Bacteriological evaluation of some meat products with some trials to improve their quality

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Abstract

Meat products are an excellent source of many nutrients; particularly protein, vitamins and minerals. Despite being one of the most important items in the human diet, they are considered as one of the main vehicles of pathogens. These pathogens can result in many cases of food poisoning. Therefore, the present study was conducted to evaluate the bacteriological quality of some meat products (minced meat, sausage, burger and luncheon) in Zagazig City, Sharkia Governorate, Egypt through determination of psychrotrophic count, pseudomonas count, enterococci count and isolation of *Salmonella spp*. In addition to, study the anti-microbial activities of some essential oils (clove oil, oregano oil and garlic oil) on minced meat quality and shelf life. Results revealed that the mean count of psychrotrophic bacteria was 5.4 ± 0.097, 5.1 ± 0.066, 3.5 ± 0.117 and 2.7 ± 0.114 log10CFU/g, pseudomonaswas5.2 ± 0.075, 4.5 ± 0.112, 3.1 ± 0.108 and 2.9 ± 0.066 $\log_{10}$ CFU/g and enterococci was 4.7 ±0.104, 3.8 ±0.079, 3.4 ±0.114 and 2.8 ±0.074 $\log_{10}$ CFU/g in the examined minced meat, burger, sausage, and luncheon, respectively. *Salmonella spp* failed to be detected in all examined meat products. The three essential oils (clove, oregano and garlic) used in this were effective in improving the bacteriological quality of meat. Garlic oil was the most effective one followed by oregano then clove oil.

Key words: Meat products, Pseudomonas, Psychrotrophic, Essential oils

1. Introduction

Meat products are an excellent source of many nutrients; particularly protein, unsaturated fats like omega-3 fatty acids as well as several vitamins such as vitamins E, B1, B2, B3 and B6. Also, meat products contain several minerals including magnesium, iron and zinc.

In Egypt, meat productsare favored by numerous peoples because they are easy to purchase, quickly to cook, tasty to eat and low in cost. Despite being one of the most important items in the human diet and an industry with considerable potential for growth, meat and meat products are considered one of the main vehicles of pathogens to humans **(Rhoades *et al*. 2009)**, causing foodborne illne. There are various sources which can contaminate such products duringthe different stages on production process including food handlers, cross contamination and unhygienic preparation, processing and storage resulting in bacteriological contamination and therefore, meat spoilage and food borne illnesses.

Psychrotrophic bacteria develop on meat products at chill temperatures. They belong to microbial genera of both gram positive, such as lactic acid bacteria, and gram-negative bacteria, such as *Pseudomonas spp*. and Enterobacteriaceae**(Ercolini*et al.*, 2009)**. *Pseudomonas* species are the major causative spoilage bacteria in meat, primarily due to their metabolic versatility and ability to produce extracellular proteases and lipases cause oxidation, color change, off- flavor, slimy form and animal tissues degradation **(Doulgeraki *et al*. 2012)**. *Enterococcus* species are associated with the gastrointestinal tracts of animals and are responsible for morbidity and mortality in predisposed humans. They are used as indicators of animal fecal contamination of meat products. They are ubiquitous bacteria widely distributed in a variety of habitats; they also, comprise a high proportion of saprophyte bacteria **(Domig*et al*. 2003)**.

Salmonella is a genus of rod-shaped Gram-negative bacteria of the family Enterobacteriaceae. According to the World Health Organization, Salmonella is one of the most relevant pathogens in meat and meat products; its presence poses a risk to consumers **(WHO, 2005)**.

Many naturally occurring extracts like essential oils from edible and medicinal plants, herbs and spices have been shown to possess antimicrobial functions and could serve as a source for antimicrobial agents against food spoilage organisms and pathogens **(Dhanze*et al*., 2013)**. For instance, clove, oregano and garlic show antimicrobial and antioxidant properties.Clove oil (*Syzygiumaromaticum L.*) has been used for many purposes since ancient times in various food applications. Clove oil has a widespectrum of actions not only antibacterial, antiviral, antifungal and antiprotozoal, but also have beneficial effects on the cardiovascular and immune system **(Maheshwari*et al*., 2012)**. Essential oil of oregano(*Origanumvulgare L.*) is known for its relatively strong antimicrobial properties **(Teixeira *et al*., 2013)**. It contains mainly carvacrol and considerably less thymol as well as small amounts of other constituents which may have antioxidant activity **(Michalczyk*et al*., 2015).**Garlic oil (*Allium sativum L.*) is used as a preservative and additive to prevent lipid oxidation**(Salejda*et al*., 2011)**; it also characterized by high biological activity.

Keeping the above view, the present study was planned to evaluate the bacteriological quality of minced meat, sausage, burger and luncheonin Zagazige City, Sharkia Governorate in addition to, study the anti-microbial activities of clove, oregano and garlic on minced meat.

2. Materials and method

A. Bacteriological examination

Collection of samples:

A total of 80 random samples of minced meat, burger,sausage and luncheon (20 of each), were randomly collected from different markets in Zagazig City, Sharkia governorate,Egypt. All samples were transferred under complete a septicconditionsto Food Control lab for,bacteriological examinations.

***Preparation of samples*:**

According to**APHA (2001)**.

Determination of total psychrotrophiccount:

On standard plate count agar (Oxiod CM325) according to **APHA (2002)**

Determination of Pseudomonas count:

On Pseudomonas Agar Base (CM 559; Oxoid) supplemented with cetrimide, fucidin, and cephaloridine (CFC) supplements according to **Roberts and Greenwood (2003).**

Determination of* Enterococci *count:

On a Bile Esculin Ager, Himedia (M340) according to **ISO (2000)**

Isolation and identification of Salmonellaspp

According to **ISO (2002)**, Pre- enrichment on a non- selective liquid medium, Selective enrichment Rappaport Vassiliadis with soya then Selective plating and identification on Xylose Lysine Desoxycholate ager (XLD agar).

B. Evaluation of the effect of some essential oils on the quality of minced meat

The experimental part aimed to testing the effect of selected oils on the shelf life of minced meat concerning the previous bacteriological andchemical parameters. The selected oils arecumin oil 1% (*Cuminumcyminum* L.), thyme oil 1% (*Thymus vulgaris L.*) and C. rosemary 1%(*Rosmarinusofficinalis L.*). These oils were obtained from the squeezing and extraction of natural oils in the National Research Center, Dokki, Giza.

Design of the experiment:

In the laboratory, minced meat was divided into four equal groups:

1. Control group: 500 grams of minced meat, separated to five clean Ziploc bags.
2. Clove treated group: 500 grams of minced meat mixed and gently massaged by hand for the homogenous distribution with 5 m1 of Clove oil to obtain final concentration 1% then separated to five clean Ziploc pages.
3. Oregano treated group: 500 grams of minced meat mixed and gently massaged by hand for the homogenous distribution with 5 m1 of oregano oil to obtain final concentration 1%, then separated to five clean Ziploc pages.
4. Garlic treated group: 500 grams of minced meat mixed and gently massaged by hand for the homogenous distribution with 5 ml of garlic oil to obtain final concentration 1% then separated to five clean Ziploc pages.

All the groups were sampled immediately after treatment (zero time) and every 48 hours. All groups were kept in fridge at 4±1° C. Bacteriological examination was conducted.

Statistical analysis.

One way analysis of variance (ANOVA) was done by using the statistical package for social sciences (SPSS-14; Chicago, IL, USA). Statistical significance was evaluated using tukey-kramer honestly significant difference tests with $p < 0.05$.

3. Results

A. Bacteriological examination of meat products

Results illustrated in **Table (1)** revealed that the mean count ofPsychrotrophic bacteria in the examined minced meat, burger, sausage, and luncheon samples was5.4 ± 0.097, 5.1 ±0.066, 3.5 ± 0.117 and 2.7 ±0.114Log_{10}CFU/g, respectively.While, the mean count of Pseudomonas was 5.2 ± 0.075, 4.5 ± 0.112, 3.1 ± 0.108 and 2.9 ± 0.066 Log_{10}CFU/g in the examined minced meat, burger, sausage and luncheon samples, respectively **Table (1)**.Meanwhile, the mean count of enterococci in the examined minced meat, burger, sausage and luncheon samples were 4.7 ±0.104, 3.8 ± 0.079, 3.4 ±0.114 and 2.8 ± 0.074Log_{10}CFU/g, respectively**Table (1)**.*Salmonella spp*failed to be detected in all examined meat products.

Table (1) Statistical analytical results of Psychrotrophic, Pseudomonas and Enterococci count (n=20) log_{10} CFU/g

Samples	Psychrotrophic		Pseudomonas		Enterococci	
	Range	Mean± S.E	Range	Mean± S.E	Range	Mean± S.E
Minced meat	4.6-6.4	5.4^{a}± 0.097	4.6-5.9	5.2^{a}± 0.075	3.4-5.2	4.7^{a}± 0.104
Burger	4.2-5.4	5.1^{b}± 0.066	3.5-5.2	4.5^{b}± 0.112	3.2-4.7	3.8^{b}± 0.079
Sausage	2.4-4.3	3.5^{c}± 0.117	2.5-3.7	3.1^{c}± 0.108	2.7-4.3	3.4^{c}± 0.114
Luncheon	2.1-3.6	2.7^{d}± 0.114	2-3.5	2.9^{c}± 0.066	2.3-3.3	2.8^{d}±0.074

n: number of the examined samples, CFU/g: Colony Forming Unit per gram
S.E: Standard error of mean, (a, b, c and d): Means within the same column bearing different superscript letters are significantly different (P< 0.05).

B. Effect of clove, oregano and garlic oil 1% on the bacteriological quality of minced meat:

As shown in **Figure (1)**, Psychrotrophic counts of control untreated samples gradually increased along storage period; the initial Psychrotrophic count was 5.05±0.293 log_{10} CFU/g. By the third day the count increased to 6.49± 0.329 log_{10} CFU/g, while, at the 5th day of storage it reached to 7.48±0.309 log_{10} CFU/g, by the 7th day, the count highly increased to 8.1±0.391log_{10}CFU/g. The mean Psychrotrophic counts in treated samples by clove, oregano and garlic oil1% at the third day of storage were 5.68±0.147, 5.53±0.068 and 5.11±0.318 log_{10} CFU/g, respectively, meanwhile at the 5th day of cold storage, the countwas6.83± 0.229, 6.69±0.177 and 6.26±0.289log_{10} CFU/g, respectively, by the 7th day of storage, Psychrotrophiccountwas7.57±0.373, 7.48±0.368 and 7.46±0.320 log_{10} CFU/g, respectively.

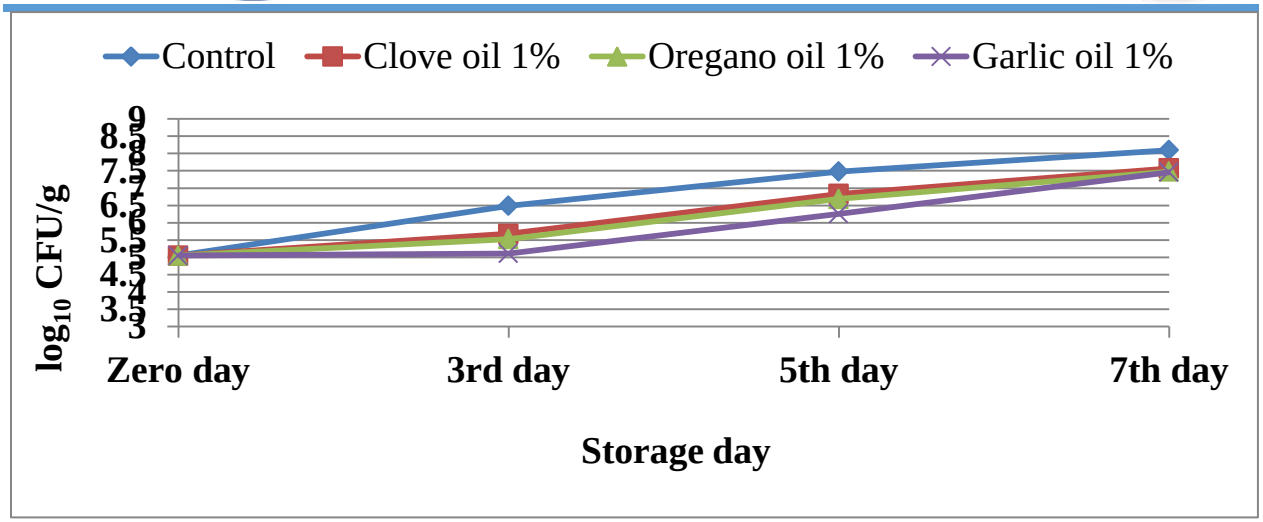

Figure (1): Effect of Clove, Oregano and Garlic oil 1%on Psychrotrophic count (log_{10}cfu/g) of chilled minced beef meat samples at 4±1° C at zero, 3rd, 5th, and 7th day.

The initial Pseudomonas count was 4.66±0.029 log_{10} CFU/g, while it reached to 6.26±0.375, 7.53±0.399 and 7.99±0.341 log_{10} CFU/g at the 3rd, 5th and 7th day of storage, respectively. Regarding to treated samples, Pseudomonas count after treatment by clove, oregano and garlic oil 1%, at the third day of storage, was 5.25±0.124, 5.09±0.291 and 4.49±0.313 log_{10} CFU/g, respectively. Meanwhile at the 5th day, it was 6.18±0.057, 5.72±0.117 and 5.13±0.386 log_{10} CFU/g. By the 7th day of storage, Pseudomonas count in treated samples by clove, oregano and garlic oil 1% reduced to 6.64±0.278, 6.40±0.087 and 5.73±0.119 log_{10} CFU/g, respectively (**Figure 2)**.

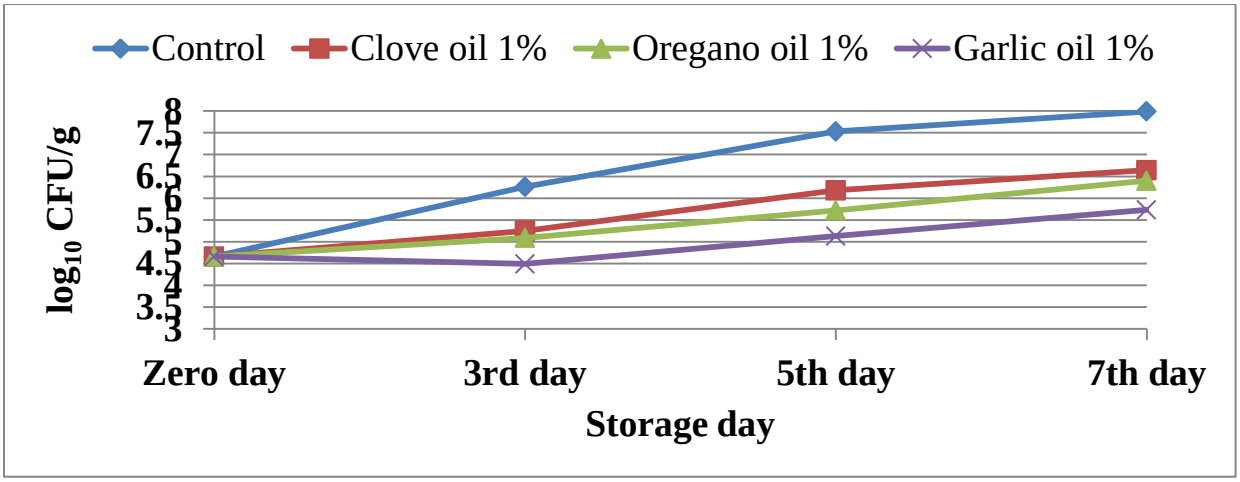

Figure (2): Effect of Clove, Oregano and Garlic oil 1% on Pseudomonas count (log_{10} CFU/g) of chilled minced beef meat samples at 4±1° Cat zero, 3rd, 5th, and 7th day

TheEnterococci count of control untreated samples gradually increased along the storage period; its initial count was 4.02±0.047 log_{10} CFU/g, by the third day of cold storage, the count increased to 6.50±0.106 log_{10} CFU/g. Concerning to treated samples,the counts of enterococci after treatment by clove, oregano and garlic oil 1% at 3rd day of cold storage ranged from 5.40 to 6.23, 4.95 to 5.32 and 4.32 to 5.45 log_{10} CFU/g, respectively. Meanwhile at the 5th day of storage, enterococci count in control samples was 7.21±0.428 log_{10} CFU/g, while, treatment by clove, oregano and garlic oil 1% reduced the enterococci count to 6.46±0.096, 6.08±0.449 and 5.86±0.345 log_{10} CFU/g, respectively. By the 7th day of storage, enterococci count was 7.57±0.341, 7.56±0.315 and 6.61±0.368 log_{10} CFU/g, respectively (**Figure 3)**.

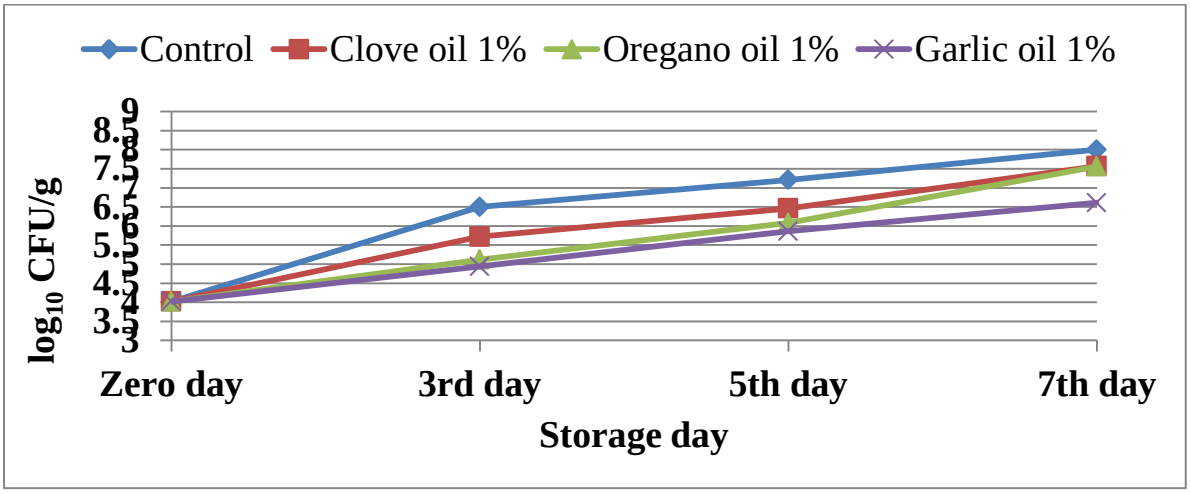

Figure (3): Effect of Clove, Oregano and Garlic oil 1% on Enterococci count (log_{10} CFU/g)of chilled minced beef meat samples at 4±1° Cat zero, 3rd, 5th, and 7th day

4. Discussion

Psychrotrophic bacteria are capable of surviving in extremely cold environment. They provide an estimation of the shelf life of meat. Minced meat samples had the highest count of Psychrotrophic bacteria compared with other samples. Significance differences were detected between the examined samples ($P < 0.05$). The variation in counts may be attributed to improper handling and poor sanitation level during the processing steps and storage. Nearly similar results were detected by **Selvan*et al.* (2007)**for sausage**, Mousa*et al.* (2014)** for luncheon**Mashak*et al.* (2015).** Meanwhile, lower results were recorded by **Selvan*et al.* (2007)** for minced meat (3.33 log_{10} CFU/g); **Pao and Ettinger (2009)**and**Mousa*et al.* (2014)** (3.3and 2.7 log_{10} CFU/g) for burger and **Mousa*et al.* (2014)** for sausage (2.9 log_{10} CFU/g). But higher results were reported by **Ercolini*et al.* (2009)** for minced meat (6.04 to 7.4 log_{10} CFU/g) and **Shaltout*et al.* (2017)** for sausage (4.3 log_{10} CFU/g).

Pseudomonas spp., are used as general indicators of processing hygiene, storage conditions and spoilage in meat industries. It is an important meat spoilage indicator as

nitrogenous compounds, including primary, secondary, tertiary amines and others, are released. The obtained results in this study agreed with **Siriken (2004)** for minced meat; **El-Said (2010)** and **El-Shopary (2010)** for sausage; and **Gaafar*et al.* (2012)** for burger. But disagreed with**El-Shopary (2010), El-Said (2010)** and**Gaafar*et al*. (2012)** who reported lower counts of Pseudomonas (4.7, 3.4 and 4.1 $\log_{10}$ CFU/g) in the examined minced meat samples**,** while,**El-Said (2010)** and**El-Shopary (2010)** reported lower counts of Pseudomonas (2.9 and 3.3$\log_{10}$ CFU/g) in the examined burger samples. Higher counts of Pseudomonas for the examined luncheon, sausage and minced meat samples 4, 4.5 and 6.1 $\log_{10}$ CFU/g were recorded by **El-Shopary (2010), Gaafar*et al*. (2012)** and **Erdem*et al.* (2014)**, respectively.

Enterococci are common members of the microbiota in thegastrointestinaltract of mammals and other animals and can also be found in soil, water, and food. Minced meat samples were highly contaminated by enterococci, while luncheon samples had the lowest count. Contamination of meat products with enterococci is an indication on unhygienic conditions and fecal contamination. These findings were in line with**Sadeghifard*et al.* (2015), Ike and Akortha (2017)** who isolatedenterococci from the examined meat samples.

Salmonella spp. failed to be detected in all examined samples, these results coincided with **Selvan*et al.* (2007)** who did not isolate *Salmonella spp.* from the examined meat product samples. However, these results disagreed with **Mousa*et al.* (2014)** and **Roger *et al.* (2015)** who isolated*Salmonella spp.* from the examined meat product samples.

Treatment of minced meat samples by clove, oregano and garlic oil 1% was effective improving bacteriological quality and extension of shelf life compared with control untreated samples. Garlic oil was the most effective one followed by oregano then clove oil. Essential oils have different compounds with antibacterial activities such as; geraniol, menthol, cinnamylalcohol linalool, citronellol, carvacrol, cinnamaldehyde, eugenolthymol, estragole, carvone and chavicol**(Ayala-Zavala *et al*., 2008).** These results were in line with **Gutierrez *et al.* (2009)** who reported that essential oil of oregano is known for its relatively strong antimicrobial properties, while, **Ratti*et al.* (2007)** reported the antimicrobial activity of garlic. **Michalczyk*et al.* (2015)** reported the antimicrobial activity of oregano and garlic, however, **Kumudavally*et al.* (2011)** reported that ethanolic extract of clove exerted a strong inhibitory effect on meat spoilage organisms and pathogenic organisms.

5. References

American Public Health Association (APHA) (2001): Compendium of methods for the microbiological examination of foods (4th Ed.). APHA technical committee on microbiological methods for foods. Washington, D.C., USA.

American Public Health Association (APHA) (2002): Methods for the microbiological examination of foods. 4th Ed., Technical Committee on Microbiological Methods for Foods. Washington, D.C., USA.

Ayala-Zavala, J. F.; Toro-Sanchez, L.D.; Alvarez Parrilla, E.; Soto-Valdez, H.; Martin-Belloso, O.; Ruiz Cruz, S. and Gonzalez-Aguilar, G.A. (2008): Natural antimicrobial agents incorporated in active packaging to preserve the quality of fresh fruits and vegetables. Stewart Postharvest Review, 4: 1-9.

Dhanze, H.; Khurana, S. K. and Mane, B. G. (2013): Effect of seabuckthorn leaf extract on microbiological quality of raw chicken during extended periods of storage. J Food Quality, 36: 59-65.

Domig, K. J.; Mayer, H. K.; Kneifel, W. (2003): Methods used for the isolation, enumeration, characterization and identification of Enterococcus spp.: 1. Media for isolation and enumeration. Int J Food Microbiol 88: 147-164.

Doulgeraki, A. I.; Ercolini, D.; Villani, F. and Nychas, G. J.E. (2012): Spoilage microbiota associated to the storage of raw meat in different conditions. Int. J. Food Microbiol. 157, 130– 141.

El-Said, S. A. A. (2010): Psychrophilic microorganisms in frozen meat products. M.V.Sc. Thesis, Meat hygiene, Fac. Vet. Med., Zagazig Univ.

El-Shopary, N. F. (2010): Prevalence of Pseudomonas species in some retailed meat products. M.V. Sc. Thesis. (Meat hygiene). Fac. Vet. Med., Zag. Univ., Egypt.

Ercolini, D.; Russo, F.; Antonella, N.; Ferranti, P. and Villani, F. (2009): Mesophilic and Psychrotrophic Bacteria from Meat and Their Spoilage Potential In Vitro and in Beef. Appl Environ Microbiol., 75(7): 1990–2001.

Erdem, A. K.; Saglam, D.; Ozer, D. and Ozcelik, E. (2014): Microbiological quality of minced meat samples marketed in Istanbul. YYU Vet FakDerg., 25 (3): 67-70.

Gaafar, R. E. M.; Ahmed, A. M. and soliman, S. A. (2012): Spoilage bacteria in frozen meat products. Suez Canal Vet Med J., 17(1): 97-108.

Gutierrez, J.; Barry‐Ryan, C. and Bourke, P. (2009): Antimicrobial activity of plant essential oils using food model media: Efficacy, synergistic potential and interactions with food components. Food Microbiol., 26: 142–150.

Ike, C. C. and Akortha, E. E. (2017): Microbial diversity associated with different fresh meats sold in Aba Metropolis, Abia State, Nigeria. IJRDO-J Biological Science, 3(5): 108-121.

International Organization for Standardization (ISO) (2002): 4th ed. Microbiology - General guidance on methods for the detection of Salmonella, International Organization for Standardization, Geneve, Switzerland, No. 6579.

International Organization for Standardization (ISO) 7899-2 (2000): Water quality -- Detection and enumeration of intestinal enterococci -- Part 2: Membrane filtration method. Geneva, Switzerland.

Kumudavally, K. V.; Tabassum, A.; Radhakrishna, K. and Bawa, A. S. (2011): Effect of ethanolic extract of clove on the keeping quality of fresh mutton during storage at ambient temperature (25 ± 2 °C). J Food Sci Technol., 48(4): 466–471.

Maheshwari, R.; Rani, B.; Yadav, R. K. and Prasad, M. (2012): Usage of holy basil for various aspects. Bullettin of Environment, Pharmacology and Life Science, 1(10): 63-65.

Mashak, Z. Langroodi, A. M.; Ehsani, A.; Fathabad, A. and Ilkhanipoor, A. (2015): Microbiological quality of ready-to-eat foods of Tehran province. African J. Food Science, 9(5): 257-261.

Michalczyk, M.; Macura, R.; Banaś, J.; Tesarowicz, I. and Maciejaszek, I. (2015): Effect of adding oregano essential oil, garlic and tomato preparations separately and in combination on the stability of vacuum-packed minced pork during storage. Ann. Anim. Sci., 15 (1): 221–235.

Mousa, M. M.; Ahmed, A. A. and El-Shamy, S. Y. (2014): Microbiological Criteria of Some Meat Products.Alex J Vet Scis, 42: 83-89.

Pao, S. And Ettinger, M. R. (2009): Comparison of the microbial quality of ground beef and ground beef patties from internet and local retail markets. J Food Protec., 72(8):1722–1726.

Ratti, C.; Araya‐Farias, M.; Mendez‐Lagunas, L. and Makhlouf, J. (2007): Drying of garlic (Allium sativum) and its effect on allicin retention. Dry Technol., 25: 349–356.

Rhoades, J. R.; Duffy, G. and Koutsoumanis, K. (2009): Prevalence and concentration of verocytotoxigenic*Escherichia coli*, *Salmonella enterica* and *Listeria monocytogenes* in the beef production chain: a review. Food Microbiol., 26(4):357-376.

Roberts, D. and Greenwood, M. (2003): Practical food microbiology. 3rd edition. Blackwell Publishing Ltd, UK. 273-274.

Roger, D.; James, B. and Bakari, D. (2015): Microbiological quality and safety of street meat-food sold in SoudanoSahelian zone of Cameroon. Int. J. Curr. Microbiol. App. Sci., 4(2): 441-450.

Sadeghifard, N.; Kazemian, H.; Mohebi, R.; Sekawi, Z.; Khosravi, A.; Valizadeh, N. and Ghafourian, S. (2015): Epidemiological alteration in pathogens found in ground meat in Iran: unexpected predominance of vancomycin-resistant Enterococcus faecalis. GMS Hyg Infect Control., 10: Doc12.

Salejda, A. M.; Krasnowska, G. and Tril, U. (2011): Attempt to utilize antioxidant properties of green tea extract in the production of model meat products. Zywnosc.Nauka.Technologia.Jakosc / Food.Science.Technology. Quality, 78: 107–118.

Selvan, P.; Narendra, R.; Sureshkumar, B. and **Venkataramanujam, V. (**2007): Microbial quality of retail meat products available in Chennai City. American J. Food Technol., 2 (1): 55-59.

Shaltout, F. A.; Maarouf, A. A. and Elkhouly, M. E. (2017): Bacteriological evaluation of frozen sausage. Nutrition and Food Toxicol., 1.5 (2017): 174-185.

Siriken, B. (2004): The microbiological quality of ground beef in Aydin and Afyon provinces, Turkey. Revue Med Vet., 12: 632-636.

Teixeira, B.; Marques, A.; Ramos, C.; Neng, N. R.; Nogueira, J. M. F.; Saraiva, J. A. and Nunes, M. L. (2013): Chemical composition and bioactivity of different oregano (Origanumvulgare) extracts and essential oil.J Sci Food Agric., 93(11):2707-2714.

Word Health Organization (WHO) (2005): Drug-resistant Salmonella. Fact sheet n. 139, Food Safety Department, Word Health Organization. Available at Accessed on Jun. 17, 2016.

الملخص العربي

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قسم مراقبة الأغذية ، كلية الطب البيطري جامعة الزقازيق مصر

تُعد منتجات اللحوم احد الأغذية الأكثرأهمية نظرًا لقيمتها الغذائية العالية حيث أنها مصدر غني لمختلف العناصر الغذائية التي يحتاج إليها جسم الإنسان وبخاصة البروتين والدهون والعديد من الفيتامينات والمعادن مثل الحديد والزنك بالإضافة الي الحموض الأمينية الأساسية التي يحتاجها الجسم في بناء وإصلاح جميع أنسجة الجسم التالفة. تضمنت هذه الدراسة جزئين رئسيين إحتوي الجزء الأول منها علي فحص الحالة الصحية (ظاهريًا- كيميائيًا- بكتيريولوجيا) لبعض من منتجات اللحوم التي يتم تداولها بأسواق مدينة الزقازيق.تم تجميع عدد ٨٠ عينة من منتجات اللحوم (٢٠ عينة من اللحم المفروم، البرجر السجق، اللانشون) لفحصها بكتريولوجيا من حيث العد الكلى للبكتريا المحبة للبرودة و للسودوموناس والإنتيروكوكاي والسالمونيلا). بينما إحتوي الجزء الثانى علي بعض المحاولات لتحسين الحالة الصحية للحم المفروم باستخدام بعض الزيوت الطيارة مثل زيت القرنفل وزيت البردقوش وزيت الثوم بتركيز ١% من كل نوع علي حده.و خلُصت الدراسة إلى أن بعض منتجات اللحوم المتداولة في الأسواق ملوثة بكتيرياً وأن إستخدام بعض الإضافات مثل زيت القرنفل ١% وزيت البردقوش ١% وزيت الثوم ١% قد أدي إلى إطالة فترة حفظ منتجات اللحوم وتحسين جودة هذه المنتجات بكتيريًا. لذلك توصى هذه الدراسة باستخدام تلك الزيوت فى عمليات تصنيع منتجات اللحوم المختلفة كوسائل حفظ بديلة لتجنب خطر المواد الحافظة الكيميائية.