Effect of Thyme and Rosemary on Chemical Composition of Some Meat Products

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ABSTRACT

In recent years, the demand for natural antioxidants has been increased mainly because of the adverse effects of synthetic antioxidants, which have been confirmed for their toxicological and carcinogenic effects. Thus, most of the recent investigations have been directed towards the identification of natural antioxidants from various plant sources, which will offer increased consumer acceptability, decreased potential health risks, and can often achieve the same degree of oxidation prevention as Synthetic antioxidants. Therefore, the aim of this study was to conduct an investigate on the biochemical composition of some meat products in Egyptian markets. Besides, study the effect of adding Rosemary and Thyme at concentration of 100ppm on chemical composition of different meat products in the Egyptian markets. The obtained results revealed that the overall mean value of protein were not significantly improved with adding Thyme and Rosemary in all examined meat products. for fat content were significantly improved in ready to eat sausage with adding both plant extract, in minced meat also were significantly improved with adding Thyme only, while were not significantly improved in other meat products. the overall mean value of moisture were significantly improved with adding Thyme and Rosemary in all examined meat products. Ash content were significantly improved in minced meat and fresh sausage with adding thyme only, while in other examined meat products were not significantly improved. the overall mean value of fiber were significantly improved with adding Thyme and Rosemary in luncheon, burger and ready to eat sausage, while were not significantly improved in kofta, fresh sausage and minced meat. Carbohydrate content were significantly improved with adding Thyme and Rosemary in fresh sausage, in kofta were significantly improved with adding Thyme only, while were not significantly improved in other meat products. Finally, net energy content were significantly improved with adding Thyme and Rosemary in all examined meat products. These findings show that this plant extract effectively improve some parameters of the chemical composition of these meat products and did not affect others.

1. INTRODUCTION

Meat is a food that has great importance in human nutrition, due to its high protein content including essential amino acids, the presence of essential fatty acids and B complex vitamins, such as vitamin B12, cobalamin, found in higher amounts in products of animal origin as well as small amounts of minerals such as iron and zinc, as part of a balanced diet, supplemented with the nutrients of other food groups (Santos and Oliveira,2012).

Water is the most abundant component in the flesh, which affects juiciness, texture, color, taste and directly influences its quality.

The protein content varies according to the age of slaughter, with a tendency to increase with its advance. Irrespective of the age, race, sex and region produced, meat is a protein source of high biological value, that is, the amino acids present in the meat are essential to the needs of humans. Fat is a determining factor of its quality, since it exerts

effect on the organoleptic properties, palatability and nutritional value, however, it is a substrate that triggers lipoperoxidation in meat products (Webb et al.,2005). In recent times, the demand for meat products increased by consumers, which include (minced meat, luncheon, sausage, burger and kofta). Meat products are resulted from several methods of processing of fresh meat, aiming to develop desirable products and to reduce perishability during transport and storage. Meat products are complex systems of rich nutritional composition, which makes them very liable to chemical and bacterial spoilage, Lipid oxidation is the major cause of chemical deterioration in meat products.

In October, 2015, the International Agency for Research on Cancer (IARC) under World Health Organization (WHO) issued a monograph classifying processed meat as carcinogen (Group I) and red meat as probable carcinogen (Group 2A), based on the survey of published human and animal studies on meat consumption in relation to colorectal and other types of cancer (Jiang and xiong, 2016).

Nowadays, many synthetic preservatives, such as tertiary butylhydroquinone (THBQ), butylated hydroxyltoluene (BHT) and butylated hydroxylanisole (BHA) are commonly used to reduce the microbial growth together with delaying lipid and protein oxidation, thus extending the shelf-life of meat products. However, due to their potential implications in toxicity and carcinogenesis, these synthetic preservatives are being replaced by natural substances (Lorenzo *et al.,* 2018). In this regard, plants and spices are a valuable source of bioactive compounds, thus raising great interest as natural preservatives in order to improve the overall quality of meat and meat products.

Rosemary can inhibit lipid oxidation, chelate metal and eliminate superoxide radicals. Its phenolic content corresponds to about 150mg/g. The substances responsible for the antioxidant activity include phenolic acids (caffeic, ferulic, and rosamarinic acid) and phenolic diterpenes (carnosic acid and carnosol). Carnosic acid and carnosol act as iron chelators and eliminate peroxyl radicals (Velasco and Williams, 2011).

Thyme contains several antioxidant compounds, which when isolated have the following order of antioxidant activity: thyme oil > thymol > carvacrol > gamma-terpinene > myrcene > linalool > p-cymene > limonene > 1,8-cineolo > alpha-pinene (Rojas and Brewer, 2008).

The present work was conducted to investigate the biochemical composition of some meat products in Egyptian markets. Besides, study the effect of adding Rosemary and Thyme at concentration of 100ppm on chemical composition of different meat products in the Egyptian markets.

2. MATERIAL AND METHODS

2.1. Collection of samples:

A total 216 samples of some meat products including Luncheon, Burger Kofta, Minced meat, Fresh Sausage and Ready to eat Sausage, 36 of each product including four brands for each product and each brand has three batches, are collected from hypermarkets in cairo province. The collected samples were transferred as rapidly as possible in an ice box to the laboratory.

2.2. Preparation of samples:

The samples were classified into three groups, control group was samples without any treatment (72), group contained Rosemary at concentration of 100mg/100gram (72), group contained Thyme at a concentration of 100mg /100gram (72). The samples were stored in refrigerator at 4℃ for determination of chemical composition.

2.3. Determination of chemical composition of examined meat products:

2.3.1. Determination of moisture percentage (AOAC, 2015)

2.3.2. Determination of Ash percentage (AOAC,2015)

2.3.3. Determination of crude fiber (AOAC,2015)

2.3.4. Determination of fat percentage (AOAC,2015)

2.3.5. Determination of protein percentage (AOAC,2015)

2.3.6. Total carbohydrates percentage

2.4. Statistical Analysis

Data collected were analyzed using one-way analysis of variance (ANOVA) with Duncan by SPSS® version 16.0. A statistical probability (p value) less than 0.05 indicated a statistically significant difference between groups (Steel and Torrie, 1980).

3. RESULTS AND DISCUSSION

3.1. Chemical composition of examined meat products:

3.1.1. Luncheon:

The obtained results in table (1) revealed that overall mean values of protein content in control Luncheon samples, Luncheon samples treated with

Thyme and Luncheon samples treated with Rosemary were 15.58±1.33, 15.58±1.33, 15.72±1.33, respectively, with no significant difference between Luncheon samples with different treatment. For fat content were 8.68±0.45, 8.68±0.45, 8.78±0.48, respectively, with no significant difference between Luncheon samples with different treatment. For moisture content were 57.15±3.44, 56.89±3.55, 56.68±3.59, respectively, with significant difference between Luncheon samples with different treatment. For Ash content were 3.10±1.14, 3.10±0.53, 3.13±0.53, respectively, with no significant difference between Luncheon samples with different treatment. For fiber content were 4.75±1.14, 4.89±1.21, 4.98±0.98, respectively, with significant difference between Luncheon samples with different treatment. For carbohydrate content were 10.74±3.65, 10.86±3.78, 10.74±3.65, respectively, with no significant difference between Luncheon samples with different treatment. For net energy content were 191.74±13.85, 192.34±14.32, 193.21±13.56, respectively, with significant difference between Luncheon samples with different treatment. The presented results are Conforms to the

Egyptian standard specifications in the overall mean value of protein and ash but not in fat and moisture.

Higher results of moisture and fat and nearly similar results for protein and ash were obtained by Mohammed (2013) who reported that The biochemical composition of Luncheon ranged from 61.0% to 63.5% for moisture, 13.8% to 19.5% for protein, 19.6% to 15.8% for fat and 3.7 % to 4.0 % for ash. Nearly similar results for moisture, protein, fat and ash and higher results for carbohydrate were presented by Maky et al., (2020) who found a comprehensive variation in the chemical composition of luncheon samples based on the fresh weight base, moisture, protein, fat, ash, and carbohydrate varied from 56.97 to 64.52, 3.50 to16.10, 4.73 to 13.39, 3.30 to 3.51, and 11.32 to 27.44% w/w, respectively. Higher results for moisture and ash were obtained by Selim et al., (2015) who examined chemical composition of Luncheon samples collected from three supermarkets in Mansoura city. They found that the mean values percentage of moisture and ash in examined luncheon were 58.0 and from 6.72 to 5.11%, respectively.

Table (1): Mean values of Chemical composition of the examined Luncheon samples.

Chemical Composition	Treatments	Mean ± SD (A)	Mean ± SD (B)	Mean ± SD (C)	Mean ± SD (D)	Mean ± SD (Overall)
Protein	Free	15.83±0.15	13.77±0.97	15.73±0.31	16.97±0.35	15.58±1.33[a]
	Thyme	15.83±0.15	13.77±0.97	15.73±0.31	16.97±0.35	15.58±1.33[a]
	Rosemary	15.97±0.21	13.90±1.01	15.90±0.36	17.10±0.36	15.72±1.33[a]
Fat	Free	8.20±0.26	8.83±0.38	9.23±0.76	8.47±0.38	8.68±0.45[a]
	Thyme	8.20±0.26	8.83±0.38	9.23±0.76	8.47±0.38	8.68±0.45[a]
	Rosemary	8.24±0.29	8.93±0.38	9.37±0.74	8.57±0.31	8.78±0.48[a]
Humidity	Free	53.72±0.65	61.66±078	57.79±0.98	55.45±0.57	57.15±3.44[a]
	Thyme	53.33±0.55	61.53±0.78	57.58±0.91	55.12±0.58	56.89±3.55[b]
	Rosemary	52.96±0.58	61.34±0.95	57.36±1.06	55.05±0.51	56.68±3.59[b]
Ash	Free	2.66±0.12	2.76±0.02	3.82±0.30	3.17±0.20	3.10±1.14[a]
	Thyme	2.67±0.12	2.76±0.05	3.82±0.07	3.17±0.05	3.10±0.53[a]
	Rosemary	2.67±0.12	2.77±0.06	3.83±0.06	3.23±0.06	3.13±0.53[a]
Fiber	Free	3.49±0.04	4.20±0.02	5.24±0.30	6.07±0.20	4.75±1.14[b]
	Thyme	3.53±0.06	4.31±0.01	5.40±026	6.30±0.17	4.89±1.21[a]
	Rosemary	4.07±0.06	4.30±0.10	5.37±0.32	6.17±0.21	4.98±0.98[a]
Carbohydrate	Free	16.10±0.44	8.78±0.09	8.18±.0.07	9.88±0.30	10.74±3.65[a]
	Thyme	16.43±0.32	8.80±0.10	8.23±0.12	9.98±0.28	10.86±3.78[a]
	Rosemary	16.10±0.44	8.78±0.09	8.18±0.07	9.88±0.30	10.74±3.65[a]
Net energy	Free	210.35±3.96	177.36±4.16	187.05±7.69	192.22±4.99	191.74±13.85[c]
	Thyme	211.72±3.87	177.71±4.64	187.28±7.68	192.63±4.85	192.34±14.32[b]
	Rosemary	211.30±3.87	178.83±4.44	189.00±7.76	193.72±4.32	193.21±13.56[a]

- Each reported value is the mean ± SD. Means within the same item in the same column followed by different lower case letters are significantly different (p<0.05).Means with similar letters are not significantly different at (P<0.05).
- A= Brand (1), B= Brand (2), C= Brand (3), D= Brand (4), Over all = the overall average of the four beands
- Free= Control Negative

Table (2): Mean values of Chemical composition of the examined Kofta samples.

Chemical Composition	Treatments	Mean ± SD (A)	Mean ± SD (B)	Mean ± SD (C)	Mean ± SD (D)	Mean ± SD (Overall)
Protein	Free	16.73±0.31	18.20±0.30	18.70±0.20	14.57±1.01	17.05±1.85[a]
	Thyme	16.73±0.31	18.27±0.35	18.70±0.20	14.67±1.12	17.09±1.82[a]
	Rosemary	16.83±0.35	18.33±0.31	18.77±0.23	14.70±1.04	17.16±1.84[a]
Fat	Free	8.90±0.02	9.08±0.15	7.69±0.39	8.97±0.49	8.66±0.65[a]
	Thyme	8.90±0.02	9.08±0.15	7.71±0.37	8.99±0.49	8.67±0.64[a]
	Rosemary	8.97±0.04	9.17±0.15	7.80±0.40	9.10±0.52	8.76±0.65[a]
Humidity	Free	41.96±0.27	40.71±0.16	44.04±0.38	45.27±0.75	43.00±2.05[a]
	Thyme	40.94±0.38	40.22±0.26	43.63±0.28	44.85±1.09	42.41±2.19[b]
	Rosemary	41.63±0.25	40.24±0.21	43.64±0.45	44.70±0.75	42.55±2.00[b]
Ash	Free	4.18±0.21	4.90±0.02	4.30±0.03	4.35±0.04	4.43±0.32[a]
	Thyme	4.18±0.21	4.90±0.02	4.31±0.02	4.26±0.14	4.41±0.33[a]
	Rosemary	4.23±0.21	5.07±0.06	4.37±0.06	4.43±0.06	4.53±0.37[a]
Fiber	Free	9.29±0.07	8.08±0.16	7.24±0.04	7.78±0.11	8.10±0.87[a]
	Thyme	10.08±0.08	8.24±0.12	7.40±0.11	7.97±0.2	8.42±1.16[a]
	Rosemary	9.40±0.10	8.16±0.21	7.40±0.01	8.00±0.10	8.24±0.84[a]
Carbohydrate	Free	18.93±0.06	19.03±0.38	18.03±0.15	19.07±0.15	18.77±0.49[b]
	Thyme	19.17±0.15	19.30±0.20	18.25±0.28	19.27±0.06	19.00±0.49[a]
	Rosemary	18.93±0.06	19.03±0.38	18.03±0.15	19.07±0.15	18.77±0.50[b]
Net energy	Free	232.35±1.21	240.74±1.19	225.82±3.44	224.20±4.08	230.78±7.52[c]
	Thyme	233.31±1.68	242.12±0.79	224.60±2.45	225.97±3.88	231.50±8.05[b]
	Rosemary	233.46±1.27	242.12±0.93	227.16±3.98	226.01±4.09	232.19±7.39[a]

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Table (3): Mean values of Chemical composition of the examined Burger samples.

Chemical Composition	Treatments	Mean ± SD (A)	Mean ± SD (B)	Mean ± SD (C)	Mean ± SD (D)	Mean ± SD (Overall)
Protein	Free	17.60±0.40	15.60±0.36	16.37±0.15	12.17±0.95	15.43±2.33[a]
	Thyme	17.65±0.47	15.63±0.32	16.37±0.15	12.50±1.13	15.54±2.19[a]
	Rosemary	17.83±0.35	15.80±0.36	16.70±0.17	12.30±0.95	15.66±2.39[a]
Fat	Free	8.63±0.12	8.37±0.15	7.78±0.03	7.27±0.67	8.01±0.61[a]
	Thyme	8.63±0.12	8.37±0.15	7.78±0.03	7.27±0.67	8.01±0.61[a]
	Rosemary	8.83±0.12	8.52±0.10	7.91±0.08	7.53±0.55	8.20±0.59[a]
Humidity	Free	51.93±0.57	54.45±0.37	47.49±0.28	54.31±1.45	52.04±3.25[a]
	Thyme	51.49±0.64	53.84±0.74	47.18±0.27	52.99±2.13	51.38±2.96[b]
	Rosemary	50.96±0.87	53.88±0.38	46.80±0.04	53.29±1.16	51.23±3.10[b]
Ash	Free	3.20±0.02	2.75±0.06	3.67±0.04	3.92±0.03	3.38±0.52[a]
	Thyme	3.33±0.06	2.77±0.06	3.71±0.02	3.95±0.05	3.44±0.51[a]
	Rosemary	3.27±0.06	2.83±0.12	3.72±0.01	3.97±0.04	3.45±0.50[a]
Fiber	Free	8.66±0.24	8.80±0.26	13.67±0.06	12.00±0.17	10.78±2.47[b]
	Thyme	8.83±0.21	8.96±0.25	13.87±0.06	12.80±0.35	11.12±2.60[a]
	Rosemary	8.80±0.17	8.97±0.25	13.83±0.12	12.57±0.40	11.04±2.55[a]
Carbohydrate	Free	9.97±0.11	10.03±0.21	11.03±0.15	10.34±0.05	10.35±0.49[a]
	Thyme	10.06±0.12	10.27±0.25	11.10±0.17	10.50±0.00	10.48±0.45[a]
	Rosemary	10.31±0.54	10.00±0.17	11.03±0.15	10.34±0.05	10.42±0.44[a]
Net energy	Free	196.86±2.27	186.03±3.24	187.94±1.33	162.30±10.25	183.28±14.76[c]
	Thyme	197.42±2.54	187.84±4.54	189.70±3.17	164.38±11.02	184.83±14.25[b]
	Rosemary	201.09±3.29	188.15±2.24	190.64±0.95	165.36±9.09	186.31±15.05[a]

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Table (4): Mean values of Chemical composition of the examined Fresh Sausage samples.

Chemical Composition	Treatments	Mean ± SD (A)	Mean ± SD (B)	Mean ± SD (C)	Mean ± SD (D)	Mean ± SD (Overall)
Protein	Free	13.90±0.20	14.90±0.10	15.07±0.21	11.23±0.21	13.78±0.77[a]
	Thyme	13.90±0.20	14.90±0.10	15.07±0.21	11.23±0.21	13.78±1.77[a]
	Rosemary	13.93±0.21	15.00±0.10	15.23±0.23	11.27±0.23	13.86±1.82[a]
Fat	Free	10.49±0.24	10.75±0.05	7.23±0.10	8.90±0.10	9.34±1.63[a]
	Thyme	10.60±0.26	10.90±0.10	7.60±0.12	9.07±0.12	9.54±1.52[a]
	Rosemary	10.47±0.21	10.75±0.05	7.03±0.10	8.90±0.10	9.29±1.71[a]
Humidity	Free	43.62±0.31	45.14±0.25	51.18±0.27	48.93±0.27	47.22±3.64[a]
	Thyme	42.30±0.17	44.35±0.20	50.19±0.38	47.98±0.38	46.21±3.55[b]
	Rosemary	43.03±0.31	44.72±0.17	50.67±0.31	48.47±0.31	46.72±3.47[b]
Ash	Free	2.73±0.32	3.83±0.07	3.93±0.02	4.30±0.02	3.70±0.67[b]
	Thyme	3.20±0.26	4.07±0.06	4.19±0.05	4.55±0.05	4.00±0.57[a]
	Rosemary	2.83±0.32	3.90±0.10	4.03±0.06	4.37±0.06	3.78±0.66[b]
Fiber	Free	14.40±0.10	11.29±0.07	11.31±0.23	11.17±0.23	12.04±1.57[a]
	Thyme	14.90±0.10	11.48±0.14	11.60±0.12	11.43±0.12	12.35±1.70[a]
	Rosemary	14.83±0.21	11.46±0.06	11.47±0.17	11.40±0.17	12.29±1.70[a]
Carbohydrate	Free	14.86±0.06	14.10±0.20	11.29±0.14	15.44±0.14	13.92±1.84[b]
	Thyme	15.10±0.10	14.30±0.10	11.35±0.12	15.73±0.12	14.12±1.94[a]
	Rosemary	14.90±0.10	14.17±0.15	11.37±0.10	15.60±0.10	14.01±1.86[a]
Net energy	Free	218.21±1.62	221.86±0.37	178.33±0.91	194.39±0.91	203.20±20.57[c]
	Thyme	220.26±1.34	224.07±0.51	181.99±1.62	197.13±1.62	205.86±19.88[a]
	Rosemary	219.68±0.22	222.56±0.19	179.38±1.30	195.18±1.30	204.20±20.61[b]

- Each reported value is the mean ± SD. Means within the same item in the same column followed by different lower case letters are significantly different (p<0.05). Means with similar letters are not significantly different at (P<0.05). A= Brand (1), B= Brand (2), C= Brand (3), D= Brand (4), Over all = the overall average of the four beands. Free= Control Negative

Table (5): Mean values of Chemical composition of the examined Ready to eat Sausage samples.

Chemical Composition	Treatments	Mean ± SD (A)	Mean ± SD (B)	Mean ± SD (C)	Mean ± SD (D)	Mean ± SD (Overall)
Protein	Free	13.93±0.06	17.57±0.21	18.37±0.15	10.87±0.31	15.18±3.46[a]
	Thyme	13.93±0.06	17.57±0.21	18.37±0.15	10.87±0031	15.18±3.46[a]
	Rosemary	14.07±0.06	17.80±0.20	18.47±015	10.90±0.30	15.31±3.52[a]
Fat	Free	13.73±0.21	17.87±0.06	18.19±0.04	10.07±0.52	14.96±3.84[b]
	Thyme	13.90±0.17	18.10±0.10	18.33±0.06	10.23±0.38	15.14±3.85[a]
	Rosemary	13.83±0.21	17.97±0.06	19.08±0.08	10.87±0.31	15.44±3.79[a]
Humidity	Free	55.47±0.27	48.31±0.36	46.21±0.7	65.17±0.44	53.79±8.56[a]
	Thyme	54.67±0.32	47.63±0.26	45.29±0.21	63.96±0.61	52.89±8.39[b]
	Rosemary	54.74±0.17	47.74±0.15	44.85±0.16	63.52±0.67	52.71±8.32[b]
Ash	Free	4.43±0.06	4.93±0.06	6.37±0.15	4.63±0.12	5.09±0.88[a]
	Thyme	4.63±0.06	5.30±0.01	6.63±0.15	4.88±0.07	5.36±0.89[a]
	Rosemary	4.55±0.05	5.11±0.01	6.47±0.15	4.73±0.12	5.22±0.87[a]
Fiber	Free	7.67±0.06	7.18±0.47	6.76±0.04	5.89±0.05	6.88±0.75[b]
	Thyme	7.90±0.01	7.07±0.06	7.07±0.04	6.16±0.01	7.05±0.71[a]
	Rosemary	7.87±0.06	7.14±0.06	6.93±0.06	6.15±0.05	7.02±0.71[a]
Carbohydrate	Free	4.76±0.05	4.14±0.05	4.10±0.01	3.37±0.29	4.09±0.44[a]
	Thyme	4.97±0.12	4.34±0.06	4.31±0.02	3.90±0.10	4.38±0.43[a]
	Rosemary	4.87±0.06	4.24±0.05	4.20±0.02	3.83±0.06	4.29±0.57[a]
Net energy	Free	207.14±2.33	258.68±0.57	264.94±1.05	154.18±3.56	221.23±51.66[c]
	Thyme	209.55±1.98	261.65±0.76	267.13±1.09	157.89±4.17	224.05±51.18[b]
	Rosemary	209.06±1.91	261.01±0.57	274.12±1.36	163.65±3.93	226.96±50.70[a]

- Each reported value is the mean ± SD. Means within the same item in the same column followed by different lower case letters are significantly different (p<0.05). Means with similar letters are not significantly different at (P<0.05). A= Brand (1), B= Brand (2), C= Brand (3), D= Brand (4), Over all = the overall average of the four beands. Free= Control Negative

Table (6): Mean values of Chemical composition of the examined Minced meat samples.

Chemical Composition	Treatments	Mean ± SD (A)	Mean ± SD (B)	Mean ± SD (C)	Mean ± SD (D)	Mean ± SD (Overall)
Protein	Free	18.87±0.06	16.60±0.53	18.90±0.10	16.50±0.50	17.72±1.35[a]
	Thyme	18.87±0.06	16.60±0.53	18.93±0.12	16.53±0.55	17.73±1.35[a]
	Rosemary	18.97±0.15	16.67±0.58	19.00±010	16.63±0.60	17.82±1.35[a]
Fat	Free	12.27±0.25	12.16±0.04	9.63±0.15	13.03±0.61	11.77±1.48[b]
	Thyme	12.40±0.26	12.37±0.21	9.83±0.15	13.67±0.25	12.07±1.61[a]
	Rosemary	12.27±0.25	12.22±0.08	9.63±0.15	13.45±0.75	11.89±1.61[b]
Humidity	Free	59.95±0.35	61.64±0.50	63.47±0.19	60.19±0.37	61.31±1.62[a]
	Thyme	59.30±0.44	61.04±0.49	62.58±0.03	58.77±0.39	60.42±1.73[b]
	Rosemary	59.55±0.43	61.01±0.79	62.80±0.20	59.35±0.37	60.68±1.60[b]
Ash	Free	1.35±0.05	1.00±0.10	0.84±0.05	1.13±0.03	1.08±0.22[b]
	Thyme	2.33±0.92	2.51±1.30	1.20±0.10	1.43±0.11	1.87±0.65[a]
	Rosemary	1.42±0.02	1.07±0.12	1.10±0.10	1.23±0.06	1.20±0.16[b]
Fiber	Free	5.38±0.04	6.07±0.10	4.97±0.12	6.04±0.05	5.61±0.51[a]
	Thyme	5.60±0.20	6.30±0.10	5.20±0.10	6.23±0.06	5.83±0.53[a]
	Rosemary	5.47±0.06	6.47±0.39	5.13±0.15	6.14±0.05	5.80±0.61[a]
Carbohydrate	Free	2.19±0.04	2.51±0.08	2.19±0.01	3.11±0.18	2.50±0.43[a]
	Thyme	2.43±0.06	2.53±0.06	2.25±0.05	3.23±0.25	2.61±0.43[a]
	Rosemary	2.33±0.12	2.57±0.12	2.33±0.06	3.20±0.20	2.61±0.41[a]
Net energy	Free	204.10±2.34	194.77±2.31	179.84±1.14	204.92±4.20	195.91±11.66[c]
	Thyme	206.42±2.46	196.78±3.48	182.09±0.88	211.45±3.21	199.18±12.92[a]
	Rosemary	205.20±2.95	195.81±2.25	180.86±0.23	209.70±4.98	197.89±12.75[b]

- Each reported value is the mean ± SD. Means within the same item in the same column followed by different lower-case letters are significantly different (p<0.05). Means with similar letters are not significantly different at (P<0.05). A= Brand (1), B= Brand (2), C= Brand (3), D= Brand (4), Over all = the overall average of the four beands. Free= Control Negative

3.1.2. Kofta:

The presented results in table (2) showed that the overall mean value of protein content in control Kofta samples, kofta samples with addition of Thyme and Kofta samples with addition of Rosemary were 17.05±1.85 ,17.09±1.82 ,17.16±1.84, respectively, with no significant difference between Kofta samples with different treatment. For fat content, the results were 8.66±0.65 ,8.67±0.64 and 8.76±0.65, respectively, with no significant difference between Kofta samples with different treatment. For moisture content were 43.00±2.05 ,42.41±2.19 and 42.55±2.00, respectively, with significant difference between Kofta samples with different treatment. For ash content were 4.43±0.32 ,4.41±0.33 and 4.53±0.37, respectively, with no significant difference between Kofta samples with different treatment. For fiber content were 8.10±0.87 ,8.42±1.16 and 8.24±0.84, respectively, with no significant difference between Kofta samples with different treatment. For carbohydrate content were 18.77±0.49 ,19.00±0.49 and 18.77±0.50, respectively, with significant difference between the kofta samples with different treatment. For net energy were 230.78±7.52 ,231.50±8.05 and 232.19±7.39, respectively, with significant

difference between Kofta samples with different treatment. The obtained results don't meet the Egyptian standard specifications.

Lower results in protein, fat, ash and net energy and higher in moisture and carbohydrates reported by Kaba et al., (2014) who studied the biochemical composition of the raw meat ball during storage period of 8 days at 4 °C examined at days 0, 2, 4, 6 and 8, they found that the mean value percentage of crude protein, crude fat, moisture, ash, carbohydrate and energy were at day 0, 8.99±0.56, 2.89±0.02, 48.53±0.41, 2.37±0.04, 39.60±0.17, 220.31±1.72, respectively, At day 2 were, 9.86±0.14, 3.09±0.07, 48.15±0.12, 1.56±0.06, 38.91±0.10, 222.87±0.81, respectively, At day 4 were, 8.56±0.16, 3.60±0.82, 48.67±0.26, 1.66±0.03, 39.18±0.41, 223.34±5.12, respectively, At day 6 were, 9.20±0.01, 4.31±0.09, 47.23±0.39, 2.53±0.05, 39.26±0.49, 232.63±1.11, respectively, At day 8 were, 9.53±0.57, 3.88±0.22, 47.03±0.67, 2.29±0.01, 39.56±1.56, 231.28±1.58, respectively.

3.1.3 Burger:

The obtained results in table (3) revealed that the overall protein content of control Burger samples, Burger samples treated with Thyme and Burger samples treated with Rosemary were 15.43±2.33 ,15.54±2.19 and 15.66±2.39, respectively, with no significant difference between Burger samples with

different treatment. For fat content, the results were 8.01±0.61 ,8.01±0.61 and 8.20±0.59, respectively, with no significant difference between Burger samples with different treatment. For moisture content were 52.04±3.25 ,51.38±2.96 and 51.23±3.10, respectively, with significant difference between Burger samples with different treatment. For ash content were 3.38±0.52 ,3.44±0.51 and 3.45±0.50, respectively, with no significant difference between Burger samples with different treatment. For fiber content were 10.78±2.47 ,11.12±2.60 and 11.04±2.55, respectively, with significant difference between Burger samples with different treatment. For carbohydrate content were 10.35±0.49 ,10.48±0.45 and 10.42±0.44, respectively, with no significant difference between Burger samples with different treatment. For net energy were 183.28±14.76 ,184.83±14.25 and 186.31±15.05, respectively, with significant difference between Burger samples with different treatment. The illustrated results are Conform to the Egyptian standard specifications in the overall mean value of protein but not in ash, fat and moisture.

Nearly similar results for protein, lower results for ash and carbohydrate and higher results for moisture, fat and net energy were presented by Turhan et al., (2005) who examined the proximate chemical composition of Beef Burger, they found that the mean value percentage of moisture, protein, fat, Ash, carbohydrate and energy value were 59.43, 15.24, 21.42, 2.16, 1.74% and 269.5(kcal/100 g), respectively. Higher results for moisture, protein and fat and lower results for carbohydrate and ash were presented by Hashemi Gahruie et al., (2017) who examined physicochemical properties of beef burger, The results showed that the samples moisture, protein, fat, carbohydrate and ash were 59.13, 19, 12, 7.72 and 2%, respectively. Nearly similar results for protein, fat and ash ,higher results for moisture and lower results for fiber and carbohydrate were presented by Karema et al. (2011) who investigated proximate chemical composition of beef burger formulated with partial replacement of beef fat with olive oil and wheat bran fibers and they were found that, chemical composition of beef burger as follow: moisture was ranged from 58.7 – 60%, protein 15.67 – 16.67%, total lipids 7.33 – 20.20%, ash 2.72 – 3.61%, and fiber 1.11 – 7.92% as will as carbohydrates 1.54 – 5.38%. **3.1.4. Fresh Sausage:**

The presented results in table (4) showed that the overall mean value of protein content in control Fresh Sausage samples, Fresh Sausage samples treated with Thyme and Fresh Sausage samples treated with Rosemary were 13.78±0.77 ,13.78±1.77

and 13.86±1.82, respectively, with no significant difference between Fresh Sausage samples with different treatment. For fat content, the results were 9.34±1.63 ,9.54±1.52 and 9.29±1.71, respectively, with no significant difference between Fresh Sausage samples with different treatment. For moisture content were 47.22±3.64 ,46.21±3.55 and 46.72±3.47, respectively, with significant difference between Fresh Sausage samples with different treatment. For ash content were 3.70±0.67 ,4.00±0.56 and 3.78±0.66, respectively, with significant difference between Fresh Sausage samples with different treatment. For fiber content were 12.04±1.57 ,12.35±1.70 and 12.29±1.70, respectively, with no significant difference between fresh sausage samples with different treatment. For carbohydrate content were 13.92±1.84 ,14.12±1.94 and 14.01±1.86, respectively, with significant difference between Fresh Sausage samples with different treatment. For net energy were 203.20±20.57 ,205.86±19.88 and 204.20±20.61, respectively, with significant difference between fresh sausage samples with different treatment. The obtained results don't meet the Egyptian standard specifications.

Higher results for moisture, fat and protein were presented by Selim et al., (2015) who found that the mean values percentage of moisture, fat and protein in examined Sausage were from 53.62 to 56.75, 46.07 and from 20.69 to 33.19%, respectively. Higher results for moisture, fat and protein and lower in fiber and ash were presented by Henning et al., (2016) who investigated chemical composition of beef species sausage according to SANS 885:2011. they found that the mean values percentage of moisture, fat, protein, ash and total fiber were 58.1 ± 0.23%, 28.6 ± 0.36%, 16.2 ± 0.22%, 2.8 ± 0.03%, 0.4 ± 0.01%, respectively. Lower results for ash, carbohydrate and fat and higher for moisture and protein were presented by Adua et al., (2020) who investigate Proximate composition of beef sausage, they found that the mean value percentage of moisture, Ash, carbohydrate, fat, protein were 78.68, 1.39, 0.25, 0.42and 19.15%, respectively.

3.1.5. Sausage (ready to eat):
The obtained results in table (5) revealed that the overall mean value of protein content in control Ready to eat Sausage samples, Ready to eat Sausage samples treated with Thyme and Ready to eat Sausage samples treated with Rosemary were 15.18±3.46 ,15.18±3.46 and 15.31±3.52, respectively, with no significant difference between Ready to eat Sausage samples with different

treatment. For fat content were 14.96±3.84, 15.14±3.85 and 15.44±3.79, respectively, with significant difference between Ready to eat Sausage samples with different treatment. For moisture content were 53.79±8.56, 52.89±8.39 and 52.71±8.32, respectively, with significant difference between the Ready to eat Sausage samples with different treatment. For ash content were 5.09±0.88, 5.36±0.89 and 5.22±0.87, respectively, with no significant difference between the Ready to eat Sausage samples with different treatment. For fiber content were 6.88±0.75, 7.05±0.71 and 7.02±0.71, respectively, with significant difference between the Ready to eat Sausage samples with different treatment. For carbohydrate content were 4.09±0.44, 4.38±0.43 and 4.29±0.57, respectively, with no significant difference between the Ready to eat Sausage samples with different treatment. For net energy content were 221.23±51.66, 224.05±51.18 and 226.96±50.70, respectively, with significant difference between the Ready to eat Sausage samples with different treatment. The illustrated results are Conform to the Egyptian standard specifications in the overall mean value of protein and ash but not in fat and moisture.

Nearly similar result for fat, lower results for protein and ash and higher result for moisture were obtained by Jihad et al. (2009) investigated seven types of Sausages with different ingredients and they found that, the chemical composition of Sausage as follow: fat range from 14.8 – 19.4 %, protein range from 12.1 – 14.4%, ash 2 – 2.5%, moisture 59.5 – 66.9%. Higher results for protein, fiber, carbohydrate and net energy. Higher results for protein, fiber, carbohydrate and net energy and nearly similar results for moisture and ash were obtained by Hartmann et al., (2020) who examined the proximate chemical composition of cooked hamburger, they found that the mean value percentage of moisture, Ash, protein, fat, carbohydrate and energy value were 52.69±0.04, 5.35±0.08, 50.55±0.10, 28.79±0.08, 15.31±0.19 and 522.55±0.88, respectively. Higher results for moisture and protein and lower for ash, carbohydrate, and fat were obtained by Elfaki (2017) who found that the mean value percentage of moisture, carbohydrate, protein, fat and ash for sausage processed locally were 67.77 ± 0.12, 0.88 ± 0.02, 24.85±0.70, 2.93 ± 0.01 and 4.63 ± 0.05, respectively. for Looli were 70.62 ± 0.12, 1.06 ± 0.02, 20.93 ± 0.70, 2.66 ± 0.01 and 4.39b ± 0.05, respectively. for Algoussi were 68.99± 0.12, 1.00 ± 0.02, 22.71 ± 0.70, 2.75 ± 0.01 and 4.65 ± 0.05, respectively. And for Alarabi 69.85 ± 0.12, 1.17 ±

0.02, 21.10 ± 0.70, 2.86 ± 0.01 and 4.73 ± 0.05, respectively.

3.1.6. Minced meat:

The presented results in table (6) showed that the overall mean value of protein content in control Minced meat samples, Minced meat samples with Thyme treatment and Minced meat samples with Rosemary treatment were 17.72±1.35, 17.73±1.35 and 17.82±1.35, respectively, with no significant difference between Minced meat samples with different treatment. For fat content were 11.77±1.48, 12.07±1.61 and 11.89±1.61, respectively, with significant difference between Minced meat samples with different treatment. For moisture content were 61.31±1.62, 60.42±1.73 and 60.68±1.60, respectively, with significant difference between Minced meat samples with different treatment. For ash content were 1.08±0.22, 1.87±0.65 and 1.20±0.16, respectively, with significant difference between Minced meat samples with different treatment. For Fiber content were 5.61±0.51, 5.83±0.53 and 5.80±0.61, respectively, with no significant difference between Minced meat samples with different treatment. For carbohydrate content were 2.50±0.43, 2.61±0.43 and 2.61±0.41, respectively, with no significant difference between Minced meat samples with different treatment. For net energy were 195.91±11.66, 199.18±12.92 and 197.89±12.75, respectively, with significant difference between Minced meat samples with different treatment.

Higher result for protein and lower for fat content were reported by Mokhtar et al., (2018) who investigate chemical composition of beef Minced meat and found that value of protein is 20.56±9.49 and that of fat is 9.92±2.29. The obtained results don't meet the Egyptian standard specifications.

In conclusion, These findings show that this plant extract effectively improve some parameters of the chemical composition of these meat products and did not affect others.

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