



Effect of adding lycopene and vitamin C to the diets on the productive performance of broiler chickens raised under heat stress

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Abstract

The purpose of this experiment was to examine the efficacy of lycopene and vitamin C in alleviating heat stress in broilers and improving its overall performance. The experiment used 120 one-day-old broiler Ross 308 not sexed, each weighing 42 g, they were randomly distributed among five treatments with three replications (8 birds/replicate) and raised for 35 days under a temperature above 30 °C during the summer. The following are the experimental treatments: T1 was the first treatment, and it's a no-extras diet. T2: 1 gram of lycopene per kilogram. T3: 2 g of lycopene per kilogram of diet, T4. Lycopene (1 g/kg) and vitamin C (25 mg/kg feed) are combined as the fourth therapeutic option, T5. Lycopene (2 g/kg) and vitamin C (25 mg/kg feed) are combined as the fourth therapeutic option, T4. There were no statistically significant differences in the first three weeks of the experiment, but there were significant differences between the addition treatment and the control treatment in the rate of live body weight from the W2 until the end of the experiment. Feed consumption increases within the first, second and three week of contro treatment. Compared with addition treatments.

Key words: broiler heat stress, Vitamin C, lycopene.

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Introduction

When chickens are raised in temperatures above (30 ° C), heat stress disrupts physiological processes, causing a decrease in growth, productive performance, lowered immunity, and a high mortality rate, this is a problem in hot regions all over the world, especially in Iraq [1] where it accounts for a significant portion of the industry's annual losses. Investigations into the physiological effects of heat stress on birds, specifically to identify more reactive pathways Vitamin E and C, in particular, have been the focus of studies aimed at mitigating this compound's negative effects on human health [2] Vitamin C supplementation in the diet of birds has been shown to increase productivity, enhance egg quality, and increase tolerance to heat stress [1]. Lycopene, a kind of the carotenoid beta-carotene that is abundant in foods like tomatoes, fruits, and red vegetables [3], is also included. Lycopene is one of the most potent natural carotenoid antioxidants, protecting cells from oxidative stress-induced free radical damage [4].

Materials and methods

This experiment was conducted to study the use of lycopene powder compared to Vit C to relieve heat stress and its impact on the productive performance of broiler. 280 one-day-old chicks of ross 120 meat chicks were used, with an average primary weight (35±2) g. These chicks were raised in a closed hall using 15 pens with dimensions (1×1 m) on a brush of sawdust 5 cm thick, and above it chicken paper distributed chicken randomly on seven transactions by four

repeaters per transaction 10 birds per repeater and the duplicates were distributed randomly starting from the first day of life. The chicks were fed within 1-10 days on a starting sheet containing 23.59% protein and 3000 kCal/kg represented energy, and on a growth sheet of 11-24 days containing protein 21.7% and 3081 kCal/kg represented energy, and on a fattening sheet for 25-42 days contained protein 19.7% and 3210.8 kg represented energy. Table (1) shows the components of the relation used in the study and the chemical analysis calculated based [5].

The temperature was 33-35 m. A lighting program (23 hours of light and 1 hour of darkness) was used in the W1 for the purpose of getting the chicks used to get used to the darkness, and from the W2 to the end of the experiment the lighting program (20 hours of light and 4 hours of darkness) was, Relative humidity was within the required limits as instructed by the production guide, and the feed was provided in the form of a crushed and local mint leaf powder and Vit C were added to the meat frog leaf sheet starting in the W2.

The treatments were as follows: (3 replicates per treatment at 8 birds/repeaters)

- First transaction T1: Control is free of any addition.
- Second treatment T2: by 1 g/kg lycopene powder.
- Third treatment T3: by 2 g/kg lycopene powder.
- Fourth treatment T4: by 1g/kg lycopene+ 25 mg vitamin C
- fifth treatment T5: by 2 g/kg lycopene powder+ 25 mg vitamin C

Table (1) chemical composition of the experimental diets

Feed materials %	Starter ration 1-10 kg day	Feed materials %	Growth ration 11-24 days kg	Feed materials %	The final ration is 25-42 days, kg
Wheat	377.35	Wheat	372.25	Wheat	588.85
Bran	100	Bran	100	Bran	100
Soya	320	Soya	272	Soya	165
yellow corn	150	yellow corn	200	yellow corn	100
Oil	10	Oil	16	Oil	10
Permixon 0.1B-S	10	B-G-0.8% Premix	8	Between Finisher	7
Lysine	1.3	Methionine	0.25	Methionine	1
Colin	1	Lysine	1.2	Lysine	2
Threonine	1	Colin	1	Colin	0.5
Enzyme	0.5	Threonine	1.2	Threonine	0.8
Toxbond fort	1	Enzyme	0.5	Enzyme	0.5
Limestone	18.25	Anticoccidia	0.5	Anticoccidia	0.25
Mono Calcium	8	Toxbond fort	1	Toxbond fort	1
		Limestone	17	Genex	0.5
		Mono Calcium	7	Limestone	15.25
		Sodium bicarbonate	0.4	Mono Calcium	5.5
table salt	1.6			Sodium bicarbonate	0.25
		table salt	1.7	table salt	1.6

Statistical Analysis

Averages means were compared using the Duncan multiple range test [6] Farooqi. H.A. g, M. S. Khan, M.A.Khan, M. Rabbani, K. Pervez and J.A.Khan,2005. Evaluation of Betaine and vitamin C in Alleviation of heat stress in broiler. Int.J. Agri. Biol., Vol 7 no 5. 744- 746, and the Completely Randomized Design-CRD was utilized by using statistical program (SAS) according to The following mathematical model:

$$Y_{ij} = \mu + T_i + e_{ij}$$

Results

Table (2) shows that there were no statistically significant between the in the average weight of broiler in first week, while it is noted in the second week that all outperformed the control treatment, while it

was noted in the third week that the fifth and three treatments was outweighed, as they recorded (956 and 950) g, respectively, and the fourth transaction outperformed the first and second treatment, as it recorded 944 g, while the first and second treatment did not differ from each other. as they recorded (921 and 902) g respectively, while it is noted in the fourth week the superiority of the fifth transaction over the rest of the treatment, while the fourth transaction did not differ from the fifth treatment, while the first and second treatment did not differ from each other morally, while in the fifth week the fifth treatment are noted to outperform all treatment, as it recorded 2200 g.

Table (2) Broiler Mean Body Weight (g/bird) (Mean ±Standard Error) as a Function of Lycopene and Vitamin C Liquid in the Diet.

Treatment	W1	W2	W3	W4	W5
T1	137a± 4.1	398b±6.8	902c±6.5	1365d±7.5	1880d±12.1
T2	141a± 3.5	415a±5.9	921c±4.3	1425c±4.9	1955c±10.5
T3	135 a±6.2	410a±4.0	950a± 8.7	1503b±9.2	2013c±2.8
T4	129a±8.1	405a±7.6	944b±6.9	1570ab±12.1	2100b±11.5
T5	133a±2.7	423a ±10.1	956a ±4.2	1612a ±7.5	2200a ±25.1

*If the treatment in a single column are all represented by different letters, then there is no statistically significant difference between them (P<0.05).

**T1 is a control group with no additives; T2 and T3 have lycopene powder added at 1,2 g/kg feed; T5 and T4 have vitamin C added at 25 mg/kg feed.

The results of the statistical analysis in Table (3) indicate that there were no significant differences in the rate of weight gain (P≤0.05) in the first and second week, in all treatment while it was noted in the third week that the third, fourth and fifth treatment exceeded (540, 539 and 533)g respectively, while the second treatment did not differ from the control treatment, while it is noted in the fourth week that the fifth and fourth treatment were superior respectively, as they recorded

(656 and 626) g and the third and second treatment outperformed the control treatment, while in The fifth week notes the superiority of the fifth and fourth treatment and the superiority of the second treatment on the third treatment and the treatment of control, as for the total weight gain we note the superiority of the fifth and fourth treatment on the rest of the treatment. As it recorded (2158 and 2118) g respectively.

Table (3) Broiler Weight Gain Rate (g/bird) as Affected by Dietary Lycopene and Vitamin C Dosages (Mean ±Standard Error)

Treatment	W1	W2	W3	W4	W5	Total weight gain
T1	95a±3.8	216a±3.8	504b±16.5	463c±20.5	515c±8.7	1838c±10.1
T2	99a±2.9	247a±4.5	506b±6.3	504b±8.3	530b±8.2	1913b±10.1
T3	93a±2.1	275a±2.7	540a±5.2	553b±17.2	510c±10.5	1971b±4.2
T4	87a±1.5	276a±15.5	539a±10.1	626a±16.1	590a±13.7	2118a±10.7
T5	91a±4.0	290a±7.2	533a±9.3	656a±18.1	588a±20.1	2158a±30.2

*If the treatment in a single column are all represented by different letters, then there is no statistically significant difference between them (P<0.05).

**There were five treatments total: a control treatment with no additives, two treatments with lycopene powder added at 1.2 grams per kilogram of feed each, two treatments with vitamin C added at 25 milligrams per kilogram of feed, and two treatments with both additives.

It is noted through Table (4) that the amount of feed intake in the first week increased significantly in the third transaction compared to other treatment and control treatment. In the second week, we note the superiority of the fourth transaction compared to other treatment that did not differ among themselves with the control treatment, while for the third week, there were no significant differences between the treatment compared to the control treatment, in the fourth week

there was a significant increase in the control transaction compared to other treatment. We note that in the fifth week the survival of the treatment of control over the rest of the treatment, either the consumption of total feed treatment control recorded the highest consumption of feed compared to the second transaction did not differ the rest of the treatment among themselves.

Table (4) Broiler Feed Consumption Rate (g/bird) as Influenced by Dietary Supplementation with Varying Doses of Lycopene Liquid and Vitamin C (Mean ±Standard Error)

Treatment	W1	W2	W3	W4	W5	Total weight gain
T1	141c±2.0	365c±7.5	602a±13.5	953a±6.1	1350a±17.2	3411a±24.3
T2	147b±1.8	368b±7.8	598a±12.1	948b±10.5	1345b±8.4	3406b±10.7
T3	152a±1.7	366c±6.9	600a±5.8	945b±6.2	1335c±6.1	3398bc±8.3
T4	151ab±2.9	370a±4.8	597a±7.1	939bc±8.3	1340b±21.5	3397c±24.2
T5	149b±1.2	369b±9.9	605a±8.1	939c±7.9	1325c±20.2	3378c±19.3

* If the treatment in a single column are all represented by different letters, then there is no statistically significant difference between them (P<0.05).

**Normative therapy T1 is a control group with no additives; T2 and T3 have lycopene powder added at 1,2 g/kg feed; T5 and T4 have vitamin C added at 25 mg/kg feed;

Table 5 shows that there are no statistically significant differences in the food conversion ratio after the first, second, or W3, but that there are numerical differences. After four weeks, however, there is a statistically

significant increase (P≤0.05) in the control treatment relative to other treatment, and after five weeks, the control treatment's superiority over the other treatment persists.

Table (5) Effect of Lycopene and Vitamin C Liquid Use to Diet on Broiler Trophic Conversion Factor (Mean ±Standard Error)

Treatment	W1	W2	W3	W4	W5
T1	1.48±0.08	1.39±0.06	1.19a±0.07	2.05a±0.10	2.62a±0.07
T2	1.48±0.07	1.34±0.04	1.18a±0.03	1.88b±0.05	2.53a±0.02
T3	1.63±0.05	1.33±0.00	1.11a±0.04	1.70c±0.02	2.61a±0.06
T4	1.73±0.01	1.34±0.13	1.10a±0.02	1.50d±0.01	2.27c±0.08
T5	1.63±0.03	1.27±0.03	1.13a±0.05	1.41d±0.03	2.25c±0.09

*If the treatment in a single column are all represented by different letters, then there is no statistically significant difference between them (P<0.05).

**Normative therapy T1 is a control group with no additives; T2 and T3 have lycopene powder added at 1,2 g/kg feed; T5 and T4 have vitamin C added at 25 mg/kg feed;

Discussion

The improvement in relative weight, weight gain, feed consumption and feed conversion ratio is due to the benefits and advantages of lycopene liquid and vitamin C, as its anti-stress effect and vitamin C as a reason to improve the productive performance of birds, and because lycopene contains red carotenoids, they may be the reason for removing free radicals [7]. vitamin C supplementation in the diet of birds subjected to high temperatures reduces the proportion of corticosterone hormone in the blood and increases the secretion of thyroid hormone from the thyroid gland, both of which play a role in maintaining metabolism and regulating temperature in birds.

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تأثير اضافة الليكوبين و فيتامين سي الى العليقة في الاداء الانتاجي لفروج اللحم المربي في ظروف الاجهاد الحراري

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- تاريخ استلام البحث 2023/06/21 وتاريخ قبوله 2023/08/15.
 - البحث مسنن من رسالة ماجستير للباحث الاول .

الخلاصة

لقد اجريت هذه التجربة ، لدراسة استخدام الليكوبين مقارنة ب فيتامين C مخففا للإجهاد الحراري واثره على الاداء الانتاجي لفروج اللحم. وتم استخدام 120 فرخا بعمر يوم واحد من فروج اللحم نوع Ross 308 غير مجنسة ، بوزن 42 غم ، ، وزعت الأفراخ عشوائيا على خمس معاملات بواقع ثلاث مكررات لكل مكرر 8 طير/ مكرر وتم توزيع المكررات عشوائيا ابتداء من اليوم الأول استمرت التجربة 35 يوما . وكانت معاملات التجربة كالتالي: المعاملة الاولى T1 :عليقة بدون اي اضافة. المعاملة الثانية T2 : بنسبة 1 غم / كغم علف من الليكوبين. المعاملة الثالثة T3 : بنسبة 2 غم / كغم علف من الليكوبين. المعاملة الرابعة T4 : مخلوط من الليكوبين بنسبة 1 غم / كغم مع فيتامين C بالتوصيات القياسية 25ملغم /كغم علف. المعاملة الخامسة T5 : مخلوط من الليكوبين بنسبة 2 غم / كغم مع فيتامين C بالتوصيات القياسية 25ملغم /كغم علف. اظهرت النتائج وجود فروق معنوية ($P \leq 0.05$) بين معاملات الاضافة ومعاملة السيطرة في معدل وزن الجسم الحي ابتداء من الاسبوع الثاني لغاية نهاية التجربة ،والزيادة الوزنية الاسبوعية في الاسبوع الرابع والخامس كذلك الزيادة الوزنية الكلية ،لم تكن هناك فروق معنوية في الاسبوع الاول والثاني والثالث ولكن هناك فروق معنوية في معاملات الاضافة في الاسبوع الرابع والخامس مقارنة مع مجموعة السيطرة في معامل التحويل الغذائي ،نلاحظ ازدياد في استهلاك العلف في الاسبوع الاول والثاني والثالث من التجربة مقارنة مع مجموعة السيطرة بينما في الاسبوع الرابع والخامس فيلاحظ انخفاض في استهلاك العلف لصالح مجاميع الاضافة مقارنة مع معاملة السيطرة.

الكلمات المفتاحية : الاجهاد الحراري للدجاج التسمين ، فيتامين سي ، الليكوبين .