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ORIGINAL ARTICLE

Investigation of biochemical blood parameters, characteristics for carcass, and mineral composition in chicken meat when feeding on coriander seed and rosemary leaves

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ABSTRACT

Objective: Investigating the antibiotic and antioxidant benefits of medicinal herbs to enrich the serum immune responses of chicken meat.
Materials and Methods: A total of 1,080 Ross 308 broilers were reared up to 42 days. The broilers were divided randomly into nine assemblies, with each sectioned into three replicates. The first and second were supplemented with 0.25% and 0.50% of coriander seeds, respectively, while the third and fourth with 0.25% and 0.50% of rosemary leaves, respectively. A mixture of herbs from the two plants were added to fifth, sixth, seventh, and eighth treatments [(0.50% coriander seeds + 0.50% rosemary leaves), (0.25% coriander seeds + 0.50% rosemary leaves), (0.50% coriander seeds + 0.25% rosemary leaves), and (0.25% coriander seeds + 0.25% rosemary leaves)], respectively, whereas chicks in the ninth as a control group.
Results: The results showed the pH for the thigh and breast of the carcass were measured. Glycogen levels, serum immunity (H, L, Hlration, Albumin, Globulin, and A/G ratio at 28 days and alanine aminotransferase, aspartate aminotransferase, and cholesterol at 42 days). The mineral deposits in the chicken meat were measured for Mg, Fe, Ca, Na, J, and total N. The fifth treatment had a significantly higher glycogen ratio ($p < 0.05$). pH measurements for the thigh and breast were done immediately, 4, 12, and 24 h after slaughter. For the thigh, the seventh treatment was highest immediately and at 12 h. For the breast, significant differences were only noted at 12 h for chickens on a coriander diet.
Conclusion: It is concluded that these additives have a positive effect on some of the blood profiles, carcass characteristics, and mineral composition of chicken meat.

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Introduction

Broilers translate feed of lesser quality to the meat of high value for human consumption, making them an important source of meat. Therefore, when humans consume the meat, it is necessary to know the effect of additives on their blood parameters and mineral composition. It is possible to implement the findings in the near future and begin testing on mice and pigs, before extending to human consumption. The meat's major mineral source comes from the manipulating and adding to the feedstuff [1].

Common feed additions for food poultry are antioxidants and antimicrobials [2]. Alternatively, dietary antibiotics have a noteworthy position in the animal production for promoters of health and growth; they represent important substitute approaches for a sustainable continuation of the production of unharmful poultry [3]. The usage of antibiotics in the animal diet has been made forbidden in Europe because of anxieties regarding the arrival of resilient bacteria the possibility of animals' muscles carrying deposits [4]. Phytogenic diet additives are a common alternative to antibiotic growth promoters [5]. There are two major features of the examination into aromatic plants for antimicrobial and antioxidant usage in the feed. The first is the continual worrying about how safe chemical additions are which has driven researchers toward using

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natural substances. The second is the aim of reducing the percentages of sodium and sugars in the human diet for health concerns, which has resulted in other spices to be used in regularity [5].

Coriander essential oil has many medicinal values; it is one of the 20 major essential oils in the world market and is obtained by steam [6]. Coriandrum holds bioactive phytochemicals which possess a great deal of beneficial biological features, such as its antioxidant features, cancer-fighting properties, hypotensive, antimicrobial, and anti-inflammatory activities. Petroselinic acid was the major fatty acid for all coriander cultivars [7]. Extracted elements from rosemary remain quite popular antioxidants across the world [8]. Three rosemary extracts were found to possess carsonic, rosmarinic, and carnosol acid [9]. The aromatic plant rosemary is a mint in the evergreen family that is native to the Mediterranean region and can grow at high altitudes. It is a small shrub with branched, narrow, and sticky leaves [4]. Monoterpenes, like borneol and pinene myrcene 1-8 cineole, are features of rosemary's volatile oil, and are considered antimicrobial, antibacterial, and antifungal [10].

Meat is so crucial to human consumption because it provides a lot of nutrients, including the essential trace elements [11]. Trace elements are crucial to the homeostasis for both the human body and animals [12].

The classes of meat products are tightly linked to a post-mortem reduction in muscle pH. A swift decrease in pH levels after death (which is known through a low value 15 min after slaughter) produces pale, soft, and exudative (PSE) meat that holds less water [13]. Such meat is caused by shocks that cause stress to the poultry before they are killed, which alters the metabolism [14]. Regardless, these influences result in either a quick postmortem glycolysis (or resulting fast decline of pH levels) or significantly lower pH values in the meat [14].

Nevertheless, muscle *in vivo* holds glycogen at a concentration of 60e150 mmol glucose/kg wet weight (which equals 1%e2.7%). Glycogen is important as being a readily available energy supply which arises from difficult situations, including sports, stressful occurrences, and dietary changes (like intermittent fasting). It is one of the glucose's branched-chain polymers and is seen as starch in plants [15].

The significance of carbohydrates within meat products is much more than how little of a presence it has, as it can have a dramatic impact on the perimortem metabolic features that are crucial to the meat's characteristics [15]. Therefore, much attention has been dedicated to the understanding and controlling of suitable levels of glycogen in the liver and muscles [15]. Lower pH values in organic poultry could arise from their better life conditions that reduce pre-death stress and the consumption of glycogen [16]. Although minerals and trace elements have less impact than proteins and energy on overall performance and efficiency, minerals should not be treated as less important [17].

That said, if the immune system is impaired because of an inadequate supply of these minerals and trace elements, a wide variety of clinical conditions may appear [18]. Phosphorus and calcium are the two most abundant mineral elements in the animal body [19]. A deficiency of Ca is more problematic to animals who are fed mostly concentrates (pigs and poultry, for example). Magnesium is the fourth-ranked cation in the human body, with only sodium, potassium, and calcium in higher percentages [17]. Iron is one of the most abundant metals in the body and has several physiologic functions [17]. Nevertheless, special attention is given to those minerals because of their potential poisonous effect on humans if their concentrations exceed the limits of safe exposure [1]. The concentrations of these minerals in meat differ depending on the age, feed, and genetics of the animal [1].

However, the lack of information that presently exists about the possibility of using rosemary and coriander (synergy) in the feed of poultry makes this topic necessary for further research. Thus, the objective of this experiment was the investigation of the biochemical blood parameters, carcass characteristics, and mineral composition in chicken meat that fed on coriander seed and rosemary leaves.

Materials and Methods

Ethical approval

This research was carried out under an agreement with the guidelines of the Canadian Council regarding using lab animals and animal care [20] and approved by the office of the agricultural research ethics committee that recently took place in Iraq (approval number 5849/AGRO).

Birds, diets, feeding, and management

The experiment took place based on an approved protocol from the Poultry Research Station, Office of Agricultural Research, Ministry of Agriculture in Baghdad, Iraq. The experiment was performed in two stages. The first phase was the field experiment done at the Poultry research station of the Animal Resources department (Agricultural Research Office, Ministry of Agriculture), between August 14, 2013 and September 24, 2013. It was performed to study the effect of adding some medicinal herbs (coriander seeds and rosemary leaves) in the broiler chicks and their joint effect on the biochemical blood parameters at the fourth and sixth weeks of age, respectively. The second phase was the laboratory tests that were carried out between September 24, 2013 and January 15, 2014. Many tests were carried out in the laboratories of the General Authority for Agricultural Research (blood test), the laboratories of the College of the Agricultural University of Baghdad for (pH, Glycogen), and the laboratories of the Food Research and Contamination Department of the Ministry of Science and Technology (estimation of the mineral elements in poultry meat).

We randomly distributed 1,080 Ross 308 broilers at 1 day of age into nine random assemblies, with each sectioned into three replicates, with 40 chicks for each replicate. The groups were allocated as follows:

Treatment 1 = standard diet + 0.25% coriander seeds.
Treatment 2 = standard diet + 0.50% coriander seeds.
Treatment 3 = standard diet + 0.25% rosemary leaves.
Treatment 4 = standard diet + 0.50% rosemary leaves.
Treatment 5 = standard diet + (0.50% coriander seeds and 0.50% rosemary leaves)
Treatment 6 = standard diet + (0.25% coriander seeds and 0.50% coriander seeds)
Treatment 7 = standard diet + (0.50% coriander seeds and 0.25% rosemary leaves)
Treatment 8 = standard diet + (0.25% coriander seeds and 0.25% rosemary leaves)
Treatment 9 = standard diet/without supplement (control group).

The diets of the chicks were produced in order to fulfill their dietary needs. It was assembled under the Ross Broiler Manual and the chicks received it as a mashed food (as seen in Table 1). The broilers lived inside 6 cm^2 wire floor pens covered with paper rolls. Over the course of the experiment, the chicks were fed and given water in an *ad libitum* manner. They were vaccinated against the Newcastle and Gumboro diseases according to their age. Lights and temperatures were controlled during the experiment, with the chicks given 23 h of light and 1 h of darkness. Temperatures began at 32°C for one feed, with a gradual decrease of 3°C for both the second and third week, before it was settled at a stable 22°C for the duration of the experiment.

Table 1. Composition of experimental diets.

Ingredients and composition (%)	Starter (1–10 days)	Grower (11–22 days)	Finisher (23–42 days)
Yellow corn	47.5	50.85	10
Wheat	10	10	56.5
Soybean meal	32	28	24
Protein*	5	5	0
Mixtures of vitamins and minerals	0	0	2.5
Limestone	1.2	1.14	0.30
Dicalcium phosphate	0.7	0.5	0.40
Salt	0.1	0.1	0.04
Lysine	0.25	0.13	0.13
Methionine	0.25	0.13	0.13
Fat	3	4.15	6
Total	100%	100%	100%
Calculated chemical composition (%)**			
ME (Kcal/kg feed)	3058	3173,8	3239,6
Crude protein%	22,113	21,113	19,997
Methionine%	0.51	0.602	0.540
Lysine%	1.43	1.246	1.073
Methionine + cystine%	1.07	0.95	0.824
Calcium%	1.1	0.919	0.88
Phosphorous%	0.5	0.451	0.42

*The protein (WAFI) was imported from Dutch company containing 40% crude protein, 2,100 K/kg representative energy, 5% crude oil, Lysine 3.85%, cysteine 4%, and methionine 3.7%.
VIT.A 220.00000 IU, VIT.D 360.000.00 IU, VIT.E 600.000.00 MG/KG, VIT. K3. 50.00 mg/kg, VITB1 60.00 mg/kg, VIT.B2 140.00 mg/kg, VIT.B6. 80.00 mg/kg, Biotin 800.00 mg/kg, Pantothenic 300.00 mg/kg, Ca 6.5%, Total phosphate 4%, Na 2.3%. **According to NRC (1994).

Measurements

Serum samples: At 28- and 42-day-old, we took blood from the jugular veins of three birds from each replicate. Nearly, 5 ml was drawn without anticoagulant to obtain serum. To allow the sample to separate, we gave the blood 20 min for clotting and centrifuging at 1,500 rpm. We kept them at 20°C to the analyze glutamate pyruvate transaminase (ALT), glutamate oxaloacetate transaminase (AST), and cholesterol by using a commercial kit (Bro: abo SA, 20160, mazaiy, France). Another 5 ml sample was collected with ethylenediaminetetraacetic acid (EDTA) from the same birds for hematological tests, and we found the (L) Lymphocytes, (H) Hetrophils, and the H/L ratios through the methodology outlined above [21]. The cholesterol was measured by the enzymatic colorimetric technique with commercial supplies (Pars Azmun Inc), based on the techniques from Doumas et al. [22]. Glycogen concentration was estimated depending on [23], 2 h after the slaughter.

The pH for raw meat (breast and thigh) was estimated according to Jeacocke [24]. Nitrogen content and minerals were estimated according to AOAC [25].

Data analysis

We carried out the statistical analysis for each section through the 21st version of the Statistical Package for Social Science (SPSS) running the Windows Operating System (SPSS Inc., Chicago, IL) and based on the total randomized design. Averages were contrasted to figures from Duncan's Multiple Range Test, using a 5% significance level.

Results and Discussion

Results

Regarding the glycogen ratio

We found noteworthy variances between the treatments and the control treatment (Table 2). Treatment T5 displayed a significant increase ($p < 0.05$) on all treatments.

Regarding the pH measurement

The pH was measured for both breast and thigh and for four-time periods (immediately after Slaughter, 4 h after slaughter, 12 h after slaughter, and 24 h after slaughter) (Table 3). For the thigh that was measured immediately after slaughter, there were variations of significance ($p < 0.05$) between each treatment. T7 had the highest recording at 7.38 compared with T3 that had the lowest of 7.38, while the treatment of the control was recorded at 7.2. Four hours later, there were no variations of significance at ($p < 0.05$) between each treatment. After 12 h, there were variations of significance ($p < 0.05$) among treatments. T7 was the highest at 6.653, while treatments T6 and T8 were the lowest at 6.413 and 6.417, respectively, and the control was recorded at 6.64. After 24 h, there were variations of

Table 2. Effect of using different levels of coriander seed powder and rosemary leaves and their effect on the concentration of the Glycogen after Slaughter at age 42 days.

Treatment	Glycogen ratio
T1	G 0.067
T2	G 0.06367
T3	E 0.0790
T4	B 0.1077
T5	A 0.1687
T6	D 0.08467
T7	F 0.0733
T8	C 0.09033
T9	G 0.0640
Significant	*

Experimental treatments: [(T1 = standard diet + 0.25% coriander seeds), (T2 = standard diet + 0.50% coriander seeds), (T3 = standard diet + 0.25% rosemary leaves), (T4 = standard diet + 0.50% rosemary leaves), (T5 = standard diet + 0.50% coriander seeds + 0.50% rosemary leaves), (T6 = standard diet + 0.25% coriander seeds + 0.50% rosemary leaves), (T7 = standard diet + 0.50% coriander seeds + 0.25% rosemary leaves), (T8 = standard diet + 0.25% coriander seeds + 0.25% rosemary leaves) and (T9 = standard diet/control group)].

Table 3. Effect of using different levels of coriander seed powder and rosemary leaves and their effect on the of the pH measurement after Slaughter at age 42 days of broilers.

Treatment	Thigh				Breast			
	pH immediately after slaughter	pH after slaughtering by 4 hours	pH after slaughtering by 12 hours	pH after slaughtering by 24 hours	pH immediately after slaughter	pH after slaughtering by 4 hours	pH after slaughtering by 12 hours	pH after slaughtering by 24 hours
T1	Ab 0.084 ± 7.183	A 0.0265 ± 6.96	Ab 0.038 ± 6.527	A 0.035 ± 6.25	A 0.015 ± 7.22	A 0.021 ± 6.96	A 0.0133 ± 6.483	A 0. 3 ± 6.23
T2	Ab 0.006 ± 7.22	A 0.12 ± 6.96	Ab 0.067 ± 6.44	B 0.07 ± 6.15	A 0.05 ± 7.1866	A 0.022 ± 6.89	A 0.019 ± 6.473	A 0.024 ± 6.187
T3	B 0.073 ± 7.03	A 0.037 ± 6.937	Ab 0.0524 ± 6.447	A 0.0491 ± 6.147	A 0.077 ± 7.1	A 0.015 ± 6.93	Ab 0.02 ± 6.46	A 0.72 ± 6.11
T4	Ab 0.032 ± 7.137	A 0.006 ± 7.00	Ab 0.054 ± 6.463	A 0.0451 ± 6.13	A 0.046 ± 7.08	A 0.018 ± 6.8	B 0.042 ± 6.28	A 0.57 ± 5.96
T5	Ab 0.108 ± 7.143	A 0187 ± 6.997	B 0.094 ± 6.403	A 071 ± 6.08.0	A 0.033 ± 7.23	A 0.078 ± 6.96	A 0.043 ± 6.49	A 0.061 ± 6.143
T6	Ab 0.01 ± 7.113	A 0.091 ± 6.93	B 0.09 ± 6.413	A 1 ± 6.13.0	A 0.058 ± 7.11	A 0.084 ± 6.853	Ab 0.085 ± 6.37	A 0.108 ± 6.037
T7	A 0.155 ± 7.38	A 0.192 ± 7.23	A 0.108 ± 6.653	A 0.055 ± 6.147	A 0.46 ± 7.11	A 0.022 ± 6.91	Ab 0.167 ± 6.38	A 0.023 ± 6.017
T8	Ab 0.197 ± 7.137	A 0.024 ± 6.897	B 0.035 ± 6.417	A 0.044 ± 6.11	A 0.023 ± 7.23	A 0.04 ± 6.84	Ab 0.058 ± 6.32	A 0.281 ± 6.30
T9	Ab 0.0 ± 7.2	A 0.02 ± 7.173	Ab 0.043 ± 6.64	A 0.021 ± 6.18	A 0.1 ± 7.13	A 0.11 ± 6.98	A 0.12 ± 6.49	A 0.281 ± 6.30
Significant	*	N. S	*	*	NS	NS	*	NS

significance ($p < 0.05$) among treatments. Where T2 had recorded the lowest ($p < 0.05$) at 6.15 when compared with all treatments, with the control recorded at 6.18. For the breast measured immediately after slaughter, there were no variations of significance ($p < 0.05$) among all treatments.

Four hours later, we still found no variations of significance ($p < 0.05$) among all treatments.

After 12 h, there were variations of significance ($p < 0.05$) among treatments. Where treatments (T9, T5, T1, and T2) were recorded at 6.49, 6.49, 6.483, and 6.473, respectively, the highest was T4 at 6.28, while the control was recorded at 6.49. After 24 h, there were no variations of significance ($p < 0.05$) between all the treatments.

Regarding the measurement of blood at the two ages of 28 and 42 days, several measurements were taken (Albumin, Globulin, A/G, Cholesterol, Hlration, L, H, AST, and ALT).

As illustrated in Table 4 (Albumin, Globulin, A/G, and Cholesterol), there were no variations of significance at ($p < 0.05$) among all treatments, except Albumin at 42-day-old.

For Albumin: When measuring Albumin, there were variations of significance at $p < 0.05$. T1 was the highest at 1.65 at $p < 0.05$, while T6 was the lowest at 0.43 at $p < 0.05$, and the control was recorded at 1.23 (Table 4). With respect to Hlration, we found variations of significance at $p < 0.05$ between treatments at 28 and 42 days. At 28 days, T1 and T2 were the highest at 130.4 and 139.2, respectively at $p < 0.05$, with T4 at the lowest with 59.5 ($p < 0.05$), and the control recorded at 72.0 (Table 5). With respect to Halation after 42 days, we found no variations of significance at $p < 0.05$ between treatments, where T6 was highest at 81.3 at $p < 0.05$, with T7 recording the lowest at 62.5 at $p < 0.05$ and the control recorded at 72.1 (Table 5). While for L at 28- and 42-days-old, there were variations of significance at $p < 0.05$ between treatments. At 28 days, T4 was recorded the highest at 80.8 at $p < 0.05$ when contrasted to all other treatments that were recorded with the lowest at $p < 0.05$, while treatment of the control was recorded at 72.9 (Table 5). With respect to L after 42 days-of-age, we found variations of significance at $p < 0.05$ between treatments, where T7 had the highest recording of 71.3 at $p < 0.05$, with (T6) at the lowest with 53 at $p < 0.05$ and the control recorded at 61.7 (Table 5). For H measurement, there were variations of significance at $p < 0.05$ between treatments just at 28 days of age. Where T2 was recorded the highest at 61.7 at $p < 0.05$ when contrasted to the others, while we found the control at 42.8 (Table 5). After 42-days-of-age, we found no variations of significance at $p < 0.05$ between all treatments (Table 5).

Regarding the measurement of AST and ALT after 42 days, we found variations of significance at $p < 0.05$ between treatments (Table 6).

AST: When measuring AST, we found variations of significance at $p < 0.05$ among treatments, where T7 recorded the highest with 13.6 at $p < 0.05$, with T4, T1, T5, T9, and T2 were much lower at 2.0, 2.1, 3.2, 3.4, and 3.9, respectively, at $p < 0.05$, and the control recorded at 3.4 (Table 6).

Table 4. Effect of using different levels of coriander seed powder and rosemary leaves and their effect on some serum parameters at age 28 and 42 days of broilers.

Treatment	28 days			42 days			
	Albumin (g/dl)	Globulin (g/dl)	A/G ratio	Albumin (g/dl)	Globulin (g/dl)	A/G ratio	Cholesterol (mg/dl)
T1	0.2 ± 1.47	0.12 ± 1.88	0.06 ± 0.77	A 0.46 ± 1.65	0.18 ± 0.96	0.43 ± 1.77	7.6 ± 107.1
T2	0.13 ± 1.51	0.14 ± 1.06	009 ± 1.45	Ab 0.16 ± 1.20	0.35 ± 0.95	0.73 ± 1.70	3.8 ± 125.1
T3	0.39 ± 1.53	1.00 ± 2.01	0.71 ± 1.40	Ab 0.54 ± 1.27	0.34 ± 1.28	0.86 ± 1.44	121.7 ± 221.8
T4	0.17 ± 1.49	0.13 ± 2.51	0.04 ± 0.59	Ab 0.12 ± 1.29	0.37 ± 1.42	0.45 ± 1.13	62.1 ± 115.9
T5	0.11 ± 1.44	0.16 ± 1.14	0.08 ± 1.29	Ab 0.06 ± 1.05	0.12 ± 1.22	0.08 ± 0.88	60.0 ± 114.4
T6	0.21 ± 1.99	0.10 ± 1.08	0.02 ± 1.84	B 0.16 ± 0.43	0.59 ± 1.77	0.37 ± 0.48	24.9 ± 69.8
T7	0.20 ± 1.69	0.94 ± 2.01	0.51 ± 1.28	Ab 025 ± 1.29	0.31 ± 0.84	0.41 ± 1.79	16.9 ± 76.9
T8	0.10 ± 1.79	0.32 ± 1.25	0.56 ± 1.71	Ab 0.31 ± 1.07	0.19 ± 1.00	0.56 ± 1.27	62.4 ± 135.9
T9	0.11 ± 1.37	0.84 ± 1.97	0.56 ± 1.50	Ab 0.08 ± 1.23	0.18 ± 1.01	0.18 ± 1.28	34.3 ± 117.4
Significant	NS	NS	NS	*	NS	NS	NS

Table 5. Effect of using different levels of coriander seed powder and rosemary leaves and their effect on hematological parameters at age 28 and 42 days of broilers.

Treatment	28 days			42 days		
	Hlration ratio	L (×103/µl)	H (×103/µl)	Hlration ratio	L (×103/µl)	H (×103/µl)
T1	A 4.9 ± 130.4	B 0.6 ± 43.8	B 75.2 ± 2.6	Ab 6.6 ± 65.1	Ab 6.0 ± 66.7	A 42.7 ± 1.5
T2	A 4.9 ± 139.2	B 0.6 ± 44.3	A 61.7 ± 1.5	B 1.5 ± 62.9	A 3.8 ± 69	A 43.3 ± 1.67
T3	Bc 1.2 ± 74.0	B 1.6 ± 58.2	C 43 ± 0.6	Ab 11.1 ± 75.9	Ab 7.3 ± 58.3	A 42.7 ± 1.5
T4	C 12.0 ± 59.5	A 80.8 ± 18.6	C 43.7 ± 0.2	Ab 2.5 ± 66.0	Ab 63.3 ± 3.3	A 41.7 ± 0.9
T5	B 2.2 ± 80.2	B 55 ± 2.0	C ± 44 0.5	Ab 6.2 ± 71.2	Ab 62 ± 3.8	A 43.7 ± 1.3
T6	Bc 4.3 ± 69.6	B 59.8 ± 3.6	C 41.3 ± 0.15	A 3.3 ± 81.3	B 53 ± 1.5	A 43 ± 0.6
T7	Bc 0.8 ± 70.1	B 60.9 ± 0.8	C 42.7 ± 0.6	B 4.0 ± 62.5	A 71.3 ± 3.7	A 44.3 ± 0.7
T8	Bc 3.5 ± 72.0	B 69.8 ± 2.1	C 42.2 ± 0.6	Ab 3.5 ± 72.0	Ab 62 ± 3.8	A 44.3 ± 0.7
T9	Bc 9.1 ± 72.0	B 72.9 ± 1.9	C 42.8 ± 0.6	Ab 9.1 ± 72.0	Ab 61.7 ± 6.0	A 43.3 ± 1.7
Significant	*	*	*	*	*	NS

ALT: With respect to ALT, we found variations of significance at $p < 0.05$ among treatments, where T8 had the highest recording of 10.4 at $p < 0.05$, T1 and T4 were recorded the lowest at 1 and 2.4 at $p < 0.05$, and the control was recorded at 3.9 (Table 6).

Regarding the measurement of mineral composition in the chicken meat at 42 days of age for the minerals (Mg, Fe, Ca, Na, k, and total nitrogen) (Table 7), we found variations of significance at $p < 0.05$ among treatments for each type of mineral composition in meat. For total nitrogen, we found variations of significance among treatments, where T1 was recorded the highest at 0.008, while the control was recorded at 0.0 (Table 7). When measuring K, there were significant differences between treatments, where T9 (Control) was the highest at 50.50 and T2 was lowest at 22.30 (Table 7). With respect to Na, we found variations of significance among treatments, where T4 had the highest recording at 11.30, T5 was lowest at 3.00, and the control was recorded at 6.90 (Table 7). With regard to Ca, we found variations of significance among treatments, where T4 was the highest at 16.90, and the control was recorded at 1.90 (Table 7). For Fe, we found variations of significance among treatments, where T9 (Control) was the highest at 5.85, T5, T3, and T7 were the lowest at 0.37, 0.44, and 0.50, and the control was recorded at 3.9 (Table 7). For Mg measurement, we found variations of significance among treatments, where T3 was the highest at 17.0, T5 was the lowest at 5.48, and the control was recorded at 8.01 (Table 7).

Table 6. Effect of using different levels of coriander seed powder and rosemary leaves and their effect on biochemistry parameters at age 42 days of broilers.

Treatment	AST (U/100 ml)	ALT (U/100 ml)
T1	B 2.1 ± 0.11	B 0.01 ± 1.0
T2	B 3.9 ± 1.7	Ab 0.6 ± 6.8
T3	Ab 6.8 ± 1.0	Ab 2.3 ± 3.2
T4	B 2.0 ± 0.5	B 0.8 ± 2.4
T5	B 3.2 ± 1.8	Ab 0.6 ± 3.2
T6	Ab 1.7 ± 6.5	Ab 1.2 ± 2.6
T7	A 8.6 ± 13.6	Ab 1.1 ± 4.9
T8	Ab 2.3 ± 7.5	A 10.4 ± 7.0
T9	B 0.3 ± 3.4	Ab 3.9 ± 1.9
Significant	*	*

Discussion

The effects of aromatic plants in the clinical chemistry of chicken are still ambiguous. Biochemical blood parameters usually reflect the health of an animal [26].

Table 7. Concentration of metal elements in the meat after slaughtering at the age of 42 days of chicken meat.

Treatment	Total Nitrogen	K	Na	Ca	Fe Blank0.269	Mg
T1	A 0.020 ± 0.008	B 0.57 ±± 41.10	B 0.18 ±± 9.60	C 0.52 ±± 1.80	Cd 0.23 ±± 1.06	Bc 0.24 ± 7.31
T2	B 0.0 ± 0.0	G 0.41±±22.30	C 0.30 ± 7.10	C 0.05 ±± 1.60	Cd 0.17 ±± 1.60	Cd 2.29 ± 6.85
T3	B 0.0 ± 0.0	F 0.06 ±± 26.50	E 0.05 ±± 3.70	B 1.21 ±± 140	D 0.10 ±± 0.44	A 0.05 ±± 17.01
T4	B 0.0 ± 0.0	C 0.17 ±± 38.60	A 0.24 ±± 11.30	A 0.17 ±± 16.90	Bc 0.21 ±± 2.96	C 0.10 ±± 7.04
T5	B 0.0 ± 0.0	E 0.11 ±± 35.70	F 0.05 ±± 3.00	C 0.08 ±± 1.300	D 0.04 ±± 0.37	E 0.01 ±± 5.48
T6	B 0.0 ± 0.0	Cd 0.14 ±± 38.20	D 0.12 ±± 5.80	C 0.17 ±± 1.60	Cd 0.76 ±± 1.40	Ed 0.05 ±± 6.12
T7	B 0.004 ± 0.0012	D 0.12 ±± 37.10	Ef 0.18 ±± 3.30	C 0.06 ±± 1.10	D 0.11 ±± 0.50	Ed 0.05 ± 6.03
T8	B 0.0043 ± 0.0015	E 0.12 ±± 34.70	C 0.01 ±± 7.40	C 0.46 ±± 2.10	B 0.87 ± 3.40	Cd 0.03 ±± 6.85
T9	B 0.005 ± 0.0	A 0.92 ±± 50.50	C 0.17 ±± 6.90	C 0.24±1.90	A 1.22 ±± 5.85	B 0.67 ±± 8.01
Significant	*	*	*	*	*	*

Experimental Treatments: [(T1 = standard diet + 0.25 % coriander seeds), (T2 = standard diet + 0.50 % coriander seeds), (T3 = standard diet + 0.25 % rosemary leaves), (T4 = standard diet + 0.50 % rosemary leaves), (T5 = standard diet + 0.50 % coriander seeds + 0.50 % rosemary leaves), (T6 = standard diet + 0.25 % coriander seeds + 0.50 % rosemary leaves), (T7 = standard diet + 0.50 % coriander seeds + 0.25 % rosemary leaves), (T8 = standard diet + 0.25 % coriander seeds + 0.25 % rosemary leaves) and (T9 = standard diet / control group)].

As such, the sub-aim of this research was determining the impacts of varying doses of rosemary leaves and coriander for supplements in the feed. This is to study their serum biochemical characteristics and ability to deposit the minerals in chicken meat. Those parameters are crucial indicators of the physiology state and nutrition of animals and poultry [27]. Using medicinal herbs is becoming an increasingly popular alternative to additives within food over antibiotics [28].

The results of this study for Albumin, Globulin, A/G, and Cholesterol showed no significant differences between all treatments. Only Albumin showed clear differences. Albumin at 0.25% coriander was recorded the highest at 42 days of age, but at the same time, treatment T6 with intermingling (synergy) (0.25 coriander seeds + 0.50% rosemary leaves) was recorded the lowest. This showed a decrease in body saturation and with age. While 0.25% coriander seeds were highest at 42 days, this agreed with the findings of 36 when adding 2% coriander where Albumin was higher at 42 days of age. But, that is the opposite of globulin. The highest value of globulin concentration may be attributed to the resistance of the chicks against different stress factors [29]. Scientists understand the significant impact globulin plays in birds' immune system and that is produced from the lymphatic tissues [30]. For Cholesterol after 42 days, we found no variations of significance between all treatments. This contrasted the serum cholesterol that was less in 2% and 3% than the other groups. Also, it was reported [31] that including coriander oil based on 1% and 0.5% dosage showed a significant decrease in serum glucose and cholesterol in the broiler. Regarding total cholesterol, the results displayed that using 2% coriander powder in the broiler feed was able to lower the total cholesterol [28].

This is in alignment with a study [32] that showed using 2% coriander seed improves overall performance without negative effects on the hemato-biochemical profiles and that it can be used in the feed of broilers for up to 42 days for the maximum benefit. Also, the blood biochemistry parameters were not impacted by treatments in the diet ($p > 0.05$) [33].

This also agrees with [34] when feeding on coriander seeds. All results above (Albumin, globulin, and Cholesterol) are opposite the findings by Abou-Elkhair et al. [34], but the information showed that the concentrated count of serum globulin had a larger significant change T6 (coriander with black pepper and turmeric) when comparing with control and the rest of the treatment groups. This suggests that including a mixture coriander with another to the improved health status of broilers. But for rosemary, these results contrast [30]. When adding 0.5% of rosemary, the highest recording of globulin was found alongside decreased cholesterol. This reflects the ability of poultry at reserving proteins after past their maximum protein allowance through storing within tissues [30]. For Hlration, L and H: Where the results proved the addition of coriander (0.5%), then (0.50% coriander seeds + 0.25% rosemary leaves) led to the highest recording at $p < 0.05$ at the respective ages of 28- and 42-days-old, this is due to the fact that includes coriander with 0.5% as well as the synergy. While the results of [35] were the opposite, there was no difference in H/L as well as H/L ratio among treatments when adding coriander up to 0.3% at 42 days of age. This was against another study: there was no difference in H/L as the H/L ratio when adding many levels even up to 0.3% of coriander seed and this result agreed with Talebi et al. [36]. For AST and ALT: where T7 and T8 [(0.50% coriander seeds + 0.25% rosemary leaves), (0.25% coriander seeds + 0.25% rosemary leaves)] as respectively, was recorded the highest, while the treatments containing coriander (T1, T2) (+0.25%, 0.50%), respectively, were the lowest. These results agree with Al-Jaff [29] that explained AST and ALT were lower for 2% and 3% coriander seed. Both AST and ALT are thought of as liver enzymes that raise the likelihood of damaging the organ (though hepatocellular degeneration). As such, decreasing their content in the concocting of the serum could highlight the hepatoprotective feature of coriander [37]. These treatments led to a decline in liver enzymes ALT and AST [38]. The percentages of albumin, AST, and cholesterol did not have a greater presence than that of the control [34]. We observed T7 (0.50% coriander seeds + 0.25% rosemary leaves) with the recorded the highest for (Albumin, L, and AST) at 42 days of age. We also observed T6 (0.25% coriander seeds + 0.50% rosemary leaves) were recorded the lowest for (Albumin, globulin, and L) at 42, 28, and 42 days of age. We also observed T6 (0.25% coriander seeds + 0.50% rosemary leaves) was recorded the highest for (Albumin, globulin, and Hlration) at 28, 42, and 42 weeks of age, respectively. This contradiction in data [26] revealed a lessened A/G presence for broilers that consume rosemary. Also, the addition of the rosemary aromatic plant to the diet lowered total cholesterol level in a broiler [26]. Furthermore, these findings were supported by Al-Jaff [29] with regard to albumin that was recorded higher at ($p < 0.05$) and which showed lower for ALT, AST, and globulin when used 2% coriander. No major percentage differences occurred between the groups consuming the various treatments.

In general, AST and ALT are considered as liver enzymes which increase liver damage (hepatocellular degeneration), thus the decrease in serum concentration of AST and ALT may provide evidence for the occurrence of hepatoprotective effect of coriander seeds and its essential oil [37]. About cholesterol, it was shown that there were not significant differences among the treatment groups. This agrees with [29] when using coriander. This may be due to the absence of the effect of these herbs on the composition of fat and the low content of omega that decreases cholesterol. This study agrees with [27] when used supplemented with rosemary leaves at 0.5% or 1% were not affected in the same way with the various rosemary supplementations compared with the control group. This was opposite another study where there was no difference in ALT, AST, but rather a decrease in cholesterol concentration in blood serum [35]. Results in a study [28] showed that using coriander extract is a possible antibiotic alternative for broiler diets.

For Glycogen and pH: There are significant differences between the treatments, where the interaction between coriander and rosemary were at the highest levels of 0.50, both recorded the highest reserve ratio of glycogen. We noted that the glycogen concentration decreased significantly in a full dose of coriander when comparing with the control value [38]. These results agree with the conclusion of this recent study. Whilst, the content of hepatic glycogen had a major variation in both doses: with ($p = 0.001$) at low and ($p < 0.001$) at high when compared with the controls [39]. For comparison, the percentage of glycogen was not changed after receiving the treatments for seven days, irrespective of how much supplement was given [39]. Chickens raised for meat products often have an unstable habit of eating, which causes obesity and other related diseases, including: heart failure causing sudden death, issues with their legs, and ascites caused from hastening the eating and improving the types of food suddenly to make them grow quicker and bigger [39]. Accordingly, researchers must devote time and energy into understanding how to balance energy usage in chickens to reduce these issues and limit the possible side effects [39]. The results also agree with [27] when supplemented with rosemary leaves at 0.5% or 1%, as they were not affected in the same way as the various rosemary supplementations compared to the control group. Although glycogen is one of the glucose's polymers, it is retained in muscles to generate ATP [40]. Nevertheless, the glycolysis will continue after the postmortem period for a short time due to the stable glycogen that exists during the demise [40]. Normally, the glycolysis ends before the total glycogen is finished [40]. Particles of lipids (as free fatty acids) and granules from glycogen are sent through the sarcoplasm [40]. Muscles after the animal has died are turned into lactic acid, which is impossible to remove from tissues because there is no circulation [40]. Thus, it remains a factor in the lowering pH levels until it reaches a value that prevents duties performed by the enzymes or until there is no more present glycogen [40]. Scientists understand that stress to the animal before they are slaughtered play a role in PSE characteristics due to the fast rate at which glycogen is consumed and the immediate lowering of pH because the muscles exhibit a heightened temperature [40]. When glycogen has been fully used before the animal is slaughtered, a common trait of animals that are either highly active or who have lived with high-stress levels, their meat will have higher pH levels, such as DFD meat [40].

The negative impact of these traits is linked to heightened glycogen contents in muscles, which produces more lactic acid post-slaughter and lowers the muscle's pH [40]. With a lowered pH, proteins will break down and leave the meat to appear pale due to extra water being held within [40]. This situation is quite like PSE [40]. Also, oxidative fibers have less glycogen that results in higher pH. The differences change in color between different muscles, varying cuts, and also, inside the same cut [40].

For Mineral Discussion: Regarding minerals, because of the seldom-scientific literature dealing with the topic, it was difficult to obtain hard data for the mineral content of meat. This study was, therefore, done as an attempt to gain information on the mineral content of muscles which are currently used in the meat industry.

Feeding on the supplement showed no significant differences for (K and Fe), while feeding on rosemary recorded the highest percentages for (Na, Mg, and Ca) and feeding on coriander recorded the highest percentages for total nitrogen. After 29 days, we found no variations of significance ($p > 0.05$) in the thigh Fe concentration among treatments when feeding on a different diet [41].

Amino acid's profile within any given dietary protein has an impact on how they use nitrogen, as such, those low-quality dietary proteins have displayed more loss of nitrogen and a limit of the proteins synthesizing [42]. The Ca retention was 8.4% at 3 weeks when feeding the chicken phytase supplementation [43]. Four-week-old broilers showed the least levels of Na, with a recording of 62.0 mg/kg and the most profound content of Na was recorded at 84.3 mg/kg after 18 weeks [44].

For ostriches, the contents of P, Mn, and Fe were higher, and Na in their meat was less than that of chicken or beef. Still, K, Ca, Cu, Mg, and Zn are common between both beef and chicken meat [44]. The previous reports refer to Proximate analysis and mineral composition of heart and gizzard from chickens at 8 weeks for Heart and Gizzard {[(Protein (Nx6.25)]}, [(Calcium, Iron, Magnesium, Potassium, and Sodium)] (g/100 g edible portion, mg/100 g edible portion), respectively, were (15.6, 12.3, 5.61, 15.4, 174, 180, and 73.2), (18.2, 7.96, 6.93, 16.8, 138, 236, and 75.1), respectively [44]. Likewise, Mg retention was significantly ($p < 0.0001$) increased by 9.7% [43]. Also, it is considered that calcium has an effect on how energy metabolizes due to how it is a regulator of how lipids metabolize and how triglycerides are stored between cells [45].

Conclusion

Overall, this study shows that the supplementation of coriander and rosemary has the most significant impact when the two are mixed. The highest significant of glycogen (energy store) and AST, ALT, Hlration, L, and Globulin, Albumin was found at 42, 28 days of age, respectively. To concentrate the elements in poultry meat, Mg, Ca, and Na were increased in the rosemary dietary supplement. However, for total nitrogen (considered protein) the diet supplement with coriander was the highest. Further experiments will be required to determine the underlying the effective components of medicinal herbs. This study discovers the benefit of feeding medicinal herbs to poultry. It is possible to implement the findings in the near future and begin testing on mice and pigs, before extending to human consumption. This study helped the researcher to discover the critical components within the impact of adding medicinal herbs to chicken meat. This is one area where research is currently lacking. As such, the research presents a new theory on suitable combinations of these micronutrients, as well as the possibility for additional combinations, as to be included in poultry feed. The addition of these nutrients to chickenfeed will benefit human health upon consumption.

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Competing Interests

There is no present conflict of interest by the author of neither this research nor a declared conflict in researching this article and their findings.

Author contribution

Firas R. Jameel designed the experiments, wrote the manuscript, and approved finally for publication.

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