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Effect of Packaging Poultry Carcass Pieces with Fortified Collagen Proteins on the Chemical Properties of Meat Frozen Stored for Different Storage Periods

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Abstract

This study was conducted in the Department of Animal Production / College of Agriculture / University of Basra for the period from 19/12/2021 to 10/5/2022, which aims to prepare collagen proteins fortified with lysozyme protein and cinnamon oil in the laboratory in the packaging of broiler carcasses (chest) by immersion method and study of chemical composition when freezing, collagen extraction according to Mohd *et el*.,(2012) . I took 60 pieces of chicken breast which were obtained from local markets in Basra and are fresh. As these segments were divided into four coefficients, each treatment has three replicates and each repeater consists of 5 segments of the chest, these segments were immersed in the prepared collagen proteins and according to the following treatments:

T0- Treatment of control coated polyethylene bags only

T1- Chest cutters coated with collagen only

T2 - Chest cutters coated with collagen fortified with cinnamon oil

T3- Chest cutters coated with collagen fortified with lysozyme enzyme

The treatments were stored by freezing at a temperature of -18 ° C at (0, 15, 30, 45) days and the composition of the meat (moisture, fat, protein , ash) was studied and the results showed a decrease in the percentage of moisture lost and the percentage of fat and high percentage of protein in the third and fourth treatment compared to the control treatment with the progress of storage periods.

Keywords :- Collagen, Cut-to-The-Chest, Cinnamon Oil

Introduction

The packaging process is an important part of the food processing processes for the

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purpose of containing and facilitating the transport and sale of food products comfortably and maintaining their qualitative characteristics, plastics represented 70 percent of the total packaging materials used in the packaging of food products and that most plastics are non-biodegradable and derived from non-renewable materials and that the durability characteristic of which is characterized by them made them useful, but their presence in the environment has become constantly and the difficulty of disposing of their waste, which is released annually and at a rate of Thousands of tons of major problems that threaten the environment due to pollution caused by it because it is not easily degraded, and some of these substances have a negative impact on human health (Ahmadreza *et al.*,2021)

Manyrecent trends have emerged in packaging systems, namely the use of active backing, which means a packaging system that has characteristics that go beyond the functions of retaining moisture, gases, solutes, etc., by introducing effective ingredients or materials into the packaging system and to maintain product quality and increase its shelf life (AL-Hilphy et al. ,2022) *et al.* 2019) Khalaf) . Collagen proteins, which are the product of poultry slaughterhouse waste, especially their legs, have received wide attention as they have been used as a component of functional food and are one of the recent trends in the field of manufacturing. Interest in collagen proteins has increased because of their health and environmental benefits and their availability in large quantities as waste, in addition to their non-toxicity, cheapness, high nutritional value and suitability in packaging and protecting the product from damage, that the importance of meat packaging includes improving the color of meat, extending the storage life, reducing moisture loss, improving sensory qualities, preventing loss of flavor, providing information such as production and expiry date, additives and product information (Aydın and omer ,2021 **)** . The study aimed to:

Effect of Packaging Broiler Carcasses Pieces Collagen Proteins Fortified with Lysozyme Protein and Cinnamon Oil on Chemical Properties at Different Storage Periods

Materials and working methods

This study was conducted in the Department of Animal Production / College of Agriculture / University of Basra for the period from 19/12/2021 to 10/5/2022, which aims to prepare collagen proteins fortified with lysozyme protein and cinnamon oil in the laboratory and use them in different concentrations in packaging broiler carcasses by immersion method and studying the chemical composition when freezing.

Collagen extraction from chicken legs

Extract gelatin according to the method of Mohd *et* al.,(201 2) from the chicken legs after washing the legs well with water, then the legs are cut by a sharp knife, then the skin is removed from the bone, then the legs are boiled with water for an hour at a temperature of 80 ° C to get rid of the fat, then the extract is filtered from the water, then it is treated with sodium hydroxide at a concentration of 0.2% for 60 A minute in the refrigerator, then filter and wash the rest well with water, then soak the extract with acetic acid at a

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concentration of 0.05% for 18 hours, the acidic solution is disposed of and washed with water and sodium hydroxide is added until the 11 = PH degree is fixed and placed in a water bath at a temperature of 90 ° C for 6 hours, then filtered and placed in Autoclave For an hour and when cooled, the fat layer is removed and then dried in the regular oven at a temperature of 55 ° C.

Birds used in the experiment: - I took 60 pieces of breast from broilers, which were obtained from local markets in Basra and are fresh. As these segments were divided into four with amilliliters for each treatment three repeaters and each repeater consists of 5 pieces of the chest, these segments were dipped in collagen proteins fortified with cinnamon oil and lysozyme protein according to the following parameters: - Control treatment coated with polyethylene bags only

T1- Chest cutters coated with collagen only

T2 - Chest cutters coated with collagen fortified with cinnamon oil

T3- Chest cutters coated with collagen fortified with lysozyme enzyme

The freeze treatments were stored at a temperature of -18 °C at (0, 15, 30, 45) days and the composition of the meat (moisture, fat, protein, ash) was studied.

Chemical composition

1. Humidity

Percentage humidity was estimated according to the method mentioned in AOAC(2005)

2-Fat

Fat percentage was calculated according to the method mentioned in (2005) AOAC

3- Protein

Semi-Micro Kjeldahl method was adopted *in the determination of the protein content of samples according to AOAC* (2005)

Ash: - Adopted the mentioned method AOAC(2005)

Statistical analysis

The statistical analysis of the results was performed using CRD Randomized Design Complete within the SPSS program and comparing the results with the test of the least significant difference L.S.D at a significant level ($p \leq 0.05$)) according to (Al-Rawi and Khalaf Allah, 2000).

Results and discussion

1. Humidity

The results of Table (1) indicate the effect of wrapping the breast of chicken carcasses with fortified collagen proteins and its effect on the moisture stored in freezing for different storage periods, where the results showed at a storage period of zero that the subsidized treatment T3, T2, T1 significantly exceeded $P \leq 0.05$ on the control treatment T0, as their values reached (72.63 7 3.73, 7 3 25. respectively, while the value of the 7 transaction was T0 1.67) and there were no significant differences between all supported transactions . The table shows that the supported transactions at a storage period of 15, 30 and 45 days significantly outweigh $P \leq 0.05$ on the control transaction . Theuse of collagen in the encapsulation of the chest segments

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reduced the percentage of moisture loss and gave a more tender product due to the structure of the protein substance contained in it, as well as having a great ability to react and form clots. (Greusot *et al.*, 2011) and Weber (2000) have shown Malak (2014) states that the ability of these reinforced casings to retain moisture reduces the percentage of DHNthat replaces lost moisture, which is consistent with what he stated (Holownia *et al.*, 2000). With a higher percentage of moisture in meat products. Pelaes et al.,(2016) and Song et al.,(2011) stated that the decrease in moisture loss is due to the formation of a protective layer on the surface of the food in the initial stage and this layer will prevent the exchangeof moisture and fat. Holownia *et al.*, (2000) to Using casings reduces the absorption of the DH and N and retains a higher percentage of moisture in the products of the DAJ

Table 1: Effect of Packaging Poultry Carcass Pieces with Fortified Collagen Proteins on the Moisture Content of Meat Stored by Freezing for Different Storage Periods ± Experimental Error

Storage Periods/Day				**Treasury Duratio**
45	**30**	**15**	**Zero**	Transactions
70.14b ± 0.51	70.90b ± 0.19	71.08b ± 0.45	71.67b± 0.23	**T0**
71.99a± 0.49	72.28a± 0.39	72.99[a] ± 0.43	72.63a ± 0.62	**T1**
72.05a± 0.25	72.60a ± 0.12	73.31a± 0.42	73.25 a± 0.60	**T2**
72.06a± 0.56	72.75a ± 0.36	73.49a± 0.27	73.73a± 1.68	**T3**
*	*	**	*	**level Moral**

T0. - Control treatment coated with polyethylene bags only

T1- Chest cutters coated with collagen only

T2 - Chest cutters coated with collagen fortified with cinnamon oil

T3- Chest cutters coated with collagen fortified with lysozyme enzyme

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2: Fat

The results of Table (2) The effect of packaging the cut-breasted chicken carcasses with fortified collagen proteins and its effect on the fat percentage of meat stored in freezing for different storage periods, where the results at zero storage period showed that there were no significant differences between the treatments. As for the storage period of 15 days, the two treatments, T2 and T0 significantly outperformed $P \leq 0.05$ on the two treatments. T3 and T1 with a value of (0.22, 0.27) respectively, while the transactions T2 and T0 reached their value (0.34, 0.32) respectively. As for the storage period of 30 days, the transaction T0 significantly outperformed $P \leq 0.05$ on the transactions T3, T2, T1, as their values reached 0.20, 0.27 , 0.23) respectively, while the value of T0 ((0.31 . As for the storage period of 45 days, the two coefficients T2 and T0 significantly outperformed $P \leq 0.05$ on the coefficients T3 and T1 as their values reached (0.24, 0.44, 0.27, 0.36) respectively. The reason for this may be due to the fact that edible wrappers are colloidal substances that forma coating on the food, which increases the percentage of moisture and prevents the decrease in the amount of fluid lost, which reduces the percentage of fat in foods (Indrani et al., 2014) and (Marıa *et al.*, 2012). There is a differencebetween moisture loss and blood absorption and positive fitness because moisture loss causes voids that lead to oil replacing it with Saguy & Pinthus (1995) and Kim et al. .,2011) .

It was noted from the results obtained that the gelatin was clearly effective in reducing the percentage of DN in chicken breast slices compared to the control treatment and that the low permeability of the shells to water vapor due to the formation of covalent bonds in the protein shells, which gives the shell high effectiveness by reducing the percentage of food (Rayner *et al.).* 2000) and a n The efficiency of protein shells is due to their ability to form a strong and compact network when subjected to freezing and prevent their vulnerability to external factors, which increases their ability toretain water (Asmita *et al.,* 2013) and Youn

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Table 2: Effect of Packaging Poultry Carcass Pieces with Fortified Collagen Proteins on Fat Percentage of Meat Frozen Stored for Different Storage Periods ± Experimental Error

Storage Periods/Day				Treasury Durations / Transactions
45	**30**	**15**	**Zero**	
0.36[a] ± 0.02	0.31[a] ± 0..02	0.32[a] ± 0.02	0.26 ± 0.02	**T0**
0.27[b] ± 0.03	0.23[b] ± 0.01	0.27[b] ± 0.02	0.22± 0.05	**T1**
0.44[a] ± 0.06	0.27[b] ± 0.03	0.34[a] ± 0.03	0.18 ± 0.04	**T2**
0.24[b] ± 0.04	0.20[b] ± 0.00	0.22[b] ± 0.03	0.17 ± 0.06	**T3**
**	**	*	N.S	**Level Moral**

T0 - Control treatment coated with polyethylene bags only

T1- Chest cutters coated with collagen only

T2 - Chest cutters coated with collagen fortified with cinnamon oil

T3- Chest cutters coated with collagen fortified with lysozyme enzyme

3- Protein

Table (3) shows the effect of packaging the breast cutter of chicken carcasses with fortified collagen proteins and its effect on the protein stored in freezing for different storage periods, where the results at zero storage period showed that there were no significant differences between the treatments. While the storage period is 15 days, the two treatments T3 and T2 showed a significant superiority $P \leq 0.05$ over the two treatments T1 and T0 as their values reached (27.30, 26.15 and 25.24 and 24.43 respectively. As for the storage period of 30 days, the two transactions T3 and T2 showed a significant superiority $P \leq 0.05$ over the transaction T1, which in turn significantly outperformed $P \leq 0.05$ on the transactionT0 The value of the transactions T 3, T 2, T 1 T0 , is 26.47) (25.87, 25.32) 26.84) respectively. As for

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the storage period of 45 days, the transaction (27.64) T3 significantly outperformed P ≤ 0.05 on the two transactions T2 and T1 (26.62, 26.14) respectively, as the two treatments significantly outperformed P ≤ 0.05 over T0, as its values (,(24.89). The reason may be due to the superiority of T3 and T2 in the ratio of protein at storage period 15, 30 and 45 to the occurrence of muscle protein degradation due to enzyme activity at the T1 and T0 treatments, while the two treatments fortified with lysozyme protein and cinnamon oil maintained their protein content (Forouzan *et al.*,(2022)

Table 3: Effect of Packaging Poultry Carcass Pieces with Fortified Collagen Proteins on Fat Percentage of Meat Frozen Stored for Different Storage Periods ± Experimental Error

Storage Periods/Day				**Treasury Durations / Transactions**
45	**30**	**15**	**Zero**	
24.89 ^{c} ±0.51	25.32 ^{c} ±0.10	24.43^{b}±0.71	23.47 ± 0.38	**T0**
26.14 ^{b} ±0.52	25.87^{b}±0.33	25.24^{b}±0.69	23.21 ± 0.52	**T1**
26.62 ^{b} ±0.25	26.47^{a}±0.11	26.15^{a}±0.38	23.30 ± 0.60	**T2**
27.64^{a}±0.64	26.84^{a}±0.14	27.30^{a}±0.12	22.85 ± 1.62	**T3**
**	**	**	N.S	**level Moral**

T1 -Chest cutters coated with collagen only

T2 - Chest cutters coated with collagen fortified with cinnamon oil

T3- Chest cutters coated with collagen fortified with lysozyme enzyme

4- Ash

Table (4) shows the effect of coating the breast-cutting of chicken carcasses with fortified collagen proteins and its effect on the percentage of ash stored in freezing for different storage periods, where the results showed at a zero storage period, the treatment T0 outperformed a significant superiority P ≤ 0.05 on the coefficients T3, T2, T1, as their values reached (1.16, 1.00, 0.88) respectively, while the value of

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T0 (1.84) . As for the storage period of 15 days only, the transaction T0 showed a significant superiority $P \leq 0.05$ over the transactions T3, T2 and T1, as their values reached (0.98, 1.18, 1.48) respectively, while the value of T0 was 1.90). As for the storage period of 30 days, no significant differences were shown between the transactions. While the storage period is 45 days, the two transactions T1 and T0 significantly outperformed $P \leq 0.05$ on the two transactions T3 and T2 as their values reached (1. 63 , 1. 69 ,) and (1. 12 , 1. 15) respectively. The decrease in the percentage of ash in the T2 and T3 treatments may be due to the high percentage ofprotin in them, there is an inverse relationship between protein and ash (Forouzan *et al.*,(2022)

Table 4: Effect of Packaging Poultry Carcass Pieces with Fortified Collagen Proteins on Fat Percentage of Meat Frozen Stored for Different Storage Periods ± Experimental Error

Storage Periods/Day				**Treasury Durations / Transactions**
45	**30**	**15**	**Zero**	
1.69[a] ± 0.08	1.46 ± 0.29	1.90[a] ± 0.41	1.48[a] ± 0.18	**T0**
1.63[a] ± 0.06	1.31 ± 0.13	1.48[b] ± 0.42	0.88[b] ± 0.17	**T1**
1.15[b] ± 0.00	1.15 ± 0.03	1.18[b] ± 0.02	1.00[b] ± 0.03	**T2**
1.12[b] ± 0.09	1.19 ± 0.21	0.98[b] ± 0.14	1.16[b] ± 0.008	**T3**
**	N.S	*	**	**level Moral**

. - Control treatment coated with polyethylene bags only

T0- Control treatment coated with polyethylene bags only

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T1- Chest cutters coated with collagen only

T2 - Chest cutters coated with collagen fortified with cinnamon oil

T3- Chest cutters coated with collagen fortified with lysozyme enzyme

Conclusions . The results showed that the use of collagen encapsulated with cinnamon oil and lysozyme protein improved the Chemical Composition proerties of frozen frozen breast segmented meat and prolonged its storage life**.**

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