Effect of using fennel seed extract on improving quality characteristics and extending shelf life of minced lamb

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Abstract

Minced lamb is one of the products commonly used in Iraqi dishes and is widely traded in the local markets. Fennel seeds have been widely used since ancient times in cooking, confectionery and traditional folk medicines in many cultures around the world. The current study aims to know the effect of adding fennel seed extract in different concentrations to minced lamb meat models and stored by refrigeration for a period of 10 days, the aqueous extract of fennel seeds was prepared, concentrations of 1,2,3% of fennel extract were used to study its effect on the chemical characteristics and sensory of minced lamb meat during cold storage. The results of the sensory evaluation of the studied models indicated no significant changes were observed regarding the overall organoleptic quality during the storage period Data available for sensory assessment of ground lamb helps consumers make healthy and satisfactory choices to maintain a healthy lifestyle . The T2 and T3 treatments recorded pH values between 5.92 - 5.72 and 5.94 - 5.75 respectively during the storage period for 10 days. As there were no significant differences in the pH of all the studied treatments. throughout the cold storage period, peroxide values increased significantly throughout the storage period and reached on the tenth day of T2 and T3 treatments (7.24 , 6.89) respectively. Also, the percentage of free fatty acids for control treatmeant.increased significantly between (0.49 - 2.85) during the storage period for 10 days, while recording a slight increase among all the studied treatments.

The extract of fennel seeds improves the organoleptic and chemical properties of minced lamb and prolongs the preservation period by cooling compared to control treatment.

Keywords: Minced meat, Fennel, Sensory properties, Chemical quality, Storage periods

Introduction

Minced and processed meat products are an important source of essential fatty acids, amino acids, and essential minerals, as well as good energy and many important nutrients in the human diet. and are widely consumed in the world in fast food in restaurants and commercial markets(1). However, minced meat is considered a perishable food with a short shelf life compared to whole meat, due to some physical and chemical features it possesses such as moisture content, acid number, rapid oxidation, handling and processing processes.(2). There is a significant increase in the consumption of ground and processed meat worldwide due to its consumer-friendliness due to its low cost and nutritional value. (3). the spread of the sheep meat products industry is extremely important in the consumer cultures of most countries of the world. Most of them have high demand and are highly regarded from a religious or heritage point of view in many countries and regions. (2). The morphological properties of the muscles in minced meat products are removed by crushing and mixing processes during the minced meat production stages, making it difficult to classify one style of muscle from the other. Thus, it is difficult to

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distinguish the source of meat varieties in minced meat due to a change in the texture, color, appearance or flavor of meat. For this purpose, replacing meat with meat of unknown origin and usually Less quality is one of the most widespread forms of economic corruption in minced meat production, leading to commercial fraud that can have economic and health effects on the consumer (4) ،Due to the high demand by consumers and the economic importance of minced meat products, the main goal of the food industry is to reduce chemical changes and control the growth of microbes in those products, thus extending the shelf life and general food safety. minced meat products. (1) Fennel or sweet seed (Foeniculum vulgare Mill.) is a medicinal and aromatic plant rich in antioxidants and antimicrobials that can be used in the field of food processing as preservatives. It is also an important source of vitamins, minerals, fatty acids and rich in bioactive compounds (phenolic acids, tocopherols, flavonoids, carotenoids (5, 6). Research has indicated that aromatic and medicinal. Fennel extracts can be used as potential antioxidants in minced meat products as natural additives and quality enhancers to ground meat products. (7). The current study aims to study the effect of using different levels of aqueous extract of fennel seeds on the sensory and chemical quality standards of minced lamb spread in the markets of the city of Amara.

Material and Methods

Preparation of samples:

This study was carried out in the college of Agricultural University of Misan /Iraq, in order to study the effect of aqueous extract of fennel on sensory and chemical properties of minced lamb meat. samples of minced lamb meat were randomly composed from markets in, Misan city, the samples were brought in a cooler box to the Lab; department of food science Misan University, college of agriculture for their analysis.

Preparation of Extracts

Briefly, 25 g of fennel seeds (Foeniculum vulgare Mill.) belonging to the Umbelliferae (Apiaceae) were weighed and soaked in boiling distilled water for 30 minutes with magnetic mixing, filtered by a funnel through the Watt Man filter paper No.1, then the filtrate concentrates with the rotary evaporator at a temperature of 40 ° C, then the filtrate is kept at a temperature of 25-30°C and is packed in opaque containers and kept in refrigeration until use. Concentrations of 1, 2, and 3% of aqueous extract were used in this study (8).

Studied traits:

Sensory properties of minced lamb meat

Preparation of the sensory evaluation form: 5 g was taken from each treatment and is formed in the form of small patties and cooked on a hot plate for 5 minutes, stirring until cooking is complete, then provided to

Evaluated by experienced and specialized assessors and graduate and primary students males and females for evalution of Color, flavor, overall acceptability and juiciness of the meat samples, after cooking, seven characteristic grades were given to panelists from 1. Dislike extremely to 7. like extremely. Panelists considered the above points (4).

pH value

(10 g) from minced lamb meat were homogenized with 50 ml of distillated water then filtered through filter paper whatman No.1.The pH of filtrate samples were measured using digital pH meter (D. Germany WTW 2f40-11420) (9).

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Free Fatty acids (FFA)

FFA were estimated by the way of (10). 3 g of minced meat was weighed and 50 ml of ethyl alcohol concentration of 98% was added to the sample then added 2-3 drops from phenolphthalein index and the sample was heated in a water bath until boiling The mixture was brushed with a 0.1N of sodium hydroxide solution until the mixture turned light pink The percentage of free fatty acids was estimated by the following equation:

Acid value =(V (ml)of NaoH × 5.61)/(sample (gm))

V is volume of NaOH solution used in mL

Free Fatty Acid % = Acid value ÷2

Peroxide value (POV)

According to (11) Peroxide value (PV) for all extracted fat from minced lamb meat samples were determined. And expressed as mliequivalant peroxide/kg fat. 1 g of minced meat was placed in test tubes and 1 g of potassium iodide and 20 ml of a mixture of glacial acetic acid and chloroform were added in a ratio of 1:2 and the tubes were closed with a tight lid and placed in a water bath at boiling temperature for 20-30 seconds and then emptied the contents of the tubes into a flask containing 30 ml of potassium iodide solution 5% The tubes were washed with 25 ml distilled water and the free iodine was equalized by wiping with sodium thiosulfate 0.002 standard Until the appearance of the pale yellow color and then added 1 ml of starch 1% and titrated until reaching the end of the point of drying with the disappearance of the blue color The sample (blank) was prepared by following the same steps without adding the sample .

Peroxide value calculated as in the equation:

Peroxide value (meq/kg meat) =(1000×N×(S-B))/(sample(gm))

S = Volume of sodium thiosulfate required for the sample (ml)

B = Volume of sodium thiosulfate required for Blanke (ml)

Statistical analysis

Standard error and Means among samples were calculated during storage periods for 10 days (12).

Results and Discussion

Figure (1) showed the sensory properties of minced lamb meat during the Storage period at 10 days. The sensory manifestations of minced meat are one of the important issues affecting consumer demand. Sensory analysis conducted by committee members is the most important way to clarify the differences between treatments as people see them.. Changes in sensory characteristic (Color, flavor, juiciness and overall acceptability) of the treatments were shown within 10 days of storage, during 10 days of storage, no significant changes were observed regarding the overall organoleptic quality in the case of various additives of fennel extract. Generally, a deterioration in sensory quality has been observed generally after 10 days of storage. The results were somewhat similar to what the researcher found in (13) during the study of the effect of using some plant extracts in the preparation of beef Patties , there are no significant differences between the sensory properties, especially color and overall acceptability, with an increase in the concentrations of the added plant extract and the length of the storage period for the studied samples.

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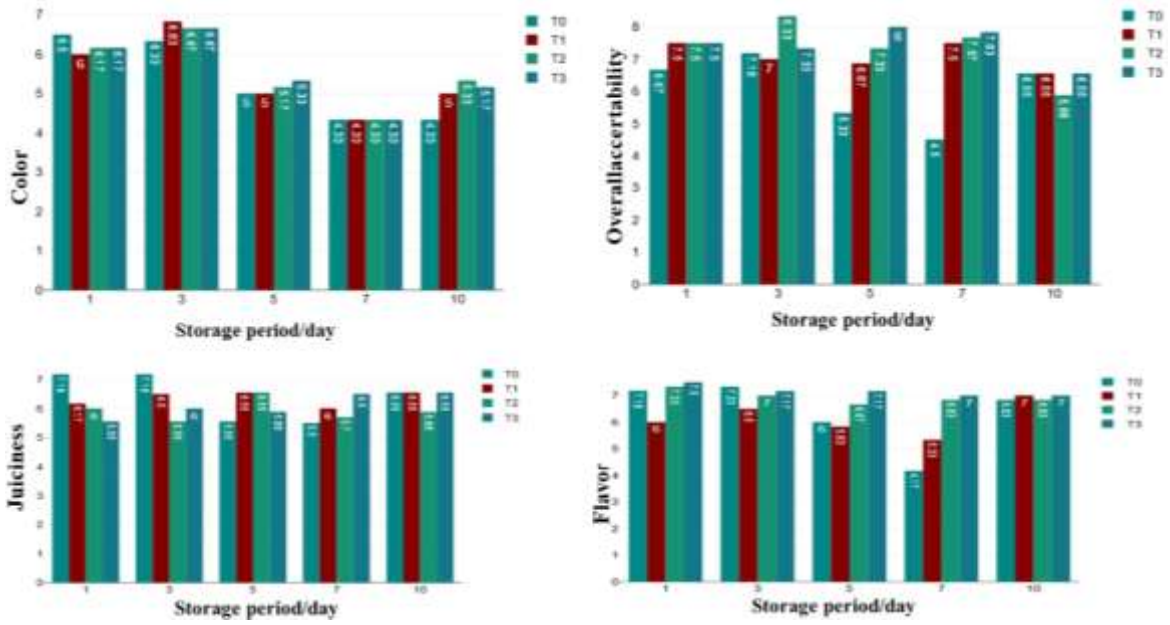

Figure (1) the sensory properties of minced lamb meat during the storage period 10 days

pH value

It can be seen from Table 1 that there are significant differences at p ≤0.01 when using different concentrations of fennel extract at pH values of minced lamb samples stored in refrigeration for 10 days, The T2 and T3 treatments recorded pH values between 5.92 - 5.72 and 5.94 - 5.75 respectively during the storage period for 10 days. No significant differences were recorded in pH for all treatments studied compared to the control model. , those results are consistent with data of (13) during the use of sumac extract in meat Patties stored by cooling and freezing. The reason for the rise is due to the release of ammonia due to the activity of microorganisms during storage (14 .(

Table 1. Effect of Different Concentrations of Fennel Extract on pH Values of Minced Lamb Samples Stored by Refrigeration for 10 Days

Storage period/ days		Treatment			
	Mean ± Std.	T0	T1	T2	T3
1		5.41 ± 0.02	5.63 ± 0.01	5.72 ± 0.02	5.75 ± 0.01
3		5.53 ± 0.01	5.72 ± 0.01	5.76 ± 0.02	5.81 ± 0.01
5		5.61 ± 0.01	5.75 ± 0.01	5.82 ± 0.01	5.84 ± 0.01
7		5.67 ± 0.01	5.79 ± 0.01	5.82 ± 0.06	5.82 ± 0.06
10		5.78 ± 0	5.83 ± 0.01	5.92 ± 0.01	5.94 ± 0.01

T0: control, T1: 1% Fennel Extract, T2: 2% Fennel Extract, T3: 3% Fennel Extract

Free Fatty acids (FFA(

Table 2 show the effect of different concentrations of fennel extract on percentage of free fatty acids of minced Lamb Samples Stored by Refrigeration for 10 Days, as a clear decrease at p ≤0.01 was observed in the values of free fatty acids in the treatment T0, while

the treatments T2 and T3, it recorded a slight increase ,as it recorded (1.63 , (1.22 respectively on the tenth day compared to the percentage of free fatty acids on the first day (0.33 , 0.27)respectively this is consistent With data of (15) in meat Patties treated with plant extracts and stored by cryologic.

Table 2 effect of different concentrations of fennel extract on percentage of free fatty acids of minced lamb samples stored by refrigeration for 10 days

Storage period/ days		Treatment			
	Mean ± Std.	T0	T1	T2	T3
1		0.49 ± 0.01	0.42 ± 0.02	0.33 ± 0.01	0.27 ± 0.01
3		1.35 ± 0.04	1.11 ± 0.01	0.67 ± 0.01	0.5 ± 0
5		1.68 ± 0	1.47 ± 0.01	1.01 ± 0.02	0.65 ± 0.01
7		2.08 ± 0.02	1.63 ± 0.02	1.3 ± 0.02	0.94 ± 0.02
10		2.85 ± 0.03	1.92 ± 0.05	1.63 ± 0.03	1.22 ± 0.02

T0: control, T1: 1% fennel extract, T2: 2% fennel extract, T3: 3% fennel extract

Peroxide value (POV(

table 3 show the effect of different concentrations of fennel extract on peroxide value of minced lamb samples stored by refrigeration for 10 days, there are significant increase in the values at $p \leq 0.01$ during storage periods is observed in all fennel extract transactions and the control treatment T0 , However, the increase was less in the T3 treatment compared to the other treatments and the control model, as it ranged between (4.36 - 6.89) during the storage period for 10 days by cryological, while the peroxide values of the control TRETMEANT between (5.34 - 8.77) were recorded in the same periods studied. The use of fennel extract led to a reduction in the peroxide value with an increase in the concentration of the added extract compared to the control treatment. The reason for the increase in the value of POV in the control treatment is due to primary oxidation and increasing the speed of peroxide formation, while slow primary oxidation and slow formation of peroxides in the treatments containing fennel extract because it contains inhibitory substances that are anti-peroxide formation and thus delay the oxidation process. (6). (16). these results agreed with what was recorded in (16) with low peroxidation values for samples of minced pork and treatment in alcoholic and aqueous extracts for nigella sativa during storage for 9 days.

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Table 3 Effect of concentrations of Fennel Extract on Peroxide value of Minced Lamb Samples Stored by Refrigeration for 10 Days

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Storage period days		Treatment			
	Mean ± Std.	T0	T1	T2	T3
1		5.34 ± 0.01	5.56 ± 0.01	4.87 ± 0.01	4.36 ± 0
3		7.09 ± 0.01	6.87 ± 0	5.78 ± 0.01	5.56 ± 0.02
5		7.7 ± 0.01	7.04 ± 0.29	5.88 ± 0.19	5.96 ± 0.01
7		8.04 ± 0.02	7.67 ± 0.01	6.83 ± 0.01	6.34 ± 0.01
10		8.77 ± 0.01	8.08 ± 0.01	7.24 ± 0.02	6.89 ± 0.01

T0: control, T1: 1% Fennel Extract, T2: 2% Fennel Extract, T3: 3% Fennel Extract

Conclusion

Fennel seed can be safely used in vivo in order to improve the organoleptic properties and desirable qualities of minced lamb during storage periods. In addition, it improves product quality and increases shelf life. It is also a potential natural source of antioxidant and antibacterial agents in dietary and therapeutic applications.

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