Journal of Basic and Environmental Sciences, 5 (2018) 342-350

ISSN
Online: 2356-6388
Print: 2536-9202

Research paper Open Access

Effect of natural oils of some plants on the bacterial contamination and chemical status of meat luncheon and chicken luncheon

M. T. Shaaban[1], A. E. Beltagy[2], S. Faheem[2], L. A. Ibraik[1,3]
[1] Department of Botany and Microbiology, Faculty of Science, Menoufia University, Shebin El Kom, Egypt.
[2] Department of Botany, Faculty of Agriculture, Menoufia University, Shebin El Kom, Egypt.
[3] Department of Botany, Faculty of Science, Tobruk University, Libya.

Abstract

This research was conducted to evaluate the presence and abundance of thermophilic bacteria, psychrophilic bacteria, thermophilic bacteria, coliform bacteria, *Salmonella* sp., and *Shigella* sp. in two meat and two chicken luncheon samples. These samples were collected from markets in Shebin El Kom, Menoufia, Egypt. Moreover, we determined the chemical composition and pH value. Furthermore, we tested the effect of Garlic, Onion, and Nigella sativa oils on the bacterial contamination, the chemical composition and pH of the samples.

The obtained results clearly showed the presence of psychrophilic, mesophilic, and thermophilic bacteria in both meat and chicken luncheon.

Their total counts showed an increment with increasing storage period over three seasons (spring, winter, and summer). However, there were no coliform, *Salmonella*, or *Shigella* in the investigated samples.

Tested oils of Garlic, Onion, and N. sativa showed an inhibitory effect on three examined groups of bacteria (thermophilic, mesophilic, and psychrophilic bacteria. Therefore, they can be used as preservative agents. Analysis of luncheon chemical composition in the absence and presence of these tested oils showed that addition of these oils causes an increase in total protein, total fat, and moisture percentage. At the same time, pH showed lower values in both chicken and meat luncheon in comparison to their corresponding values in the absence of these oils.

Keywords: Garlic, onion, N. sativa, meat, chicken, luncheon. psychrophilic, mesophilic, thermophilic bacteria
Received; 25 May 2018, Revised form; 20 Jun 2018, Accepted; 20 Jun 2018, Available online 1 Dec. 2018

1. Introduction

Meat is an excellent concentrated nutrients source: protein with high digestibility score, essential amino acids, fatty acids, vitamins and minerals, previously considered essential to optimal human growth and development [1]. Raw meat represents the main ingredient for most meat products [2].

The meat products are acquiring a prominent position over the last years due to their high nutritional value and the important source of animal proteins for human [3-5]. According to the applied processing technology, the meat products consist of uncooked processed meat products, cooked uncured meat and meat products, raw cured products, cooked cured products, and commercially sterile meat products. The majority of illness originates from raw meat rather than processed meat products [6]. Raw meat is liable to harbor various microorganisms during the pre-slaughter husbandry practices, handling during slaughtering, processing, distribution and storage, preservation methods, type of packaging and handling, as well as by consumption habits [1, 3-5]. The processed meat products have no longer the appearance or perishability of fresh products due to their formulation and treatment which provide a range of preservation system**.** The stability and safety of processed meat products relies on the interaction of their microflora with the nutrients and preservations factors (processing, storage temperatures, pH, chemical agents and packaging). The thermal processing destroys a fraction of the initial microflora, inhibits or inactivates another part and allows growth of the remainder [6].

The metabolic activity of growing spoilage microbial fraction results in loss of quality and shortening of shelf-life with economic losses, while the growth of pathogens may cause safety problems [5-8]. Knowledge about the meat products 'microflora is needed for effective management of the meat products' safety and in the control strategies at processing, distribution, packing, retailer and the consumer's safety.

The spoilage microorganisms are commercially significant in meat products when their numbers reach around 10^7/g resulting in sensory changes limiting acceptability and shortening shelf-life [6]. Species of *Pseudomonas, Acinetobacter*, *Alcaligenes*, and *Moraxella* are particularly involved in the spoilage of unpreserved meat products stored at chill temperatures (4 - 10°C) [9].

The spoilage bacteria are generally harmless, but they spoil the food product and it becomes sensory undesirable for the customer to purchase. The spoilage process

consists of lipids 'oxidation, proteins' degradation and the loss of other valuable molecules. The breakdown of fats, complex proteins, peptones, polypeptides and carbohydrates of meat results in the development of off-odours, off flavor, change of color, slime formation, gas production, and pH's change [10-11].

We conducted this research to determine the total number of mesophilic, thermophilic, and psychrophilic bacteria in chicken and meat luncheon that sold at small markets in Shebin El Kom City, Menoufia Governorate, Egypt. Furthermore, it aims to detect the activity of some natural plant oils on inhabiting and limiting bacterial growth on chicken and meat luncheon to be used as preservative for luncheon production.

2. Materials and methods

In this study, different meat and poultry products belongs to two different food companies were obtained from supermarkets, located in Shebin El Kom city, Menoufia Governorate, Egypt. These products were as follows:

- Product (1A): chicken luncheon (Food Company I)
- Product (1B): meat luncheon (Food Company I)
- Product (2A): chicken luncheon (Food Company II)
- Product (2B): meat luncheon (Food Company II)

The samples were aseptically collected in sterile polyethylene pouches, sealed and transported in ice packs to the laboratory of Microbiology. For chemical analysis, samples mixed with essential oils and stored at 5°C were subjected to chemical analysis. Protein, fat moisture content and pH value were estimated at Zero time, 1 week, 2 weeks. Samples without oils were also investigated.

Bacterial count in chicken and meat luncheon

Meat and poultry luncheon were tested for the presence of microorganisms causing poisoning, microorganism causing spoilage as total aerobic viable counts (mesophilic, psychrophilic, and thermophilic bacteria) total coliforms, fecal coliforms, *Salmonella* and *Shigella*. Luncheon samples were prepared as the following: 10 grams of each sample were transferred into 90 ml sterilized water and homogenized. 1 ml of sterilized dilution (10^{-2}, 10^{-3}, 10^{-4}, and 10^{-5}) was transferred to Petri dishes or tubes, and suitable medium was poured and mixed well and left to solidify. Petri dishes were then incubated at suitable temperature for limited period [12]. In addition, chemical analyses include the determination of pH values, moisture, protein, and fat contents were determined.

This experiment aimed to study the effect of essential oils (Garlic, Onion and N. sativa), separately, added as preservative agent to meat and chicken luncheon on their contents of bacterial counts. In this regard, 50 ml of the used oils were separately mixed with 50 gm of meat or chicken luncheon under sterile conditions and stored at refrigerator for 2 weeks. Samples were checked for total count at different intervals (Zero-time, 1 week and 2 weeks) by homogenized 10 g of stored sample with 90 ml of 1% sterilized peptone water serially diluted and plated nutrient agar medium. Samples were mixed with essential oil and stored at 5°C till used to chemical analysis. Protein, fat, and moisture contents and pH value were estimated at zero-time, 1 week, and 2 weeks and samples without oils were also investigated.

All bacterial counts were estimated on yeast extract nutrient agar medium [13] using pouring plate method. Thermophilic bacteria were counted after incubation at 45°C for 48 hours, mesophilic bacteria were counted after incubation at 28°C for 48 hours, while psychrophilic bacteria were incubated at 5°C and counted after 5-7 days.

The composition of nutrient agar medium [13] was 5 g/L peptone, 5 g/L sodium chloride, 2 g/L yeast extract, 17 g/L agar, and distilled water up to 1000 ml.

Coliform and fecal coliform counts:

These bacteria were estimated on MacConkey agar [14] using pouring plate technique. Suitable plates were counted after 24 hours at 37°C for total coliform and 44.5°C for total coliform and fecal coliform, respectively.

The composition of MacConkey agar [14] medium was 17 g/L peptone, 3 g/L protease, 1.5 g/L bile salt, 0.03 g/L neutral red, 5 g/L sodium chlorite, 0.001 g/L crystal violet, 13.5 g/L agar, and distilled water up to 1000 ml.

***Salmonella* and *Shigella*: (SS Agar)**

The SS Agar is a differential, selective medium for the isolation of *Salmonella* and *Shigella* species from pathological specimens, suspected foodstuffs, etc. Gram-positive and coliform organisms are inhibited by the action of the selective inhibitory components such as brilliant green, bile salts, thiosulphate and citrate.

The composition of *Salmonella* and *Shigella* (SS Agar) medium [15] was 5 g/L Lab-Lemco powder, 5 g/L peptone, 10 g/L lactose, 8.5 g/L bile salt, 8.5 g/L sodium citrate, 8.5 g/L sodium thiosulphate, 1 g/L ferric citrate, 0.00033 g/L brilliant green, 0.025 g/L neutral red, 13.5 g/L agar, and distilled water up to 1000 ml.

Chemical analysis:

pH-values:

The pH-values were measured according to [Association of Official Analytical Chemists [16], using ORION 720A pH meter.

Moisture content:

The moisture contents of all samples were determined according to [16] by drying the samples in an oven at 105°C to constant weight. At the end of the drying period, the samples were weighed as soon as they reached room temperature. The change in weight was recorded and moisture content was calculated.

Protein content:

Total nitrogen was determined using the micro-Kjeldahl method as described by [16]. Crude protein was calculated by multiplying total nitrogen value by a factor of 6.25.

Fat content:

Fat content was determined according to the method described in [17]. A known weight of the dried sample was extracted by petroleum ether in a Soxhlet apparatus for 7 hours.

3. Results and discussion

The results presented in Table (1) and Table (2) show the mean value of the bacterial counts of Psychrophilic, mesophilic and thermophilic bacteria, total-*coliform*, fecal-*coliform*, *Shigella*, and *Salmonella* recorded in chicken and meat luncheon samples that were collected during

three seasons (winter, spring, and summer) from supermarkets in Shebin El Kom. Psychrophilic bacteria in chicken luncheon were found to be 3.8 x 10^4, 5.3 x 10^4, and 4.1 x 10^4 cfu/g in winter, spring, and summer seasons, respectively. The highest count was recorded in spring sample (5.3 x 10^4 cfu/g) followed by moderate number (4.1 x 10^4 cfu/g) in summer, while the lowest counts were recorded in winter sample (3.8 x 10^4 cfu/g). Moreover, psychrophilic bacteria in meat luncheon showed higher numbers as they came to be 3.3 x 10^5 in winter, 1.8 x 10^5 in spring, and 2.9 x 10^5 cfu/g in summer season. Regarding mesophilic bacteria numbers in chicken luncheon came to be 3.7 x 10^5, 6.3 x 10^5, and 5.2 x 10^5 cfu/g in winter, spring, and summer seasons, respectively. On the other hand, their numbers in meat luncheon recorded higher numbers. Those were 3.2 x 10^6, 4.3 x 10^6, and 5.3 x 10^6 cfu/g in winter, spring, and summer seasons, respectively. Thermophilic bacteria showed higher number in meat luncheon over that in chicken.

In all three tested samples over the three seasons, their values came to be 3.7 x 10^6 vs. 4.3 x 10^5 in winter, 5.9 x 10^6 vs. 8.8 x 10^5 in spring, and 7.7 x 10^5 vs. 5.1 x 10^6 cfu/g in summer.

In fact, there were no much variations in thermophilic bacterial numbers in meat luncheon over three tested duration samples.

Moreover, Tables (1 & 2) represents the very low number of T. coliform in both chicken and meat luncheons. Also, there were no any pathogenic bacteria in all tested samples. Our results came in good agreement to what [18] reported. He also mentioned that high total bacterial count might be due to the contamination of the product or unsuitable storage temperature. Moreover, increasing number of bacteria could be due to passing through various contaminated processes as slaughtering, transportation, and storage [19]. Therefore, luncheon may be exposed to the contamination at any time [20].

All luncheon samples showed higher numbers of bacteria than that of the permissible limit of Egyptian Organization for Standardization and Quality (EOSQ, 2005). These results showed the absence of *Salmonella* and *Shigella* which reflexes their permissible limit of [21].

In fact, we would like to mention that total bacterial count is not indicative for some consumption, but it is important to prove hygenic condition in handling and storage [22]. Our results are similar to that obtained by [3] who reported the absence of *Salmonella* and *Shigella* in luncheon. Meanwhile results are in disagreement with what of [23] reported. Moreover, our obtained results are in agreement with what [24] reported on total bacterial numbers in luncheon and absence of *Salmonella* and *Shigella*.

Results presented in Table (3) and Table (4) are clarifying the chemical composition (moisture%, protein%, and fat%) and pH value in chicken and meat luncheon samples that were obtained over winter, spring, and summer seasons.

All tested parameters are almost the same regarding chicken and meat luncheon. Furthermore, there were no variations in their values over the three seasons. Moisture content appeared to be the same with minor differences between seasons and between kinds of luncheon. The Fat% appeared to be almost the same value and considered to be low due to absence of fatty tissues in luncheon processing.

Meanwhile, pH value appeared to be the same without noticeable change due to absence of microbial load which would cause protein degradation leads to luncheon spoilage as [4] reported.

Our obtained results are in agreement with what [25] reported on moisture percentage, total protein, fat content and pH value.

Data presented in Table (5) and Table (6) clearly show the antibacterial effect of garlic, onion, and N. Sativa oils on mesophilic, thermophilic, and psychrophilic bacteria that present in chicken and meat luncheon. Both garlic and onion oils caused an inhibitory effect especially at 80% concentration. Moreover, garlic oil caused a severe reduction for psychrophilic bacteria in both chicken and meat luncheon comparing to the control value. In fact, this reduction appeared to resemble the garlic oil on the three tested types of bacteria. However, N. *sativa* oil did not show that growth inhabitation, even at 80% concentration. In fact, the number of mesophilic, thermophilic, and psychrophilic bacteria came to be a little bit less than the control value.

Table (1): Bacterial counts * of various categories in chicken luncheon samples over three seasons.

Season / Bacteria type	Winter		Spring		Summer	
	Zero ± SD	Two weeks ± SD	Zero ± SD	Two weeks ± SD	Zero ± SD	Two weeks ± SD
Psychrophilic	$3.1 \times 10 \pm 0.94 \times 10$	$3.8 \times 10^4 \pm 1.88 \times 10^2$	$4.5 \times 10 \pm 0.59 \times 10$	$5.3 \times 10^4 \pm 1.39 \times 10^2$	$2.6 \times 10 \pm 0.72 \times 10$	$4.1 \times 10^4 \pm 3.52 \times 10^3$
Mesophilic	$2.5 \times 10^2 \pm 1.38 \times 10$	$3.7 \times 10^5 \pm 1.41 \times 10^3$	$2.1 \times 102 \pm 1.56 \times 10$	$6.3 \times 10^5 \pm 1.84 \times 10^3$	$3.8 \times 102 \pm 2.61 \times 10$	$5.2 \times 10^5 \pm 3.78 \times 10^4$
Thermophilic	$7.1 \times 10^2 \pm 1.24 \times 10$	$4.3 \times 10^5 \pm 1.15 \times 10^3$	$6.9 \times 102 \pm 1.47 \times 10$	$8.8 \times 10^5 \pm 1.74 \times 10^3$	$9.7 \times 102 \pm 8.45 \times 10$	$7.7 \times 10^5 \pm 6.18 \times 10^4$
T coliform	$0.3 \times 10 \pm 0.15 \times 10$	$2.1 \times 10 \pm 0.25 \times 10$	$0.7 \times 10 \pm 0.15 \times 10$	$2.5 \times 10 \pm 0.25 \times 10$	$0.5 \times 10 \pm 0.15 \times 10$	$2.7 \times 10 \pm 0.25 \times 10$
F coliform	Ab	Ab	Ab	Ab	Ab	Ab
Shigella	Ab	Ab	Ab	Ab	Ab	Ab
Salmonella	Ab	Ab	Ab	Ab	Ab	Ab

* Results are means of triplicate experiments ± standard deviation (SD), * Ab: Absent

Table (2): Bacterial counts* of various categories in meat luncheon samples over three seasons.

Season / Bacteria type	Winter		Spring		Summer	
	Zero ± SD	Two weeks ± SD	Zero ± SD	Two weeks ± SD	Zero ± SD	Two weeks ± SD
Psychrophilic	$1.6 \times 10^2 \pm 2.13 \times 10$	$3.3 \times 10^5 \pm 2.71 \times 10^3$	$1.1 \times 10^2 \pm 1.13 \times 10$	$1.8 \times 10^5 \pm 1.79 \times 10^4$	$1.2 \times 10^2 \pm 0.98 \times 10$	$2.9 \times 10^5 \pm 1.94 \times 10^4$
Mesophilic	$1.4 \times 10^3 \pm 1.82 \times 10^2$	$3.2 \times 10^6 \pm 3.89 \times 10^4$	$2.9 \times 10^3 \pm 2.78 \times 10^2$	$4.3 \times 10^6 \pm 3.47 \times 10^5$	$2.3 \times 10^3 \pm 1.78 \times 10^2$	$5.3 \times 10^6 \pm 3.39 \times 10^5$
Thermophilic	$3.2 \times 10^3 \pm 4.75 \times 10^2$	$3.7 \times 10^6 \pm 4.53 \times 10^4$	$3.8 \times 10^3 \pm 3.24 \times 10^2$	$5.9 \times 10^6 \pm 6.43 \times 10^5$	$5.8 \times 10^3 \pm 4.42 \times 10^3$	$5.1 \times 10^6 \pm 4.14 \times 10^5$
T coliform	$0.5 \times 10 \pm 0.21 \times 10$	$2.5 \times 10 \pm 0.18$	$0.8 \times 10 \pm 0.12 \times 10$	$2.8 \times 10 \pm 0.21 \times 10$	$1.5 \times 10 \pm 0.14 \times 10$	$4.2 \times 10 \pm 0.15 \times 10$
F coliform	Ab	Ab	Ab	Ab	Ab	Ab
Shigella	Ab	Ab	Ab	Ab	Ab	Ab
Salmonella	Ab	Ab	Ab	Ab	Ab	Ab

* Results are means of triplicate experiments ± standard deviation (SD), * Ab: Absent

Table (3): Chemical composition and pH values* of chicken luncheon samples over three seasons.

Season	Winter		Spring		Summer	
Chemical parameter	Zero ± SD	Two weeks ± SD	Zero ± SD	Two weeks ± SD	Zero ± SD	Two weeks ± SD
Moisture %	73.48 ± 0.08	75.46 ± 0.07	73.41 ± 0.06	75.48 ± 0.07	73.38 ± 0.06	75.63 ± 0.09
Protein %	12.51 ± 0.17	8.43 ± 0.44	12.46 ± 0.30	8.29 ± 0.36	12.42 ± 0.36	8.15 ± 0.17
Fat %	11.69 ± 0.87	6.26 ± 0.69	11.64 ± 0.51	6.12 ± 0.71	11.61 ± 0.34	6.9 ± 0.46
pH-value	5.81 ± 0.06	6.38 ± 0.14	5.80 ± 0.06	6.42 ± 0.07	5.80 ± 0.05	6.45 ± 0.05

* Results are means of triplicate experiments ± standard deviation (SD).

Table (4): Chemical composition and pH values* in meat luncheon samples over three seasons.

Season	Winter		Spring		Summer	
Chemical parameter	Zero ± SD	Two weeks ± SD	Zero ± SD	Two weeks ± SD	Zero ± SD	Two weeks ± SD
Moisture %	73.48 ± 0.04	75.32 ± 0.06	73.45 ± 0.09	75.39 ± 0.08	73.38 ± 0.04	75.72 ± 0.1
Protein %	12.97 ± 0.23	8.62 ± 0.16	12.94 ± 0.21	8.51 ± 0.35	12.91 ± 0.18	8.4 ± 0.1
Fat %	11.23 ± 0.56	6.37 ± 0.78	11.23 ± 0.69	6.37 ± 0.76	11.19 ± 0.31	6.3 ± 0.7
pH-value	5.72 ± 0.05	6.31 ± 0.11	5.72 ± 0.02	6.39 ± 0.08	5.71 ± 0.01	6.4 ± 0.1

* Results are means of triplicate experiments ± standard deviation (SD).

Table (5): Antibacterial activity* of garlic, onion, and N. Sativa essential oils* against mesophilic, thermophilic, and psychrophilic bacteria in chicken luncheon samples.

Season		Mesophilic Bacteria		Thermophilic Bacteria		Psychrophilic Bacteria	
Essential oils	Co%	Zero ± SD	Two weeks ± SD	Zero ± SD	Two weeks ± SD	Zero ± SD	Two weeks ± SD
Control	0%	$7.4\times 10^2 \pm 6.13 \times 10$	$5.3\times 10^4 \pm 1.39 \times 10^2$	$6.2\times 10^2 \pm 1.45 \times 10$	$5.4\times 10^4 \pm 1.39 \times 10^2$	$2.6\times 10^2 \pm 0.78 \times 10$	$4.4\times 10^3 \pm 5.84 \times 10$
Garlic oil	60% 80%	$3.8\times 10 \pm 0.25 \times 10$ $2.5\times 10 \pm 0.25 \times 10$	$1.2\times 10 \pm 0.18 \times 10$ $0.9\times 10 \pm 0.18 \times 10$	$5.1\times 10 \pm 0.42 \times 10$ $4.2\times 10 \pm 0.15 \times 10$	$2.7\times 10 \pm 0.19 \times 10$ $1.8\times 10 \pm 0.20 \times 10$	$2.4\times 10 \pm 0.18 \times 10$ $2.3\times 10 \pm 0.12 \times 10$	$1.1\times 10 \pm 0.18 \times 10$ $0.8\times 10 \pm 0.18 \times 10$
Onion oil	60% 80%	$4.4\times 10 \pm 0.18 \times 10$ $3.4\times 10 \pm 0.25 \times 10$	$1.1\times 10 \pm 0.20 \times 10$ $2.1 \times 10 \pm 0.22 \times 10$	$3.2\times 10 \pm 0.12 \times 10$ $2.7\times 10 \pm 0.25 \times 10$	$2.4\times 10 \pm 0.20 \times 10$ $1.1\times 10 \pm 0.20 \times 10$	$2.7\times 10 \pm 0.23 \times 10$ $2.1\times 10 \pm 0.25 \times 10$	$1.9\times 10 \pm 0.12 \times 10$ $1.1\times 10 \pm 0.20 \times 10$
N. Sativa oil	60% 80%	$5.3\times 10^2 \pm 1.43 \times 10$ $4.1\times 10^2 \pm 1.56 \times 10$	$3.2\times 10^2 \pm 0.72 \times 10$ $2.8\times 10 \pm 0.20 \times 10$	$1.6\times 10^2 \pm 2.13 \times 10$ $1.1\times 10^2 \pm 1.13 \times 10$	$3.0\times 10^4 \pm 2.73 \times 10^3$ $2.7\times 10^4 \pm 4.92 \times 10^3$	$4.5\times 10 \pm 0.59 \times 10$ $3.6\times 10 \pm 0.27 \times 10$	$9.5 \times 10^2 \pm 3.81 \times 10$ $6.7\times 10 \pm 3.29 \times 10$

* Results are means of triplicate experiments ± standard deviation (SD); Co%: Concentration

Table (6): Antibacterial activity of garlic, onion, and N. Sativa essential oils* against mesophilic, thermophilic, and psychrophilic bacteria in meat luncheon samples.

Season		Mesophilic Bacteria		Thermophilic Bacteria		Psychrophilic Bacteria	
Essential oils	Co%	Zero ± SD	Two weeks ± SD	Zero ± SD	Two weeks ± SD	Zero ± SD	Two weeks ± SD
Control	0%	$4.8\times 10^3 \pm 3.59 \times 10$	$2.9\times 10^5 \pm 1.94 \times 10$	$9.8\times 10^3 \pm 0.58 \times 10^2$	$2.6\times 10^5 \pm 4.45\times 10^4$	$6.9\times 10^2 \pm 1.47 \times 10$	$5.3\times 10^4 \pm 1.39 \times 10^2$
Garlic oil	60% 80%	$1.6\times 10^2 \pm 2.13 \times 10$ $1.2\times 10^2 \pm 0.14 \times 10$	$3.1\times 10 \pm 0.23 \times 10$ $1.4\times 10 \pm 0.17 \times 10$	$7.4\times 10^2 \pm 2.97 \times 10^3$ $3.2\times 10^2 \pm 3.81 \times 10$	$2.8\times 10 \pm 0.21 \times 10$ $1.9\times 10 \pm 0.12 \times 10$	$4.5\times 10 \pm 0.59 \times 10$ $3.1\times 10 \pm 0.94 \times 10$	$1.4\times 10 \pm 0.20 \times 10$ $1.1\times 10 \pm 0.20 \times 10$
Onion oil	60% 80%	$2.1\times 10^2 \pm 1.96 \times 10$ $1.9\times 10^2 \pm 0.20 \times 10$	$2.7\times 10 \pm 0.32 \times 10$ $1.9\times 10 \pm 0.12 \times 10$	$9.7\times 10^2 \pm 4.45 \times 10$ $3.8\times 10^2 \pm 1.11 \times 10$	$3.4\times 10 \pm 0.25 \times 10$ $2.1\times 10 \pm 0.22 \times 10$	$1.1\times 10^2 \pm 1.13 \times 10$ $4.2\times 10 \pm 0.15 \times 10$	$2.3\times 10 \pm 0.12 \times 10$ $1.5\times 10 \pm 0.20 \times 10$
N. Sativa oil	60% 80%	$3.8\times 10^2 \pm 2.61 \times 10$ $2.5\times 10^2 \pm 1.38 \times 10$	$4.4 \times 10^3 \pm 3.52 \times 10^2$ $5.3\times 10^3 \pm 1.84\times 10^2$	$8.1\times 10^3 \pm 6.92 \times 10^2$ $3.9\times 10^3 \pm 3.14 \times 10^2$	$9.9\times 10^4 \pm 6.81 \times 10^3$ $7.3\times 10^4 \pm 5.89 \times 10^3$	$1.9\times 10^2 \pm 0.20 \times 10$ $4.4\times 10^2 \pm 1.65 \times 10$	$1.4\times 10^2 \pm 1.91 \times 10$ $8.2\times 10 \pm 1.22 \times 10$

* Results are means of triplicate experiments ± standard deviation (SD); Co%: Concentration

Table (7): Total protein, fat, and moisture contents and pH values* of chicken luncheon samples mixed with essential oils and stored at 5°C in refrigerator for two weeks.

Chemical parameters		Total protein		Total fat		Moisture		pH	
Essential oils	Co%	Zero ± SD	Two weeks ± SD	Zero ± SD	Two weeks ± SD	Zero ± SD	Two weeks ± SD	Zero ± SD	Two weeks ± SD
Control	0%	12.56 ± 0.21	8.26 ± 0.38	10.89 ±0.56	7.03 ± 0.28	73.39 ± 0.09	75.54 ± 0.04	5.78 ± 0.08	6.41 ± 0.21
Garlic	60% 80%	12.57 ± 0.19 12.58 ± 0.22	11.10 ± 0.40 11.59 ± 0.76	10.85 ± 0.52 10.88 ± 0.39	9.64 ± 0.21 9.97 ± 0.28	73.37 ± 0.07 73.38 ± 0.08	74.98 ± 0.08 74.56 ± 0.06	5.75 ± 0.05 5.76 ± 0.04	5.89 ± 0.04 5.85 ± 0.06
Onion	60% 80%	12.56 ± 0.21 12.55 ± 0.17	11.37 ± 0.69 11.46 ± 0.31	10.86 ± 0.36 10.87 ± 0.55	9.45 ± 0.35 9.71 ± 0.31	73.39 ± 0.02 73.36 ± 0.05	75.09 ± 0.05 74.88 ± 0.06	5.77 ± 0.03 5.79 ± 0.06	5.95 ± 0.02 5.92 ± 0.06
N. Sativa	60% 80%	12.81 ± 0.24 12.42 ± 0.16	8.56 ± 0.36 9.41 ± 0.21	10.19 ± 0.47 10.51 ± 0.25	7.21 ± 0.23 7.77 ± 0.58	73.42 ± 0.03 73.45 ± 0.06	75.32 ± 0.04 75.64 ± 0.05	5.78 ± 0.07 5.76 ± 0.04	6.24 ± 0.11 6.18 ± 0.07

* Results are means of triplicate experiments ± standard deviation (SD); Co%: Concentration

Table (8): Total protein, fat, and moisture contents and pH values* in meat luncheon samples mixed with essential oils and stored at 5°C in refrigerator for two weeks.

Chemical parameters		Total protein		Total fat		Moisture		pH	
Essential oils	Co%	Zero ± SD	Two weeks ± SD	Zero ± SD	Two weeks ± SD	Zero ± SD	Two weeks ± SD	Zero ± SD	Two weeks ± SD
Control	0%	12.94 ± 0.21	8.87 ± 0.19	11.32 ± 0.59	7.15 ± 0.41	73.47 ± 0.04	75.65 ± 0.09	5.68 ± 0.04	6.37 ± 0.21
Garlic	60% 80%	12.98 ± 0.24 12.96 ± 0.23	10.57 ± 0.48 10.91 ± 0.42	11.30 ± 0.56 11.35 ± 0.51	9.89 ± 0.27 10.05 ± 0.45	73.49 ± 0.08 73.46 ± 0.06	74.96 ± 0.05 74.50 ±0.03	5.69 ± 0.03 5.68 ± 0.05	5.92 ± 0.06 5.86 ± 0.07
Onion	60% 80%	12.95 ± 0.21 12.92 ± 0.19	10.12 ± 0.55 10.24 ± 0.45	11.31 ± 0.58 11.33 ± 0.52	9.73 ± 0.29 9.86 ± 0.27	73.45 ± 0.06 73.48 ± 0.08	75.05 ± 0.07 74.86 ± 0.06	5.65 ± 0.04 5.70 ± 0.03	5.95 ± 0.04 5.99 ± 0.02
N. Sativa	60 % 80 %	12.92 ± 0.18 12.91 ± 0.16	9.69 ± 0.24 9.54 ± 0.20	11.33 ± 0.61 11.35 ± 0.57	7.61 ± 0.56 7.62 ± 0.44	72.51 ± 0.07 73.44 ± 0.08	15.95 ± 0.08 75.77 ± 0.02	5.71 ± 0.02 5.87 ± 5.09	6.12 ± 0.03 3.14 ± 0.06

* Results are means of triplicate experiments ± standard deviation (SD); Co%: Concentration

Data presented in Table (7) and Table (8) clearly indicated the effect of garlic, onion, and N. sativa oils on luncheon chemical constituents of total protein, total fat, and moisture. Presence of garlic oil increases the total protein content in both chicken and meat luncheon over the control values as became 10.51, 11.10, over 8.87 and 8.26, respectively. In fact, this was true either when garlic was used at 60% or 80% concentration in the tested luncheon whether chicken or meat but total protein content in chicken luncheon came to be higher than that in meat.

Concerning total fat, all tested samples showed higher values over the control (absence of tested plant oil) onion and garlic. In presence of N. sativa however, there were a slight total fat increase at used 60% and 80% concentrations in both chicken and meat luncheon.

Moisture content however did not show a noticeable change upon presence of plant oil. This was true in chicken and meat luncheon. Detected changes in pH values Tables (7 & 8) may be due to presence of bacteria which may cause protein hydrolysis, bacterial metabolites as reported by [26]. Our obtained results are in agreement with that what [27] and [28] reported in their studies on chicken and meat luncheon treated with natural essential oils. The use of natural oils as bacterial inhibitory effects and due to their safe agent, they could be used as preservative to extend shelf-life of either chicken or meat luncheon.

Upon usage of onion and garlic oil in both chicken and meat luncheon resulted in lower pH values. This may be due to inhibitory action of them on bacteria – this finding is consisted of what [29] reported. Moreover, at lower pH, the hydrophobicity of garlic and onion oil increases casing it to easily dissolve the lipids in all membrane and increase oxidation of fatty acids [30].

References

[1] R.G. Vasut, M. Dima Robeci, "Food contamination with psychrophilic bacteria" Lucrări stiinłifice medicină veterinară, XII (2) (2009) 325-330.

[2] C. Banu, Manual inginerului de industrie alimentară. Ed. Tehnică, Bucuresti, II (2002) 142- 144.

[3] F.S. Hassanien, "Bacterial hazards associated with consumption of Some Meat products" Benha Veterinary Med. J., 15(2) (2004) 41-54.

[4] D. Dave, A.E. Ghaly, "Meat spoilage mechanisms and preservation techniques: A critical review" Am. J. Agric. Biol. Sci., 6(4) (2011) 486-510.

[5] J.N. Sofos, "Meat and meat products" In Food safety management, Elsevier Inc., Oxford, (2014) 119-162.

[6] M.H. Brown, "Processed meat products" In: The microbiological safety and quality of food, Aspen Publishers, Gaithersburg, (2000) 389-419.

[7] M.N. Filimon, A. Borozan, D. Bordean, F. Radu, "Microorganisms, qualitative indicators for meat products" Animal Sci. Biotech., 43(2) (2010) 346-349.

[8] G.T. Adeyanju, O. Ishola, "Salmonella and Escherichia coli contamination of poultry meat from a processing plant and retail markets in Ibadan, Oyo State, Nigeria" Springer Plus, 3/139 (2014) 1-9.

[9] A.I. Doulgeraki, G-J.E. Nychas, "Monitoring the succession of the biota grown on a selective medium for pseudomonads during storage of minced beef with molecular-based methods" Food Microbiol., 34 (2013) 62-69.

[10] M. Lin, M. Al-Holy, M. Mousavi-Hesary, H. Al-Qadiri, A.G. Cavinato, B.A. Rasco, "Rapid and quantitative detection of the microbial spoilage in chicken meat by diffuse reflectance spectroscopy (600–1100nm)" East. Lett. Appl. Microbiol., 39 (2013) 148-155.

[11] G-J.E. Nychas, P.N. Skandamis, C.C. Tassou, K.P. Koutsoumanis, "Meat spoilage during distribution" Meat Sci., 78(1-2) (2008) 77-89.

[12] M.A. Ronald, "Handbook of microbiological media" CRC Taylor and Francis Group Boca Raton London, New York, USA (2010).

[13] J.G. Collee, J.P. Duguid, A.G. Fraser, B.P. Marmior, "Practical Medical microbiology" 3th Ed. Mackie and Mc Carney, (1989) 54-55.

[14] Difco, "Difco manual of dehydrated culture media and reagents for microbiological and clinical laboratories products" 9th Ed., difco laboratories, Detriot Michigan, USA (1989).

[15] W.I. Taylor, B. Harris, "Isolation of Shigellae II. Comparison of plating media and enrichment broths" Am. J. Clin. Pathol., 44 (1965), 476–479.

[16] A.O.A.C., "Association of official Analytical Chemists" Official methods of analysis published by A.O.A.C. Intern. 16th Ed. Washington, D.C. (2000).

[17] A.O.A.C., "Association of Official Analytical Chemists" Official methods of analysis. Published by A.O.A.C. Intern. 17th Ed. Washington, D.C. (2002).

[18] J.M. Jay, "Microbiologia de alimentos" Porto Alegre: Artmed, (2005) 712p.
[19], N. Bhandari, D.B. Nepali, S. Paudyal, "Assessment of bacterial load in broiler chicken meat from the retail meat shops in Chitwan, Nepal" Intern. J. Infec. Microbiol., 2(3) 99-104.
[20] M.H. Ehrampoush, S.M. Mazloomi, S. Zarei, F. Hemati, M.T. Gtaneian, B. Haji mohammadi, A. Dehghan, "Microbiological quality of sausage during slicing at food retail stores in Shiraz, Iran" Intern. J. Nutri. Sci., 2(1) (2017) 20-25.
[21] EOSQ: Egyptian Organization for standardization and Quality, "Egyptian standards for requirements of Luncheon" No. 1114 (2005).
[22] M.M. Levine, "Escherichia coli that cause diarrhea: enterotoxigenci, enteropathyo- genic, enteroinvasive, enterohaemorrhagic enteroaldherant" J. Infec. Dis., 155 (1987) 377-389.
[23] M. Karmi, "Prevalence of salmonella in meat products" Global Veterina, 11(5) (2013) 685-688.
[24] A.E.I. Selim, F.I. Hauka, A.H. Talib, "Microbiological and chemical analyses of sausage and luncheon samples collected from some supermarkets in Mansoura City" J. Agric. Chem. Biotechn. Mansoura Univ., 6(9) (2015) 321-330.
[25] A.K. Modak, "Effect temperature and defrosting methods on the quality of beef" MS Thesis, Dept. Animal Sci., Bangladesh Agric. Univ. Mymensingh (2009).
[26] C.O. Gill, "The control of microbial spoilage in fresh meats" In Advances in meat research 2. Meat and poultry microbiology (Pearson, A.M. and T.R. Dutson Eds.), AVI Publishing Co. Inc., Westport, Connecticut (1986) 49-88.
[27] A.I. EL-Desouky, H.E.M. Bahlol, A.M.A. Sharoba, "Effect of some essential oils and preservatives on the growth of E. coli and quality of refrigerate minced meat". Annals Agric. Sci. Moshtohor, 44 (2006) 1675-1695.
[28] A.R. Shalaby, R.K. Moawd, W.H. Emam, G.F. Mohamed, "Quality and shelf life of cold stored Mullet Fish (MugilCephalus) pretreated by Sorbate/Thyme oil with emphasis on biogenic amines. Current Nutri. Food Sci., 9 (2013) 328-334.
[29] M. Banerjee, P.K. Sarkar, "Inhibitory effect of garlic on bacterial pathogens from spices". World J. Microbiol. Biotech. 19 (2003) 565–569.
[30] J.M. Jay, "Microorganisms in fresh ground meats: The relative safety of products with low versus high numbers" Meat Sci., 43 (1996) S59-S66.