3 Bacterial analysis:

3.1 Determination of Psychrotrophic count as described by ***(APHA, 2002).***

3.2 Determination of Enterobacteriaceae count as described by **(*ISO 21528-2).***

3.3 Detection of Salmonella as described by **(*ISO 6579:2002).***

3.4 Determination of Coliform count as described by **(*ISO/FDIS 4832:2005)***

4 Chemical analysis:

4.1 Determination of PH as described by ***(AOAC, 2005).***

4.2 Determination of TVN as described by ***(AOAC, 2005).***

4.3 Determination of TBA as described by **(AOAC, 2005).**

Results and Discussions

Food borne illness caused by consumption of contaminated food with pathogenic bacteria and with their toxins has been of critical concern to public health. More than 250 diverse food borne diseases have been mentioned, and the

bacteria are the causative agents of two thirds of foodborne disease outbreaks ***(Olsen et al., 2000).***

1. Microbiological analysis:

1.1 Psychrotrophic count of sausage:

Due to the increased usage of frozen food nowadays to save time, it is very vital to study the effect and role of Psychrotrophic bacteria in frozen foods spoilage **(*Kraft, 1992).*** The data recorded in **Table (1)** revealed that the mean value ±SE of Psychrotrophic count of the examined fresh sausage was 7.164 ±0.131 (log_{10} CFU/g). While in frozen sausage in **Table (2)** it was 5.633 ±0.118 (log_{10} CFU/g). The recorded result for fresh sausage was nearly compatible with ***(Araújo et al., 2018).*** The recorded result for fresh sausage was relatively higher than that obtained by ***Bostan and Mahan (2011)*** and ***Ali et al. (2021***). For frozen sausage, the obtained results matched that to the result obtained by ***Sharoba (2009***) and ***Badr and Mahmoud (2011),*** while these results were lower than those results found by ***Bostan and Mahan (2011).*** On the other hand, these results were relatively higher than that obtained by ***Gaafar et al. (2014), Mousa et al., (2014) and Shaltout (2017).*** The differences in the results were ascribed to the quality of the raw materials used and the application of good manufacturing practice.

1.2 Enterobacteriaceae count sausage

The occurrence of Enterobacteriaceae act as an indicator of food sanitation and it has received an attention of most scientists. The presence of Enterobacteriaceae indicates the potential of toxigenic bacteria and microbiological in meat that leads to public health hazard **(*Mira, 1989).*** The data recorded in **Table (1)** revealed that the mean value ±SE of Enterobacteriaceae count of the examined fresh sausage was 5.393 ±0.140 (log_{10} CFU/g), while in frozen sausage in **Table (2)** was 3.193 ±0.199 (log_{10} CFU/g). The recorded result for fresh sausage was nearly similar to **Al-*Mutairi (2011)*** and ***Badr and Mahmoud (2011),*** meanwhile these results were relatively lower than those results found by ***Oluwafemi and Simisaye (2006),*** meanwhile the results were relatively higher than those results found by ***Shaltout et al. (2016b), Salem et al. (2018)*** and ***Youness (2018).*** For frozen sausage, the obtained results almost matched that result obtained by ***Khalafalla and El-Sherif (1993)*** and ***Gaafar et al., (2014).*** On the other hand, these results were relatively lower than those results found by ***Badr and Mahmoud (2011)***. The results were relatively higher than those results found by ***Mousa et al. (2014)*** and ***Shaltout (2017).***

1.3 Detection of Salmonella in sausage:

The absence of Salmonella in the meat product samples indicate the

quality of raw meat and other hygienic processing including the quality of the water used in processing ***(Datta et al., 2012).*** The data recorded in **Table (3)** revealed that the incidence of salmonella in the examined fresh sausage was 20%, while in frozen sausage all samples were negative for salmonella. The obtained results for fresh sausage was nearly similar to this reported by ***Moustafa et al. (2014), Abd El Tawab et al. (2015) and Kayed (2020),*** while it was relatively lower than results obtained by ***Hamed et al. (2007), Elhag et al. (2014) and Humaeda (2014).*** On the other hand this result was higher than results obtained by ***Manihuruk et al. (2017), Younes et al., (2019),*** and ***Gamal et al., (2020).*** For frozen sausages none of the examined samples contained Salmonella, this is in accordance with the results reported by ***Surkiewicz et al. (1973), Phillips et al. (2006)*** and ***Hassanin et al., (2018)*** Salmonella proved to be highly sensitive to freezing, regardless of the freezing method. On the other hand, it was relatively lower than results obtained by ***Mousa et al. (2014), Shaltout et al. (2016c)*** and ***Saad et al. (2018b).*** By comparing this result with Egyptian Standard ***(ES 2005*)*,*** it revealed that 100% of frozen sausage samples were compatible to Egyptian Standard.

1.4 Coliform count of sausage

The occurrence of coliforms in food indicates poor hygienic standards ***(Shaltout 2017).*** The data recorded in **Table (1)** revealed that the mean value ±SE of Coliform count of the examined fresh sausage samples was 5.2308 ±0.1504 (log_{10} CFU/g), while in frozen sausage samples in **Table (2)** was 3.2973 ±0.2385 (log_{10} CFU/g). The obtained results for fresh sausage were nearly similar to **Oranusi and Braide (2012), Elhadi *et al.* (2017)** and ***Saad et al. (2018b).*** On the other hand, these results were relatively lower than result found by ***Abomengeal (2010),*** while these results were relatively higher than result obtained by ***Shaltout et al. (2016a), Hamza and Elshrek (2019)*** and ***Younes et al. (2019)*** For frozen sausage, the obtained results almost matched that result obtained by ***Shaltout et al. (2016c)*** and ***Shaltout (2017),*** while these results were relatively higher than result found by ***Sharoba (2009) and Shaltout (2017).*** On the other hand, these results were relatively lower than result obtained by **Ha*med et al. (2007), Hassanin et al. (2018)*** and ***Saad et al. (2018b).*** By comparing this result with ***ES (2005)***, it revealed that 80% of frozen sausage samples were not compatible to ***Egyptian*** organization for standardization and quality control.

2- Chemical analysis:

The data recorded in **Table (4)** revealed that mean value ±SE of pH of the fresh sausage was 5.480 ±0.066, while in frozen sausage was 6.503 ±0.067. The recorded result

of pH for fresh sausage was nearly similar to ***Elhag et al. (2014), Manihuruk et al. (2017)*** and ***Ali et al. (2021).*** On the other hand, these results were relatively lower than result found by ***Humaeda (2014), Slima et al., (2017)*** and ***Araújo et al., (2018).*** For frozen sausage, the obtained results almost matched that result obtained by ***Hamed et al. (2007), Sharoba (2009)*** and ***Badr and Mahmoud (2011).*** The data recorded in **Table (4)** revealed that mean value ±SE of TVN of the examined fresh sausage was 8.263 ±0.348, while in frozen sausage was 4.399 ±0.082 mg/100g. The recorded result of TVN for fresh sausage was nearly lower than results reported by ***Hamed et al. (2007), Ali et al. (2010), Ibrahim (2012)*** and ***Ali et al. (2021***). For frozen sausage, the obtained results were nearly lower obtained by ***Hamed et al. (2007)*** and ***Sharoba (2009).*** By comparing this result with ***ES (2005),*** it revealed that 100% of frozen sausage samples were compatible to Egyptian organization for standardization and quality control. The data recorded in **Table (4)** revealed that the mean value ±SE of TBA of the fresh sausage was 0.2346 ±0.0078, while in frozen sausage was 4.399 ±0.082 Mg malondhyde /Kg. The recorded result of TBA for fresh sausage was nearly similar to ***Ali et al., (2010)*** and ***Ali et al., (2021).*** On the other hand, these results were relatively lower than result found by ***Hamed et al. (2007), Ibrahim (2012)*** and ***Abdel-rasoul (2021)***. By comparing this result with ***ES (2005),*** it revealed that 100% of frozen sausage samples were compatible to Egyptian standard.

Conclusion:

Fresh and frozen sausages are considered a hazard source for public health due to presence of Enterobacteriaceae, Salmonella and Coliform this may be ascribed to lack of hygienic conditions, absence of quality control and multi contamination sources throughout sausage processing, packaging, storage and distribution. The undesirable level of contamination which might have been acquired from the environment and surrounding and considered was considered as major cause of spoilage of meat products. Additionally, retailed Egyptian sausage might pose a possible health hazard, making it essential to apply sanitary measures during its processing, handling, storage, packaging, distribution and selling Therefore, improving the microbiological quality and increasing the shelf life of sausage is necessary by implementation of the principles of Good Manufacturing Practices throughout the chain of sausage manufacturing process.

Table (1) *Statistical analytical results of (log10 CFU/g) of (Psychrotrophic, Enterobacteriaceae and Coliforms) of Fresh sausage.*

Parameter **Result**	Psychrotrophic	Enterobacteriaceae	Coliforms
Minimum	6.068	3.869	3.6435
Maximum	8.391	6.146	5.9542
Mean	7.164	5.393	5.2308
SE	± 0.131	± 0.140	± 0.1504

Table (2) *Statistical analytical results of (log10 CFU/g) of (Psychrotrophic, Enterobacteriaceae and Coliforms) of frozen sausage*.

Parameter **Result**	Psychrotrophic	Enterobacteriaceae	Coliforms
Min.	4.544	<10	<10
Max.	6.681	4.041	4.6990
Mean	5.633	3.193	3.2973
SE	± 0.118	± 0.199	± 0.2385

Table (3): *Prevalence of salmonella in Fresh sausage*.

Positive		Negative	
No.	%	No.	%
10	20	40	80

Table (4) *Statistical analytical results of (pH, TVN and TBA) of Fresh and frozen sausage.*

Parameter Result	Fresh Sausage samples			Frozen Sausage samples		
	pH	TVN mg/100g	TBA mg malondhyde /kg	pH	TVN mg/100g	TBA mg malondhyde /kg
Min.	5.03	6.3	0.2	6	4	0.228
Max.	5.9	10.500	0.3	7.1	5.300	0.62
Mean	5.480	8.263	0.2346	6.503	4.399	0.4064
SE	±0.066	±0.348	±0.0078	±0.067	±0.082	±0.0348

References

Abd El Tawab A.A.; El-Hofy F.I.; Maarouf A.A. and El-Said A.A. (2015):Bacteriological studies on some food borne bacteria isolated from Chicken meat and meat products in Kaliobia Governorate. Benha Veterinary Medical Journal; **29**: 47-59.

Abdel-Aziz H.A. (2000):Chemical and technological studies on the processing of beefburger. M.V.Sc. Thesis, Faculty of Agriculture, Monoufeyia Univ.

Abdel-rasoul M.A.-S.A. (2021):Nutritive Value and Physiochemical Quality of Some Meat Products. M.V.Sc. Thesis (Meat Hygiene), Fac. Vet. Med., Assuit Univ.

Abomengeal W (2010):Microbiological quality study of Mergaze (Fresh sausage) [M.V.Sc thesis]. Food Science Department. Faculty of Agric. Tripoli University. Tripoli, Libya.

Al-Mutairi M.F. (2011):The incidence of Enterobacteriaceae causing food poisoning in some meat products. Advance Journal of Food Science and Technology; **3**: 116-21.

Ali F.; Abdel-Atty N. and Helmy E. (2021):Improving the quality and extending the shelf life of chilled fresh sausages using natural additives and their extracts. Journal of Microbiology, Biotechnology and Food Sciences; **2021**: 580-5.

Ali F.H.; Kassem G.M. and Atta-Alla O.A. (2010):Propolis as a natural decontaminant and antioxidant in fresh oriental sausage. Veterinaria italiana; **46**: 167-72.

APHA (2002):Compendium of methods for the microbiological examination of foods. Washington, DC: American Public Health Association.

AOAC (2005): Official Methods of Analysis, 18th edn.

Association of Official Analytical Chemists, Washington, D.C.

Araújo M.K.; Gumiela A.M.; Bordin K.; Luciano F.B. and de Macedo R.E.F. (2018):Combination of garlic essential oil, allyl isothiocyanate, and nisin Z as bio-preservatives in fresh sausage. Meat science; **143**: 177-83.

Aymerich T.; Picouet P.A. and Monfort J.M. (2008): Decontamination technologies for meat products. Meat science; **78:** 114-29.

Badr H.M. and Mahmoud K.A. (2011):Antioxidant activity of carrot juice in gamma irradiated beef sausage during refrigerated and frozen storage. Food Chemistry; **127**: 1119-30.

Borch E. and Arinder P. (2002):Bacteriological safety issues in red meat and ready-to-eat meat products, as well as control

measures. Meat science; **62**: 381-90.

Bostan K. and Mahan F. (2011):Microbiological quality and shelf-life of sausage treated with chitosan. J. Fac. Vet. Med. Istanbul Univ; **37**: 117-26.

British Standards Institution (2004) ISO 21528-2:2004. Microbiology of Food and Animal Feeding stuffs - Horizontal Methods for the Detection and Enumeration of Enterobacteriaceae - Part 2: Colony Count Method. London: BSI.

Datta S.; Akter A.; Shah I.; Fatema K.; Islam T.; Bandyopadhyay A.; Khan Z. and Biswas D. (2012):Microbiological quality assessment of raw meat and meat products, and antibiotic susceptibility of isolated Staphylococcus aureus. Agriculture, Food and Analytical Bacteriology; **2**: 187-94.

Elhadi D.A.; Elgasim E.A. and Mohamed Ahmed I.A. (2017):Microbial and oxidation characteristics of refrigerated chicken patty incorporated with moringa (Moringa oleifera) leaf powder. CyTA-Journal of Food; **15**: 234-40.

Elhag N.B.; Babiker E. and Mahdi A.A. (2014):Microbial profile of sausages in Khartoum State. J. Agri. Food Appl. Sci; **2**: 206-19.

Egyptian Standard, ES:1972/2005 (2001): Frozen Sausage. Arab repuplic of Egypt, Egyptian Organization for Standarization and quality control ICS: 67.120.10.

Gaafar R.E.; Ahmed A.M. and Soliman S.A. (2014): Spoilage bacteria in frozen meat products. Suez Canal Vet Med J., 17(1*):* 97-108.

Gamal N.M.; El-Tawab A.; Awad A.; Elhofy F. and Maarouf A.A. (2020):Phenotypic characterization of some foodpoisoning bacteria isolated from meat and meat products in Kaliobia, Egypt. Benha Veterinary Medical Journal; **38**: 146-51.

Gibriel A.; Ebeid H.; Khalil H. and Abdel-Fattah A. (2007):Application of Monascus purpureus pigments produced using some food industry wastes in beef sausage manufacture. Egyptian Journal of Food Science; **35**: 27-45.

Hamed E.; Ahmed A. and Abd El-Aaty M. (2015):Bacteriological hazard associated with meat and meat products. Egypt. J. Agric. Res; **93**: 385-93.

Hamed E.s.; Rashed A.; Nasem A.; Mohamed R. and Ghonemy A. (2007):Microbial and Chemical quality of retailed sausage and antimicrobial effect of essential oils or lactic acid bacteria against foodborne pathogens. 12th Conference of Microbiology; Cairo, Egypt,: 1-15.

Hamza I.B. and Elshrek Y. (2019):Microbiological quality of fresh sausage Marketed in Tripoli city, Libya. 4th International Conference on Food Microbiology and Food Market . New York, USA.

Hassanin F.S.; Salem A.M.; Elbaba A.H. and Elmonsef S.A. (2018):Bacteriological quality of some meat products processed in supermarkets in Cairo. Benha Veterinary Medical Journal, Vol. 34, No. 1:496-501,

Humaeda W.A.S.A. (2014):Quality and Safety of Unpacked Beef Sausage in Khartoum State. Sudan University of Science and Technology. http://repository.sustech.edu/handle/123456789/10241

Ibrahim F.Y. (2012):Effect of addition different levels of rosemary, basil and mint on the quality of fresh beef sausage during refrigerated storage. Journal of Food and Dairy Sciences; **3**: 277-89.

International Organization for Standardization (2007): ISO 6579:2002/Amd 1:2007. Detection of Salmonella spp. in animal faeces and in environmental samples from the primary production stage, amendment 1, annex D. In Microbiology of food and animal feeding stuffs. Horizontal method for the detection of Salmonella spp. International Organization for Standardization, Geneva, Switzerland.

Kayed A.M.M. (2020):Prevalence and molecular characterization of some foodborne infectious microorganisms in meat products. M.V.Sc.Thesis (Meat Hygiene), Fac. Vet. Med., Elsadat Univ.

Khalafalla F. and El-Sherif A. (1993):Psychrotrophic bacteria in sausage. Food/Nahrung; **37**: 428-32.

Kraft A.A. (1992) *Psychotropic Bacteria in FoodsDisease and Spoilage*. CRC Press.

Lorenzo J.M.; Pateiro M.; Domínguez R.; Barba F.J.; Putnik P.; Kovačević D.B.; Shpigelman A.; Granato D. and Franco D. (2018):Berries extracts as natural antioxidants in meat products: A review. Food Research International; **106**: 1095-104.

Mahmoud B.S. (2012) *Salmonella: A dangerous foodborne pathogen*. BoD–Books on Demand.

Manihuruk F.M.; Suryati T. and Arief I.I. (2017):Effectiveness of the red dragon fruit (Hylocereus polyrhizus) peel extract as the colorant, antioxidant, and antimicrobial on beef sausage. Media Peternakan; **40**: 47-54.

Mercuri A.; Cox N.; Carson M. and Tanner D. (1978):Relation of Enterobacteriaceae counts to Salmonella contamination of market broilers. Journal of food protection; **41**: 427-8.

Mira E.K. (1989):Hygienic Status of Beef Produced in New Cairo

Abattoir. M.V.SC. Thesis,Faculty Vet. Med. Cairo Univ.

Mousa M.M.; Ahmed A.A. and El-Shamy S.Y. (2014):Microbiological Criteria of Some Meat Products. Alexandria Journal for Veterinary Sciences; **42**.

Moustafa N.Y.; Al-Hawary I.I. and Ibrahim R.M. (2014):DETECTION OF SALMONELLAE IN SOME MEAT PRODUCTS. Kafrelsheikh Veterinary Medical Journal; **12**: 85-96.

Olsen S.J.; MacKinon L.C.; Goulding J.S.; Bean N.H. and Slutsker L. (2000):Surveillance for foodborne-disease outbreaks, United States, 1993-1997.

Oluwafemi F. and Simisaye M. (2006):Extent of microbial contamination of sausages sold in two Nigerian cities. African Journal of Biomedical Research; **9**.

Oranusi S. and Braide W. (2012):A study of microbial safety of ready-to-eat foods vended on highways: Onitsha-Owerri, south east Nigeria. International Research Journal of Microbiology (IRJM); **3**: 066-71.

Phillips D.; Jordan D.; Morris S.; Jenson I. and Sumner J. (2006):A national survey of the microbiological quality of beef carcasses and frozen boneless beef in Australia. Journal of food protection; **69**: 1113-7.

Saad M.; Hassan M. and Elgnainy N. (2018b):Evaluation of the Quality of the Minced Meat in Egyptian Markets. Benha Veterinary Medical Journal; **35**: 257-68.

Sachindra N.; Sakhare P.; Yashoda K. and Rao D.N. (2005):Microbial profile of buffalo sausage during processing and storage. Food control; **16**: 31-5.

Salem A.M.; Shawky N.A. and Abo-Hussein L. (2018):Microbiological Profile of Some Meat Products in Menofia Markets. Benha Veterinary Medical Journal; **34**: 1-7.

Shaltout F.; Ali A. and Rashad S. (2016a):Bacterial Contamination of Fast Foods. Benha Journal of Applied Sciences (BJAS); **1**: 45-51.

Shaltout F.A. (2017): Bacteriological Evaluation of Frozen Sausage. Nutrition and Food Toxicology; **1**: 174-85.

Shaltout F.A.; Maarouf A.A.; El-Kewaiey I. and Heweidy A.Y. (2016b):Prevalence of some foodborne microorganisms in meat and meat products. Benha Veterinary Medical Journal; **31**: 213-9.

Shaltout F.A.; Salem A.M.; Khaterb D.F. and Lela R.A. (2016c):Studies on bacteriological Profile of some meat products. Benha Veterinary Medical Journal; **31**: 43-9.

Sharoba A. (2009):Quality attributes of sausage substituted by different levels of whole amaranth meal. Annals of Agricultural Science, Moshtohor; **47**: 105-20.

Slima S.B.; Ktari N.; Trabelsi I.; Triki M.; Feki-Tounsi M.; Moussa H.; Makni I.; Herrero A.; Jiménez-Colmenero F. and Perez

C.R.-C. (2017):Effect of partial replacement of nitrite with a novel probiotic Lactobacillus plantarum TN8 on color, physico-chemical, texture and microbiological properties of beef sausages. LWT; **86**: 219-26.

ISO 4832: (2005): Microbiology of food and animal feeding stuffs—Horizontal method for the enumeration of coliforms-Colony count technique.

Surkiewicz B.F.; Harris M.E. and Johnston R.W. (1973): Bacteriological survey of frozen meat and gravy produced at establishments under federal inspection. Applied microbiology; **26**: 574-6.

Younes O.; Ibrahim H.; Hassan M. and Amin R. (2019): Demonstration of some food borne pathogens in different meat products: a comparison between conventional and innovative methods. Benha Veterinary Medical Journal; **36**: 219-28.

Youness A.M. (2018): Bacteriological status of some meat products. MV Sci. Thesis (Meat Hygiene), Fac. Vet. Med., Benha Univ. Egypt.

Zafar A.; Ahmed E.; Wajiha H. and Khan A.B. (2016): Microbiological Evaluation of Raw Meat Products Available in Local Markets of Karachi, Pakistan: Microbial Evaluation of Raw Meat Products. Proceedings of the Pakistan Academy of Sciences: B. Life and Environmental Sciences; **53**: 103-6.

مؤشرات جودة السجق الشرقي الطازج والمجمد

حسني عبداللطيف عبدالرحمن- سعاد احمد سليمان- فاطمة عاطف محمد

كلية الطب البيطري - جامعة قناة السويس - قسم الرقابة الصحية علي الاغذية

المخص العربي

تم فحص 100 عينة عشوائية من السجق الشرقي الطازج والمجمد (50 عينة لكل منها) من الأسواق المحلية وبتحليل مؤشرات جودتها من خلال الفحوصات البكتريولوجية والكيميائية بينت الفحوص البكتريولوجية للسجق الطازج أن متوسط قيم اللوغاريتمات الخاصة بعدد الميكروبات المحبة للبرودة والبكتيريا المعوية والقولونية هي 7.164 ± 0.131 ، 5.393 ± 0.140 ، 5.2308 ± 0.1504 لوغاريتم 10 وحدة تشكيل مستعمرة / جم ، على التوالي. بينما كانت للعينات المجمدة 3.404 ± 0.589 ، 3.193 ± 0.199 و 3.2973 ± 0.2385 لوغ 10 ,وحدة تشكيل مستعمرة / جم على التوالي.

وكانت نسبة السالمونيلا التي تم الحصول عليها هي 10 (20٪) من عينات السجق الشرقي الطازج ، بينما لم يستدل عن أنواع السالمونيلا في جميع عينات السجق المجمدة.

وقد أظهر الفحص الكيميائي أن متوسط قيم الأس الهيدروجيني ،والمركبات النتروجينيه الطيارة و وقيم حامض الثيوباربيتيورك هي 5.480 ± 0.066 ، 8.263 ± 0.348 و 0.2346 ± 0.0078 ؛ 6.503 ± 0.067 و 4.399 ± 0.082 و 0.4064 ± 0.0348 للعينات السجق الطازجة والمجمدة على التوالي.