Basrah Journal of Veterinary Research 2025; 24(4):96-112.

BASJVETRES

Print ISSN: 1813-8497
Online ISSN: 2410-8456
https://bjvr.uobasrah.edu.iq/

Effect of Carnosic Acid as a Preservative on Amino Acids and Physical Properties of Broiler Meat during Different Storage Periods

Article Info.

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Article History

Received: 8 September 2025
Accepted: 30 October 2025
e Published: 31 December 2025

Article type: **Research Article**

https://doi.org/10.23975/bjvr.2025.165212.1246

Abstract

Poultry meat is recognized as one of the primary global sources of animal protein, which explains the growing consumer demand for it due to its biological composition. Fresh poultry meat is highly perishable and must be consumed quickly. Lipid oxidation is among the major factors influencing its quality and storage stability. Because of the potential toxicity of synthetic antioxidants, attention has shifted toward natural alternatives. Carnosic acid, a phenolic compound found in rosemary (Rosmarinus officinalis) and sage (Salvia officinalis), samples of broiler breast and thigh meat were obtained from a poultry farm in. The samples were placed in sterile polyethylene bags, transported under chilled conditions, to the Public Health Laboratory, College of Veterinary Medicine, University of Basrah, within one hour. Upon arrival, the meat was rinsed with clean water, cut into uniform pieces, and treated with three concentrations of carnosic acid (0.05 - 0.10 - 0.15). The treated meat was mixed manually to ensure even coverage, then repacked in polyethylene bags and stored in a refrigerator at 4 °C for 3, 7, and 14 days. During storage, physical quality parameters (pH, drip loss, cooking loss) and essential amino acid content were measured. The application of carnosic acid lowered pH, enhanced meat tenderness, and extended its shelf life. It also reduced drip andimproved cooking losses while preserving the stability of essential amino acids, thereby improving the quality of poultry meat.

Keywords: Broiler chicken, breast, thigh, essential amino acid, Carnosic acid, meat quality.

Publisher: University of Basrah,
College of Veterinary Medicine, Basrah, Iraq

Introduction

Poultry meat, a popular source of protein, provides various health advantages thanks to its high-quality protein, essential amino acids, and abundant vitamins and minerals. Its nutritional composition promotes muscle health, owing to its greater quantity of unsaturated fatty acids. Its meat is very digestible, and due to its balanced amino acid composition, it serves as a significant protein source for every age group (1). Broiler meat is considered one of the most important and economical sources of animal protein (2), being less expensive compared to red meat such as beef. Its rich nutritional composition, which includes protein of superior quality along with vital amino acids, and its relatively low fat content, make it a valuable component of healthy diets (3). As a result, its production and consumption have been increasing worldwide, because of the low production costs and high nutritional value. Since poultry meat belongs to the group of highly perishable foods, extending its shelf life has become one of the major challenges for the food industry (4). Modern approaches to address this issue focus on the use of natural preservatives, which help protect spoilage and pathogenic microorganisms. Given that a large portion of the population relies on poultry meat as a primary protein source, maintaining and improving its quality and safety is crucial. Although synthetic antioxidants are effective in preventing oxidation of fat, maintaining flavor and texture, and prolonging shelf life, concerns regarding their potential toxicological effects and environmental persistence have encouraged the search for natural alternatives (5). Recent studies have demonstrated the effectiveness of natural antioxidants, such as carnosic acid, in this regard (6). Carnosic acid possesses strong antioxidant and antimicrobial properties and is increasingly used in food, nutritional health, and cosmetic industries. Approximately 90% of the antioxidant properties of rosemary extract are attributed to this compound, making it one of the most potent natural antioxidants in rosemary. It is also considered safe and non-toxic (7). Therefore, carnosic acid acts as an effective antioxidant in meat, helping protect polyunsaturated fatty acids (PUFAS) from oxidation and supporting meat stability during storage. It also contributes to improving the amino acid composition of meat, enhancing the proportion of essential amino acids such as methionine and lysine, thus supporting the overall nutritional value of meat (8). Therefore, this study aimed to prove the role of carnosic acid as a natural preservative that contributes to the preservation of white meat especially broiler chicken and especially in extending its shelf life while protects it from contamination and oxidation.

Materials and Methods

Sample Collection and Storage Conditions

Broiler chickens were obtained from a farm in basrah governorate and slaughtered according to the Islamic method at the farm's abattoir Immediately after slaughter, samples of breast and thigh meat were collected after removing the external skin under aseptic conditions and placed in sterile, tightly sealed polyethylene bags to minimize microbial contamination during transport the total weight of the samples used was 2 kg for each of breast and thigh meat the samples were

immediately transported in cooled containers at 2–4°C to the Public Health Laboratory – College of Veterinary Medicine – University of Basrah within one hour of slaughter, then cut into small homogeneous pieces to prepare them for treatment.

The samples were treated with carnosic acid imported from Huamo Biotechnology Co., Ltd – Yongzhou China, with a purity of 98% and a validity until 2028. The acid was added to the samples at the following concentrations per kilogram of meat 0.05 gm/kg (50 ppm), 0.10 gm/kg (100 ppm), and 0.15 gm/kg (150 ppm), in addition to a control group without treatment, and evenly distributed over the surface of the samples to ensure complete coverage after treatment, the samples were stored in tightly sealed bags in a refrigerator at 4°C and monitored during storage periods of 3, 7, and 14 days Subsequently, the samples were subjected to analyses of physical properties, including pH, drip loss, and cooking loss, as well as amino acid profiling physical properties

pH measurement

To measure the pH, 10 g of chicken breast and thigh meat were homogenized with 50 mL of distilled water for one minute. Before analysis, the pH meter (S220, Mettler-Toledo, Columbus, OH, USA) was standardized using pH 4.0 and 7.0 buffer solutions. For each sample, two measurements were taken and recorded. (9).

Drip loss

Following the method described by (10), the drip loss percentage was estimated using 5g of meat placed in polyethene bags and refrigerated at 4 °C for 24 hours. It was then re-weighed after drying and removing the water collected on the surface of the sample using filter paper. The percentage of liquid loss was calculated according to the following equation

$$\text{Percentage of drip loss fluid (\%)} = \frac{\text{initial weight of meat} - \text{final weight of meat}}{\text{initial weight of meat}} \times 100$$

Cooking loss

The cooking loss was determined using the method of Rasmussen and Mast (11). Each chicken breast sample was individually weighed before cooking. Then, 5-gram samples were placed in heat-resistant fabric bags and cooked in a water bath at 80°C. After cooling, the samples were blotted dry without squeezing and reweighed. The percentage of cooking loss was calculated using the equation:

$$\text{Cooking loss (\%)} = \frac{\text{weight before cooking} - \text{weight after cooking}}{\text{weight before cooking}} \times 100$$

Essential amino acid

The analyses were conducted at the Ministry of Science and Technology laboratories utilizing HPLC. The digestion and extraction process was carried out as follows: precisely 0.1 g of the sample was weighed, and 12 mL of 6 M HCl was added. The mixture was then placed in an oven at 110 °C for 24 hours to complete hydrolysis. Afterwards, the hydrolyzed solution was passed through a 0.8 µm filter paper and rinsed twice with distilled water. The resulting filtrate was concentrated using a rotary evaporator at 50 °C. Next, 10 mL of distilled water was added, and the solution was again evaporated to dryness. The remaining residue was dissolved in 3.5 mL of 0.02 M HCl, and the pH was adjusted using an appropriate base. The final sample was derivatized with OPA reagent and analyzed with an amino acid analyzer to determine its amino acid composition (12**).**

Statistical Analysis

Statistical analysis was conducted using SPSS software (version 2019) to assess the influence of treatment groups and storage times on the measured variables. A two-way ANOVA was applied, followed by mean separation using the least significant difference (LSD) test to identify significant differences among the groups (13).

Result

Figure (1-2-3) shows the table you the results of physical tests on broiler chicken breast after the addition of various concentrations of carnosic acid (0.15 - 0.10 - 0.05) compared to the control sample, with a storage duration of (3-7-14) days at a temperature of 4°c. These measurements relate to drip loss, cooking loss, and pH. The data does not show significant differences in pH value, due to the similarity of the pH concentration among them compared to the control sample. Where a decrease in pH level contributes to improving meat tenderness and shelf life. We observe in the same Figure (1-2-3) (drip loss) was lower in the treatments with carnosic acid (0.15- 0.10) compared to the control the high drip loss was observed at the control for (cooking loss) the highest loss was seen in the control sample and 0.05concentration compared to the various carnosic acid treatments the lowest cooking loss was in 0.10 - 0.15gm/kg results indicate that 0.10 and 0.15 carnosic acid concentrations enhanced water retention capacity reduced both drip and cooking loss the 0.10 concentration may represent an optimal balance between efficacy and cost.

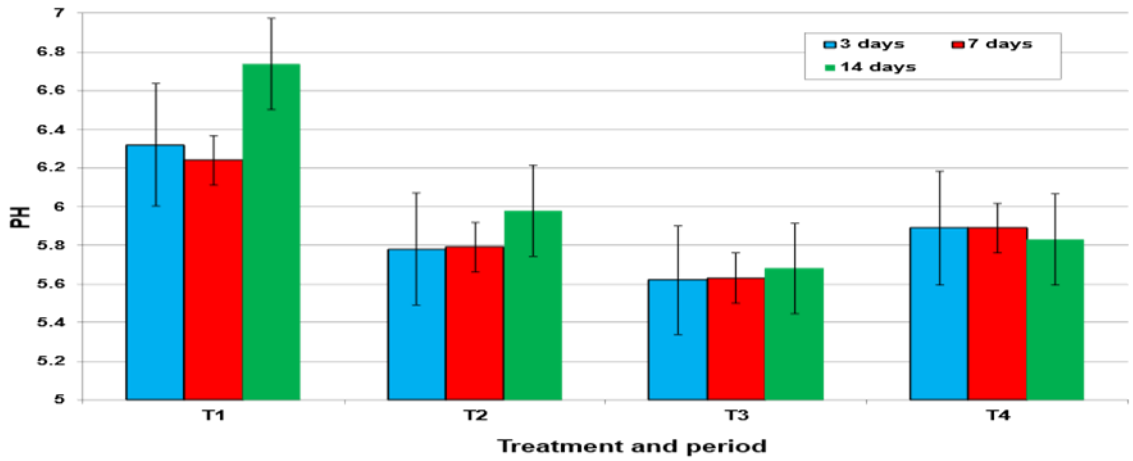

Figure 1: Effect of treatment and time in PH/Breast chicken

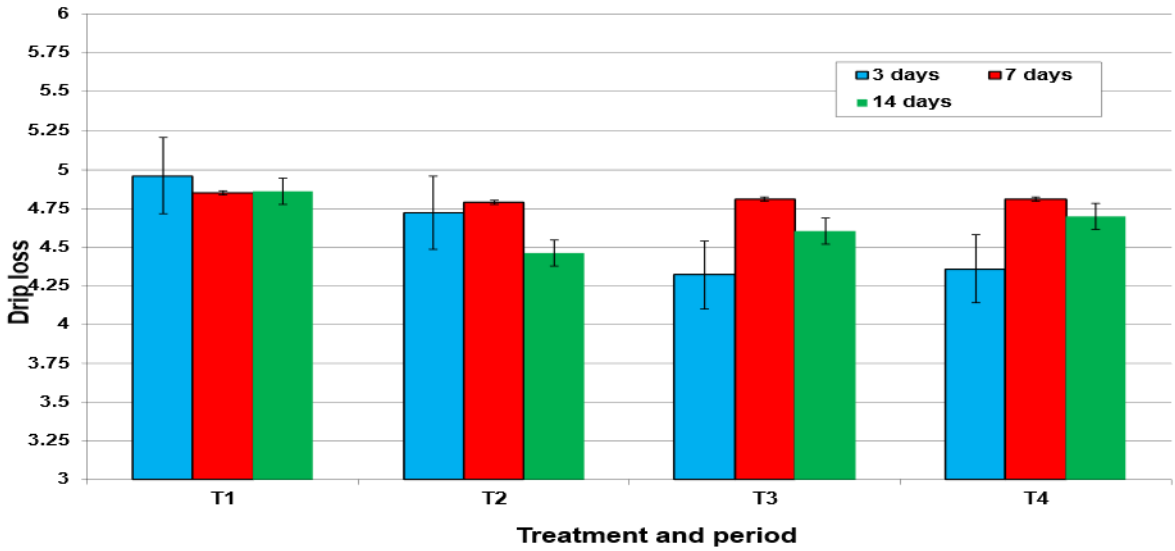

Figure 2: Effect of treatment and time in Drip loss/ Breast chicken

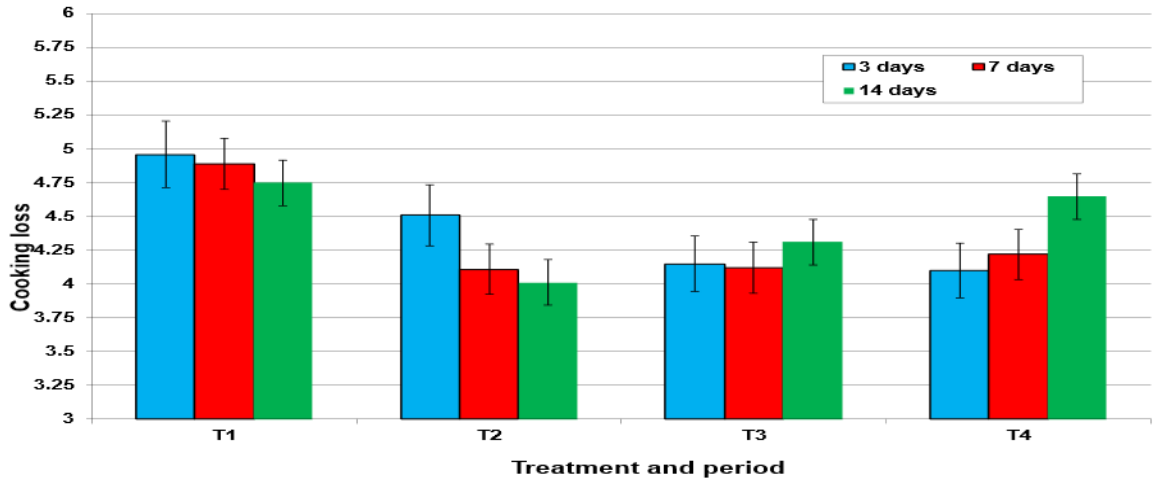

Figure 3: Effect of treatment and time in Cooking loss/ Breast chicken

Figure caption (1-2-3) The effect of adding different concentrations of carnosic acid on the physical test of the breast of broiler chicken

Figure (4-5-6) shows the table you the results of physical tests on broiler chicken thigh after the addition of various concentrations of carnosic acid (0.15 - 0.10 - 0.05gm/kg) compared to the control sample, with a storage duration of (3-7-14) days at a temperature of 4°C. These measurements relate to drip loss, cooking loss, and pH. The data does pH was stable in the various carnosic acid treatments (0.15- 0.10 and 0.05) compared to the control, where a decrease in pH level contributes to improving meat tenderness and shelf life also. we observe in the same Figure(4-5-6) (drip loss) In the thigh, drip loss was lower in the 0.10 concentration compared to the control the highest drip loss was seen at 0.05 and control, In the thigh, cooking loss was also lower in the carnosic acid treatments, particularly at in 0.10 - 0.15gm/kg compared to the control the highest loss was seen in the control sample and 0.05

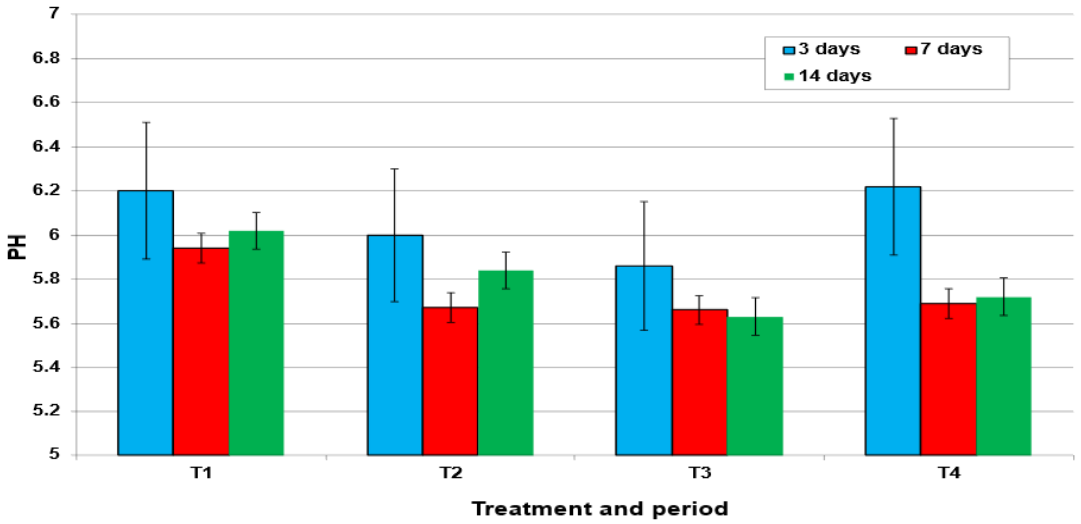

Figure 4: Effect of treatment and time in PH/Thigh chicken

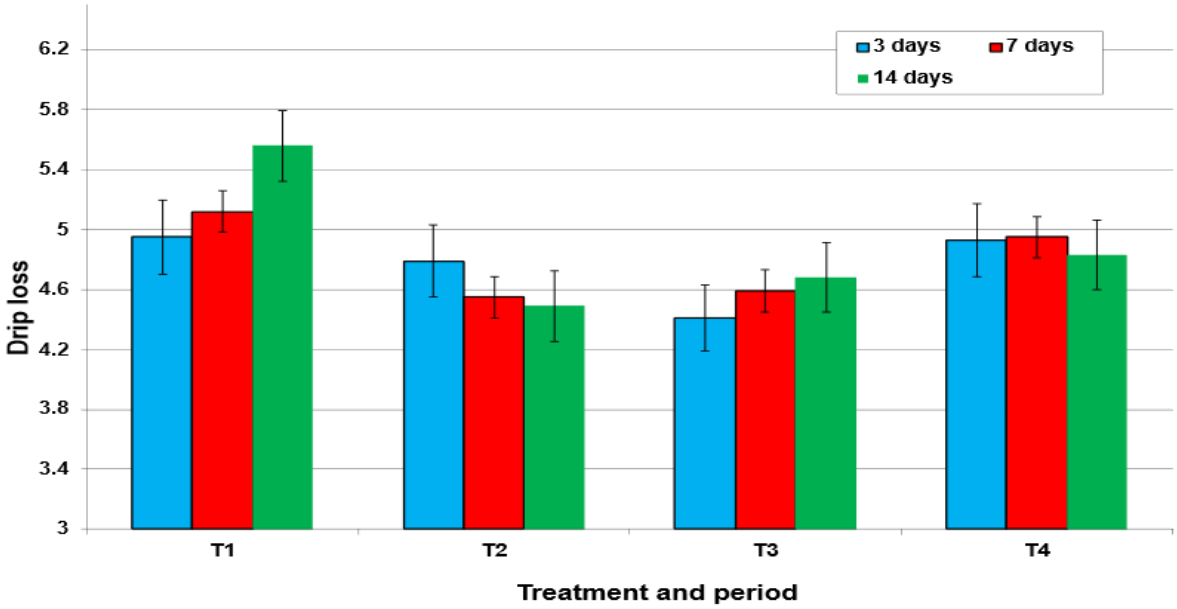

Figure 5: Effect of treatment and time in Drip loss/ Thigh chicken

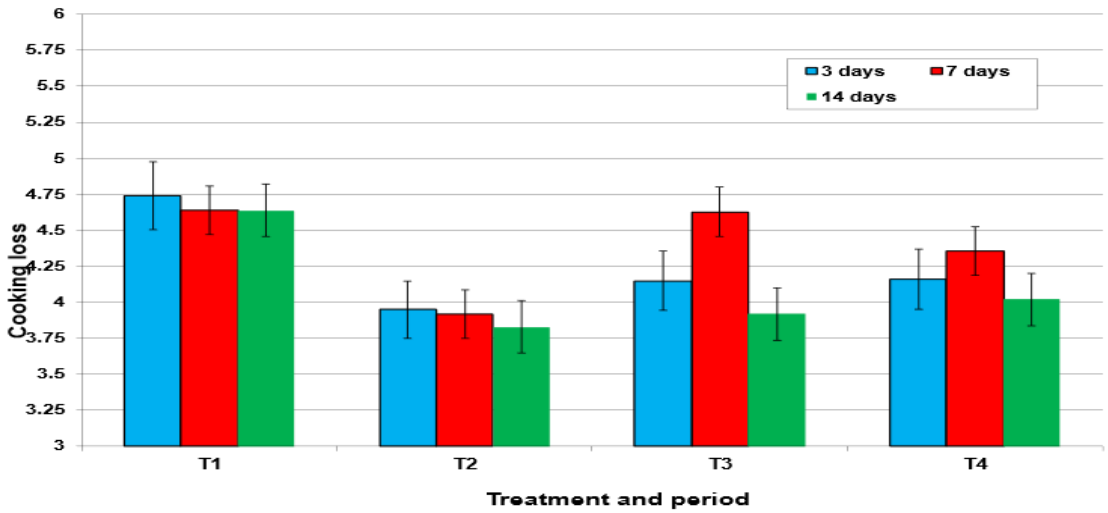

Figure 6: Effect of treatment and time in Cooking loss/ Thigh chicken

Figure caption (4-5-6) effect of adding different concentrations of carnosic acid on the physical test of the thigh of broiler chicken

Table (1) shows the effect of different concentrations of carnosic acid on amino acids in broiler breast meat for storage periods and at a temperature of 4°C. We note that some acids increased in value at certain concentrations (0.15 - 0.10compared to the control treatment, while others decreased (such as aspartic acid). This indicates that carnosic acid is effective in reducing protein degradation. Glutamic acid peaked at 0.15 and then 0.10, indicating that carnosic acid may help preserve flavour-enhancing amino acids. Serine and histidine also increased significantly in the treated groups, especially at concentrations of 0.10 and 0.15, compared to the control treatment. Methionine and isoleucine also showed higher concentrations in the carnosic acid treatments, especially at concentrations of 0.10 - 0.15 indicating anti-inflammatory protection. Oxidative protection against degradation Tyrosine and phenylalanine had slightly elevated levels in the treated samples, supporting moderate protection by carnosic acid, although less pronounced than other amino acids. Lysine, despite some fluctuations, was better preserved at 0.10 compared to the control treatment, suggesting reduced or lost oxidative stress during storage. Leucine: Significantly higher with the 0.05 treatment, indicating antioxidant stability at higher concentrations. Glycine: The highest level was at 0.10 while the control level was the lowest, indicating that carnosic acid reduces the degradation of structural amino acids.

This indicates that carnosic acid is effective in reducing protein degradation andmay help preserve flavor-enhancing amino acids.

Table (1) The effect of adding different concentrations of carnosic acid on the amino acid test of the breast (Mean ± S.E.).

Amino acid Test	Time / Treatment	3day	7day	14day
Histidine	Control	5.13 ±0.01 C a	4.68 ±0.05 B b	2.80 ±0.01 D c
	0.05	5.31 ±0.01 B a	5.03 ±0.01 A b	3.24 ±0.02 A c
	0.10	5.13 ±0.01 C a	4.41 ±0.01 C b	3.11 ±0.01 B c
	0.15	5.73 ±0.01 A a	4.64 ±0.02 B b	2.89 ±0.01 C c
	L. S. D.	0.041 *	0.096 *	0.047 *
Therionine	Control	9.04 ±0.02 D a	8.02 ±0.01 B b	6.36 ±0.01 C c
	0.05	9.15 ±0.02 C a	8.04 ±0.01 B b	7.61 ±0.01 A c
	0.10	9.70 ±0.04 B a	8.54 ±0.02 A b	7.21 ±0.01 B c
	0.15	9.94 ±0.03 A a	8.53 ±0.01 A b	6.38 ±0.02 C c
	L. S. D.	0.094 *	0.042 *	0.051 *
Arginine	Control	7.11 ±0.02 C a	7.06 ±0.03 C a	6.02 ±0.01 C b
	0.05	8.05 ±0.02 AB b	8.49 ±0.02 A a	6.61 ±0.02 B c
	0.10	7.72 ±0.31 B a	7.02 ±0.01 C b	6.92 ±0.01 A b
	0.15	8.32 ±0.02 A a	7.33 ±0.02 B b	5.12 ±0.01 D c
	L. S. D.	0.516 *	0.068 *	0.050 *
Valine	Control	1.03 ±0.01 C b	1.02 ±0.01 B b	1.25 ±0.02 B a
	0.05	1.06 ±0.01 C b	1.04 ±0.02 B b	1.47 ±0.02 A a
	0.10	1.39 ±0.04 B b	1.82 ±0.02 A a	1.13 ±0.01 C c
	0.15	1.97 ±0.01 A a	1.04 ±0.02 B c	1.23 ±0.01 B b
	L. S. D.	0.072 *	0.059 *	0.044 *
Methionine	Control	3.99 ±0.01 B a	4.02 ±0.01 C a	3.03 ±0.01 C b
	0.05	4.26 ±0.14 A a	4.37 ±0.01 B a	3.36 ±0.03 B b
	0.10	4.25 ±0.02 A a	4.04 ±0.01 C b	3.94 ±0.02 A c
	0.15	4.03 ±0.01 AB b	4.73 ±0.01 A a	3.06 ±0.01 C c
	L. S. D.	0.239 *	0.029 *	0.063 *

Phenylanine	Control	1.08 ±0.01 B a	1.02 ±0.01 C b	1.04±0.01 B b
	0.05	1.75 ±0.01 A a	1.07 ±0.01 C c	1.55 ±0.02 A b
	0.10	1.76 ±0.08 A a	125 ±0.03 B c	1.52 ±0.01 A b
	0.15	1.78 ±0.04 A a	1.41 ±0.01 A b	1.07 ±0.01 B c
	L. S. D.	0.157 *	0.059 *	0.038 *
Iso leucine	Control	1.15 ±0.02 C a	1.12 ±0.01 C ab	1.09±0.01 D b
	0.05	1.52 ±0.02 B b	1.54 ±0.01 B b	1.75 ±0.02 B a
	0.10	1.50 ±0.01 B b	1.94 ±0.01 A a	1.95 ±0.01 A a
	0.15	1.91 ±0.01 A a	1.13 ±0.01 C c	1.32 ±0.01 C b
	L. S. D.	0.054 *	0.034 *	0.040 *
Leucine	Control	1.29 ±0.01 C a	1.24 ±0.01 C b	1.11 ±0.01 C c
	0.05	1.73 ±0.01 A a	1.71 ±0.01 A a	1.26±0.01 A b
	0.10	1.51 ±0.02 B a	1.24 ±0.01 C b	1.15±0.02 BC c
	0.15	1.32 ±0.03 C a	1.34 ±0.01 B a	1.19 ±0.03 B b
	L. S. D.	0.071 *	0.032 *	0.066 *
Lysine	Control	8.35 ±0.02 C a	7.54 ±0.02 D b	7.08 ±0.04 B c
	0.05	8.48 ±0.03 B a	8.24 ±0.01 A b	7.06 ±0.02 B c
	0.10	8.54 ±0.04 B a	8.14 ±0.01 B b	7.33 ±0.01 A c
	0.15	8.73 ±0.01 A a	7.59 ±0.02 C b	7.34 ±0.02 A c
	L. S. D.	0.102 *	0.051 *	0.071 *

Table (2) shows the effect of different concentrations of carnosic acid on amino acids in broiler thigh meat for storage periods and at a temperature of 4°C, we note that some acids increased in value at certain concentrations (0.15 - 0.10) compared to the control treatment we note that aspartic acid concentrations in all treatments were higher than in the control treatment, indicating a strong protective effect on thigh meat, especially at the 0.10 concentration. Glutamic acid showed slight variation across treatments, indicating stable levels with carnosic acid. We note a significant increase in serine at the 0.10 concentration, much higher than in the control treatment. As for histidine and glycine, we note an increase in all treatments, indicating a decrease in deterioration during storage. We note a slight increase in threonine with concentrations, especially 0.10 - 0.15, which supports the preservation of essential amino acids. Similarly arginine recorded its highest value at the 0.10 concentration and its lowest in the control treatment.

We note that alanine, tyrosine, and cysteine showed a significant increase in all treatments, with tyrosine increasing significantly at the 0.10 concentration compared to the control treatment,

indicating a significant increase in the concentration. Carnosic acid helps prevent the oxidation of sensitive amino acids. As for valine-methionine and phenylalanine, we observed an improvement in all treatments.

As for isoleucine, it is preferable to store it at a concentration of 0.10, confirming its ability to dissolve antioxidants leucine recorded a significant increase at a concentration of-0.10 - 0.15 lysine recorded a significant increase in treatments, especially at 0.10, compared to the control treatment this indicates effective inhibition of lysine loss this indicates that carnosic acid is effective in reducing protein degradation and may help preserve flavor-enhancing amino acids.

Table (2) The effect of adding different concentrations of carnosic acid on the amino acid test of the thigh (Mean ± S.E.).

Amino acid Test	Time	3day	7day	14day
Histidine	Control	5.34 ±0.02 C a	5.03 ±0.01 B b	4.02 ±0.01 C c
	0.05	6.58 ±0.02 A a	5.07 ±0.01 B b	4.51 ±0.01 B c
	0.10	6.12 ±0.02 B a	5.67 ±0.01 B b	4.02 ±0.01 C c
	0.15	5.38 ±0.01 C b	22.58±11.95 A a	4.73 ±0.01 A b
	L. S. D.	0.053 *	7.64 *	0.034 *
Therionine	Control	9.12 ±0.01 A a	9.03 ±0.01 C b	7.03 ±0.02 C c
	0.05	8.33 ±0.03 C b	9.11 ±0.01 B a	8.06 ±0.01 B c
	0.10	8.39 ±0.03 C b	9.21 ±0.01 A a	8.12 ±0.01 A c
	0.15	8.46 ±0.01 B b	9.03 ±0.02 C a	7.02 ±0.01 C c
	L. S. D.	0.074 *	0.046 *	0.033 *
Arginine	Control	5.33 ±0.02 B a	3.66 ±0.02 C b	3.05 ±0.01 C c
	0.05	5.78 ±0.01 A a	4.31 ±0.01 B b	3.04 ±0.01 C c
	0.10	5.23 ±0.06 B a	4.43 ±0.01 A b	3.64 ±0.01 A c
	0.15	5.73 ±0.02 A a	3.63 ±0.01 C b	3.51 ±0.01 B c
	L. S. D.	0.112 *	0.053 *	0.036 *
Valine	Control	7.35 ±0.01 B a	5.55 ±0.02 C b	4.41 ±0.01 D c
	0.05	7.38 ±0.04 B a	5.80 ±0.01 A b	5.31 ±0.01 A c
	0.10	7.66 ±0.01 A a	5.56 ±0.06 C b	4.46 ±0.02 C c
	0.15	7.41 ±0.01 B a	5.70 ±0.01 B b	4.55 ±0.02 B c
	L. S. D.	0.067 *	0.098 *	0.048 *
Methionine	Control	8.05 ±0.01 B a	8.05 ±0.01 D a	8.04 ±0.02 D a
	0.05	8.94 ±0.01 A a	8.63 ±0.02 B b	8.43 ±0.02 C c
	0.10	8.84 ±0.06 A a	8.14 ±0.02 C b	8.66 ±0.01 B c
	0.15	8.10 ±0.01 B c	8.73 ±0.01 A b	8.92 ±0.01 A a
	L. S. D.	0.104 *	0.057 *	0.042 *

Phenylanine	Control	4.03 ±0.01 B a	3.04 ±0.01 C b	2.20 ±0.01 D c
	0.05	4.36 ±0.01 A a	3.74 ±0.01 A b	3.74 ±0.02 A b
	0.10	4.35 ±0.02 A a	3.07 ±0.01 C c	3.62 ±0.02 B b
	0.15	4.04 ±0.01 B a	3.30 ±0.04 B b	2.29 ±0.01 C c
	L. S. D.	0.051 *	0.069 *	0.038 *
Iso leucine	Control	2.02 ±0.01 B b	2.09 ±0.01 C a	1.03 ±0.01 C c
	0.05	2.06±0.01 AB b	2.93 ±0.01 A a	1.11 ±0.04 B c
	0.10	3.14 ±0.67 A a	2.69±0.34 AB ab	1.32 ±0.01 A b
	0.15	2.17 ±0.01 AB a	2.13 ±0.01 BC a	1.05 ±0.02 C b
	L. S. D.	1.098 *	0.569 *	0.043 *
Leucine	Control	6.03 ±0.02 C a	5.03 ±0.01 C b	4.31 ±0.02 B c
	0.05	6.02 ±0.01 C a	5.46 ±0.01 B b	4.32 ±0.04 B c
	0.10	6.31 ±0.01 B a	5.02 ±0.01 C b	4.97 ±0.01 A c
	0.15	6.76 ±0.01 A a	5.52 ±0.01 A b	3.42 ±0.01 C c
	L. S. D.	0.044 *	0.029 *	0.070 *
Lysine	Control	1.04 ±0.02 C c	1.19 ±0.01 B b	1.33 ±0.02 B a
	0.05	1.19 ±0.01 B c	1.44 ±0.01 A b	1.57 ±0.02 A a
	0.10	1.43 ±0.01 A b	1.49 ±0.03 A b	1.65 ±0.02 A a
	0.15	1.25 ±0.05 B a	1.22 ±0.01 B a	1.19 ±0.09 B a
	L. S. D.	0.095 *	0.059 *	0.153 *

Discussion

Based on the results presented in figure(1-2-3-4-5-6) regarding the physical properties of broiler chicken meat (breast and thigh), which included measurements of pH, drip loss, and cooking loss after treatment with different concentrations of carnosic acid (0.05 - 0.10 - 0.15) per kilogram of meat, and during storage periods of 3, 7, and 14 days, compared to the control group (no additives) a slight decrease in pH values was observed in both breast and thigh samples treated with carnosic acid, contributing to an improvement in meat quality in terms of flavor and appearance. This reduction was not significant enough to negatively affect overall quality but instead indicated greater stability in treated samples compared to the control group.

According to the data: treatment T3 (0.10 concentration) recorded the best pH values across all storage periods (3, 7, and 14 days), ranging between 5.63-5.98%, indicating good acidity stability this was followed by Treatment T4 (0.15) with values ranging from 5.79 to 6.22 showing clear

improvement but slightly less than T3, from the results shown in the previous tables, a noticeable A reduction in drip loss was recorded in the treatments with carnosic acid, particularly in the 0.10 concentration for both breast and thigh samples throughout all storage periods. The values of drip loss in treated samples ranged between 4.32 and 4.95 compared to the control. This is a promising finding with several implications for meat quality, as it is a crucial indicator of water-holding capacity and overall meat quality. Regarding cooking loss, significant improvements were also observed. Increasing water loss during cooking helps retain juiciness, tenderness, and the overall quality of meat. Here, the addition of 0.10% carnosic acid, followed by 0.15, showed the best results, with cooking loss values ranging between 4.01- 4.85.

These results confirm the effectiveness of the treatment in maintaining meat quality these findings are consistent with those reported by (14), the study indicated that the use of antioxidants had a positive effect on the physical properties and quality of broiler meat by improving oxidative stability and delaying deterioration during storage by (15) also reported positive outcomes regarding the use of rosemary extract (re) in broiler meat, with no adverse effects on quality, this was attributed to the use of optimal concentrations (500–1000 mg/kg), which effectively reduced cooking loss in breast and thigh meat. On the other hand, (16) reported increased pH values, which they attributed to the use of low concentrations of rosemary extract containing carnosic acid. Supporting evidence also comes from (17), who showed that optimal concentrations (350 mg/kg) maintained Ph stability, reduced cooking loss, and reduced drip loss this is consistent with (18) when using antioxidant neutral thus, adding carnosic acid resulted in a lower acidity, which improved the tenderness and shelf life of the meat, as well as less loss in dripping. as indicated (18) when using antioxidants natural it contributed to reducing moisture loss, reducing cooking loss, and maintaining water-holding capacity ph.

In This Study, Note In Table (1)(2) There was significant improvement in all amino acids in the broiler (breast _thigh) after spraying it with different Concentration of Carnosic acid, which were as follows: (0.05 - 0.10 - and 0.15) per kg of meat, over three storage periods of 3,7 and 14 days, compared to the Control treatment, which was without any addition.

According to the data: Treatment T3 (concentration of 0.10) recorded the best results for amino acid values, especially lysine and methionine in all storage periods (3, 7, 14 days), where the values ranged between 7.06__8.73, indicating good stability in essential amino acids. This was followed by the T4 transaction (0.15) where values ranged between 7.06__7.59, with a clear improvement

for both (breast and thigh) and for all storage periods This result may be due to natural preservatives, the most important of which are phenolic compounds, which work to in hibt the oxidation of fats and deterioration of nutritional quality of meat proteins (18). Oxidative stress processes are one of the main causes of quality degradation, as well as deterioration of taste and texture and low nutritional value, and this is related to the deterioration of protein and essential amino acids fat oxidation and interactions between proteins and fats are the main reason for the deterioration of the quality of many products and meat in particular, and the cause of these reactions is storage at temperatures or storage in refrigeration without preservatives, this leads to reducing the nutritional value of meat products

Therefore, the priority is to reduce oxidation caused by fats, so (19).to the use of plant extracts, including rosemary extracts, including carnosic acid, because natural raw materials are safe and do not contain toxic effects, and this makes them more received by consumers and because proteins are particularly susceptible to oxidation due to the large contact surface with the environment and its nature and the presence of amino acids (20) It is clear (21) the reason for the decrease in the content of amino acids as a result of oxidation and the reaction of the oxidation of fat oxidation with protein and this is due to the chemical changes to which the protein is exposed. Thus, (22) confirmed that lysine and methionine are more susceptible and sensitive to oxidation, explaining ways to reduce oxidative stress and rancidity in meat by using antioxidants, especially the possibility of using natural antioxidants that reduce the oxidation of fats and proteins and at the same time be able to improve the quality of meat as pointed out (23).

Conclusion

Based on theoretical analysis. It was shown that carnosic acid's antioxidant properties significantly contribute to the stabilization of the physical properties of meat, including acidity and water-holding capacity. Carnosic acid is effective in reducing the oxidative degradation of amino acids, particularly essential ones (such as lysine and methionine), which are vital to the nutritional quality of meat. Carnosic acid applications help extend the shelf life and additionally meet the growing consumer demand for naturally preserved food products, highlighting of carnosic acid in maintaining meat quality. Although synthetic preservatives have long been used for similar purposes, the shift toward natural alternatives reflects a broader movement toward safer and more sustainable food technologies.

Acknowledgment

The authors sincerely thank the Public Health Laboratory team, Department of Public Health, College of Veterinary Medicine, University of Basrah, for their continuous support and cooperation, which were essential in completing this research.

Conflict of Interest

The authors declare that there are no conflicts of interest related to this study. The research design and all procedures were reviewed and approved by the Institutional Ethics Committee before implementation**.**

Ethical Clearance

The Research Ethical Committee approves

this work.

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تأثير حامض الكارنوسيك كمادة حافظة على الأحماض الأمينية والخصائص الفيزيائية للحم الدجاج خلال فترات التخزين المختلفة

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الخلاصة

يُعدّ لحم الدواجن الطازج من المنتجات الغذائية شديدة القابلية للتلف، ويستلزم استهلاكه بسرعة نظرًا لتركيبه البيولوجي. وتتأثر مدة صلاحيته بعدة عوامل تشمل درجة الحرارة، ونسبة الأكسجين المحيط، والإنزيمات الداخلية، والرطوبة، والضوء، .والتغيرات الفيزيائية التي تحدث أثناء التخزين هدفت الدراسة الحالية إلى تقييم تأثير رش حامض الكارنوسيك على تحسين الخصائص الفيزيائية واستقرار الأحماض الأمينية، وإطالة فترة صلاحية صدور وأفخاذ الدجاج المبردة. إذ جُمعت 80 عينة من لحم الدجاج (صدر وفخذ) من أحد حقول الدواجن في مدينة البصرة. قُطّعت العينات إلى قطع متجانسة، ثم أضيف إليها حامض الكارنوسيك بثلاث تراكيز مختلفة (0.05%، 0.10%، 0.15%)، وتم خلطها يدويًا لعدة دقائق لضمان التوزيع المتجانس للحامض . بعد ذلك، عُبئت العينات في أكياس من البولي إيثيلين وحُفظت في الثلاجة عند درجة حرارة 4 °م لفترات 3 و 7/14يومًا تم قياس الرقم الهيدروجيني فقدان السوائل بالتنقيط، وفقدان السوائل أثناء الطبخ، بالإضافة إلى تحليل محتوى الأحماض الامينية الأساسية مثل الليسين، المثيونين، باستخدام الطرق القياسية أظهرت النتائج أن معاملة صدور وأفخاذ الدجاج بحامض الكارنوسيك ساهمت في خفض قيم الاس الهيدروجيني وتحسين طراوة اللحم، مع تقليل فقدان السوائل بالتنقيط وزيادة فقدان السوائل أثناء الطبخ. كما حافظت على استقرار الأحماض الأمينية الأساسية ومنعت تدهورها بشكل ملحوظ خلال فترة التخزين، مما ساعد على تحسين القيمة الغذائية للحوم الدواجن وإطالة فترة صلاحيتها

الكلمات المفتاحية دجاج لاحم ، صدر ، فخذ ، حمض أميني أساسي ، حمض كارنوسيك ، جودة اللحوم.