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THE EFFECT OF ADDING DIFFERENT LEVELS OF CINNAMON OIL AND THYME OIL AND THEIR MIXTURE ON SOME OF THE PHYSICAL, CHARACTERISTICS OF FROZEN MINCED CALF MEAT FOR DIFFERENT PERIODS

Suhair Kamel Laibi AL-Kinani
Directorate of Agriculture, Salah al-Din Governorate, Iraq

Adnan Shakor Ahmed Al-perkhdri
Livestock Department, College of Agriculture, University of Kirkuk
alreah@gmail.com

Abstract
This study was conducted in the Graduate Studies Laboratory that associated with animal production department, college of agriculture, University of Kirkuk 16 October 2021 until 24 November 2021. The study aim was to use medical plant oils in preserving minced beef to prolong the freezing period at a temperature of -18°C, as one-year-old calf was used, purchased from the local markets in Kirkuk city, directly after slaughter 18 kg of meat was taken from the thigh area after removing the outer fat. The meat was mixed, homogenized, and then divided into six treatments. The first treatment was considered a control treatment, as it was not treated with any additives, while cinnamon oil was added at a concentration of 0.25% and 0.05% to the second and the third treatment respectively. Thyme oil was added at a concentration of 0.25% and 0.05% to the fourth and fifth treatment respectively. Mix cinnamon and thyme at a concentration of 0.075% added to the treatment six. Each treatment has 3 replications, and all treatments were kept in refrigeration (4) °C for 72 hours and were frozen at a temperature of (-18) °C for periods of 1, 20, 40 days until, physical tests were performed The study reached the following results The addition of cinnamon oil and thyme oil and their mixture recorded the lowest percentage the drip loss and loss during thawing and the loss during cooking with an improvement in the ability of the meat to carry water when stored by freezing. Increasing the storage period led to a significant increase in the percentage of loss during thawing and loss during cooking, and a significant decrease in water carrying capacity.

Keyword: cinnamon oil, thyme oil, frozen minced calf meat

Introduction

Red meat and its components have an important role in the human diet, being an important source of nutrition (Leory and Cofnas, 2019). It contains important nutrients in the structure and growth of the body and provides it with the energy needed to contain animal protein necessary for the individual. It also works to activate the secretion of salivary glands and stomach secretions and support the organs that secrete enzymes and hormones, in addition to that it remains in the stomach for a long

time so that the person does not feel hungry (Shaltut,2010). Also, meat contributes significantly to preventing infection with many diseases, including anemia, and gives the body immunity against diseases, as it helps to increase the absorption of iron from meat protein and saturated fatty acids (Juarez et al., 2012). It is also a major source of the essential amino acids needed by the body, and a source of vitamins, especially B-complex vitamins and complex minerals, the most important of which is iron (Kalalon et al., 2004). High-efficiency preservation methods including the use of natural and artificial preservatives (Kristensen et al., 2014).

The chemical composition of meat and meat products makes them more susceptible to perishability and spoilage in storage due to chemical and bacterial deterioration, the two factors that affect meat quality (Raryts et al., 2012; Yolmen et al., 2014; Amaral et al., 2018). As a result of the increased surface area and air exposure of meat during mincing, processing and storage, meat is subjected to oxidation and accelerates the loss of internal muscle components (Nam and Ahn, 2003). As a result of contact of meat fat with oxygen, spontaneous oxidation occurs, causing the formation of undesirable flavors by consumers. Therefore, short-chain fatty acids, aldehydes, ketones and alcohols, are the end products of the auto-oxidation process and are responsible for the rancid flavor in fats (Olaoye and Onilnd, 2010).

The use of natural antioxidants is characterized by its ability to maintain the desired properties of the products and reduce the potential toxic effects from the use of industrial antioxidants (Ribeiro et al., 2019). Therefore, recent studies and research have focused on the use of natural additives, including herbs and essential oils, which are the best choice as food additives that maintain meat quality (Falowo et al., 2014), as they are of natural plant origin and are safe to use instead of chemical industrial additives, which It is a source of concern for most consumers of meat and meat products because of its negative effects on human health, as it is the main cause of carcinogenic diseases (Meyer et al., 2002). Therefore, this study aimed to show the effect of adding cinnamon oil and thyme oil and their mixture to minced veal and its effect on some physical characteristics.

Materials and Methods

This research was conducted in the Graduate Studies Laboratory of the College of Agriculture, Kirkuk University, Department of Animal Production. For the period from 10-16-2021 to 11-24-2021

Experiment Parameters

T1- control without any additives
T2- Cinnamon oil 0.025% or 0.25% ml/kg meat
T3- Cinnamon oil 0.05% or 0.5% ml/kg meat
T4- thyme oil 0.025% or 0.25% ml/kg meat
T5- thyme oil 0.05% or 0.5% ml/kg meat

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T6- A mixture of cinnamon oil and thyme oil at a concentration of 0.0375% cinnamon oil + 0.0375% thyme oil = 0.075 ml/kg meat.

Physical examination of the meat
measuring the percentage of loss during thawing

The percentage of loss during thawing of meat was measured based on the method of Nam et al., (2000), as 50 gm of frozen meat samples were taken from each treatment after recording the weight accurately and placing it in a transparent nylon bag. The bags were placed inside the refrigerator at a temperature of 4 ° C for 24 hours. Re-weigh the samples after drying them and removing liquids from the surface of the meat samples using filter papers. The percentage of loss during defrost was calculated according to the following equation:

$$\text{Loss during melting} = \frac{\text{Weight of frozen meat - weight of meat after thawing}}{\text{frozen meat weight}} \times 100$$

Loss Cooking Measurement

The percentage of loss during cooking was measured according to the method (Ahmet and Mustafa, 2018) by taking 50 g of meat after accurately recording the weight and placing it in a cooking bag (transparent nylon), closing it tightly, then placing the bags in the electric oven at 180 ° C for a period of time. 30 minutes after that, the bags were left with the meat inside to cool, then the samples were weighed after removing the liquid on the surface of the model with filter paper, and the percentage of loss was calculated as follows:

$$\text{Cooking loss} = \frac{\text{Weighting meat before cooking - Weighting meat after cooking}}{\text{Weight of meat after cooking}} \times 100$$

Water Holding Capacity

The method of Dolatowski and Stasiak (1998) was followed in measuring the water carrying capacity (WHC) by taking 50 g of meat for each treatment, mixed and mashed with 50 ml of distilled water for one minute using an electric mixer, then discarding the homogenized mixture in a centrifugal device at a speed (5000 rpm/min). for (10 minutes). The percentage of water carrying capacity was calculated as follows

$$\text{Water carrying capacity (\%)} = \frac{\text{Weight of water after centrifugation - weight of water added to meat}}{\text{model weight}} \times 100$$

Statistical Analysis:

The results were statistically analyzed using the complete random design (CRD) to study the effect of treatment and period on different traits, and the significant differences between the means were compared with Duncan's, 1955 polynomial test. According to the mathematical model:

Mathematical model:

$$Yijk= \mu + Ti+ Pj+TP (ij)+eijk$$

Results and Discussion:

Table (1) shows the effect of the interaction between different treatments and storage periods on the percentage of loss during thawing of minced veal and stored in freezing for periods (1, 20, 40) days. We note that there is a significant effect ($P<0.05$) for all treatments and for all periods, as there is a significant decrease ($P<0.05$) in the percentage of loss during dissolution, in treatment T6 (a mixture with a concentration of 0.075), which amounted to 8.05% in the first storage period of 1 day compared with The control treatment T1 (without any addition) recorded the highest percentage of loss during thawing amounted to 9.34% during the third period of storage of 40 days. There were also significant differences between treatments and for different storage periods. It is noted from the same table that treatment T6 (a mixture with a concentration of 0.075) It recorded a significant decrease ($P<0.05$)) in the percentage of loss during thawing on all treatments and in all storage periods (1,20,40) days, reaching 8.05, 8.10 and 8.12%, respectively. While the highest percentage of loss during dissolution for the control treatment T1 was 8.74, 8.86 and 9.34%. The reason for this is due to the effect of plant additives that have a role as antioxidants and have the ability to protect the cell wall from being destroyed by the oxidative process, which leads to an increase in the degree of stability and a reduction in the release of exudate fluid from inside the cell, and it agrees with the results of Al-Birkhadry, (2014). When using cinnamon extract in preserving minced beef and stock through freezing, a significant decrease in thaw loss was observed for the three storage periods of 1, 30 and 60 days compared to the control treatment.

With regard to the effect of the storage period on the percentage of loss during thawing, the results showed a significant effect ($P<0.05$)) for the storage period, as the percentage of loss was at its lowest level in the period of 1 day, which amounted to 8.35%, and then began to rise with the progress of the storage period until it reached its highest level in The third period of 40 days amounted to 8.60%. Also, the loss of water from meat does not affect the decrease in consumer desire, but also causes economic losses. Thaw loss increases when freezing is used due to the mechanical damage caused by ice crystals that causes muscle membranes to rupture and water to escape Lu et al., (2019). Or due to the decomposition of meat proteins by the decomposing enzymes, which are responsible for some subtle changes in the permeability of the cell membrane, and thus the decrease in the ability of meat to carry water, especially the water associated with protein, and its percentage increases (Muhammad and AL-Rubeii, 2018)

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Table (1) shows the effect of the interaction between different treatments and storage periods on the percentage of thawed veal lost and stored in freezing at -18° C (mean ± standarderror)

Transactions	Storage periods/days			Average Transactions
	1	20	40	
T1	8.74±0.04d	8.86±0.01b	9.34±0.03a	
T2	8.37±0.01h	8.40±0.05g	8.77±0.03c	8.98±0.27a
T3	8.34±0.01i	8.35±0.01i	8.49±0.01e	8.51±0.19b
T4	8.35±0.02i	8.38±0.02h	8.40±0.01g	8.39±0.07c
T5	8.28±0.01j	8.33±0.01i	8.47±0.01f	8.38±0.02c
T6	8.05±0.02m	8.10±0.01l	8.12±0.01k	8.36±0.08c
average periods	8.35±0.20b	8.40±0.23ab	8.60±0.39a	8.09±0.03d

Table (2) shows the effect of the interaction between different treatments and storage periods on the percentage of loss during cooking of minced veal and stored in freezing for periods (1, 20, 40) days. As we notice that there are significant differences (P<0.05)) in the effect of the interaction between the different treatments and the period of freezing storage in the percentage of waste during cooking, as this percentage decreased significantly (P<0.05)) in all the addition treatments. The treatment T6 (mixture with concentration 0.075) recorded the lowest percentage of loss. It reached 21.32% in the first storage period of 1 day compared with the control treatment T1 (without any addition), which recorded the highest percentage of loss during cooking and reached 25.19% in the third storage period of 40 days, and significant differences were recorded between treatments and for all different storage periods

The decrease in the percentage of loss during cooking is due to the low percentage of moisture due to the evaporation of the water on the surface of the meat and the decomposition of meat proteins through enzymes that work to break the bonds that bind protein with water and thus be subject to evaporation (Juarez et al., 2012). This agrees with Youssef (2014). As for the effect of the storage period on the percentage of loss during cooking, the results showed a significant effect (P<0.05)) for the storage period and it was at its lowest level in the first storage period of 1 day and then began to rise with the progress of the storage period until it reached the highest level In the third 40-day period, it amounted to 23.73%. This is consistent with what Al-Birkhadari (2014); Youssef (2014)

Table (2) The effect of the interaction between different treatments and storage periods on the percentage of loss during cooking % of minced veal and stored in freezing at a temperature of -18 ° C (mean ± standard error)

Transactions	Storage periods/days			Average Transactions
	1	20	40	
T1	24.22±0.02b	24.59±0.03b	25.19±0. 03a	24.66±0.42a
T2	23.73±0.03f	23.86±0.02e	24.04±0.02c	23.88±0.13bc
T3	23.51±0.03h	23.62±0.02g	23.86±0.02e	23.66±0.15d
T4	23.82±0.04e	23.91±0.01d	23.98±0.01d	23.90±0.07b
T5	23.66±0.01g	23.74±0.03f	23.85±0.01e	23.75±0.08cd
T6	21.32±0.02k	21.39±0.01j	21.45±0.01i	21.39±0.05e
average periods	23.38±0.97c	23.52±1.02	23.73±1.15a	

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Table (3) shows the effect of the interaction between different treatments and storage periods on the ability of meat to carry water for minced veal and stored in freezing for periods (1,20,40) days. We note that there are significant differences (P<0.05) in the effect of the interaction between the different treatments and the period of freezing storage on the ability of meat to carry water, as the T6 treatment (a mixture with a concentration of 0.075) recorded a significant increase (P<0.05) in the ability of meat to carry water, which amounted to 43.37. % in the first storage period of 1 day, compared to the control treatment T1 (without any addition), which recorded its lowest value of 36.21% in the third storage period of 40 days. There were also significant differences between treatments and different storage periods.

We note from Table (3) that treatment T6 recorded a significant increase (P<0.05) in the ability of meat to carry water in all treatments and in all storage periods (1, 20, 40) days, and it reached 43.37, 43.21 and 43.18%, respectively. Followed by treatment T3 (cinnamon at a concentration of 0.05), the meat's water-carrying capacity for all periods was 41.19, 41.13 and 41.10%, respectively, while the lowest value for water-carrying meat among the treatments was the control T1 (without any addition) treatment. It reached 36.62, 36.44 and 36.21%, respectively, for all the aforementioned storage periods. The reason for the increase in water carrying capacity is due to the ability of the active compounds present in cinnamon oil and thyme oil to protect meat proteins from oxidation and decomposition. As indicated by Saltanizzadeh et al., (2014) That the natural additives protect the protein from hydrolysis and improve the water-carrying capacity, and its percentage rises as the concentration of the natural additive increases. Al-Birkhadari, (2014); Al-Alwani, (2017).

Table (3) The effect of the interaction between different treatments and storage periods on meat ability to carry water % for minced veal and stored in freezing at -18° C (mean ± standard error)

Transactions	Storage periods/days			Average Transactions
	1	20	40	
T1	36.62±0.02n	36.44±0.020	36.21±0.02p	36.42±0.17e
T2	40.46±0.03j	40.26±0.03l	40.03±0.02m	40.25±0.18d
T3	41.19±0.01d	41.13±0.02e	41.10±0.01 f	41.14±0.04b
T4	40.60±0.02i	40.43±0.03j	40.37±0.01k	40.46±0.10c
T5	41.14±0.04e	41.02±41.02g	40.95±0.01h	41.03±0.08b
T6	43.37±0.03a	43.21±0.03b	43.18±0.01c	43.25±0.08a
average periods	40.56±2.06a	40.41 ±2.08b	2.14±0.01c	

Also, the storage period had a significant effect (P<0.05)) in the ability of meat to carry water, as its highest value was in the first storage period of 1 day and then begins to decrease with the progression of the storage period to That it reaches its lowest value in the third period of storage of 40 days, and the reason for this is due to the decomposition of meat proteins with the progression of the storage period and the decrease in its ability to carry water. These results are similar to Al-Salmani (2020)

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