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Article

Effect of adding different levels of lemongrass powder to diets on the productive performance of broilers chicken

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ABSTRACT

This study was conducted at the University of Baghdad / College of Agricultural Engineering Sciences to show the effect of adding lemongrass leaf powder (Cymbopogon citratus) and vitamin C to broiler diets at different levels on the productive traits of broilers. This experiment was conducted in the poultry field (Abu Ghraib) / Department of Animal Production / Agricultural Engineering Sciences/ for a period from 10/15/2021 to 11/26/2021 for a period of (42 days). The study used 240 unsexed commercial hybrids (Ross 308) of one-day-age chicks. They were randomly assigned to 6 treatments and 4 replicates for each treatment (10 chicks/duplicate). The experimental treatments were as follows: Control treatment T1 (feed without supplement), treatment T2 (add lemongrass 2 g/kg feed), T3 (add lemongrass 4g/kg feed), T4 (add lemongrass 6g/kg feed), treatment T5 (add lemongrass 8g/kg feed), Treatment T6 (add vitamin C 0.5 g/kg feed). Suppose we noted no differences between the addition treatments and the control treatment during the experiment period in the productive traits. In that case, we note that there are no significant differences between all the additional treatments compared to the control treatment despite their arithmetic differences.

Keywords: lemongrass, broiler, productive traits

INTRODUCTION

Nutrition science is one of the most important basic sciences in the poultry industry, where the poultry industry occupies a basic and effective pillar in covering part of the nutritional needs of humans. It has made great progress in recent years in terms of nutrition and economics. The productivity of poultry has increased significantly and with high efficiency [1]. Therefore, international companies specialized in the broiler industry began to produce new breeds with high production specifications to provide the minimum requirements for food security (Valeria, 2011, Pamela), which encouraged researchers to study some food additives that have a significant impact in supporting the productive and physiological state of domestic birds and be safe at the same time. Among these additives is what is known as medicinal plants [2], which were introduced into poultry feed as an alternative to chemical antibiotics [3] Extracts of leaves, stems, roots, flowers and buds of these plants contain active substances [4] represented by flavonoids, terpenoids, alkenes, sulfites, polyphenolics, carotenoids and saponins

(Bestami et al., 2009). This is due to its stimulating role in the properties of digestion and absorption and increases the activity of digestive enzymes and antioxidants. 5 The most important of these plants is lemongrass, its scientific name (Cymbopogon flexuosus), an aromatic tropical perennial of the grassy or herbaceous family, which grows in the wild in India, It is characterized by its distinctive aromatic smell similar to that of citrus, in particular the smell of lemon fruits.

MATERIALS AND METHODS

This experiment was conducted in the Department of Animal Production poultry field at the College of Agriculture - University of Baghdad (Abu Ghraib) from 10/15/2021 to 11/25/2021. For a period of (42 days), 240 unsexed (Ross 308) chicks of one day age with a starting weight of g/chick were used in the study, as shown in Table (1). The chicks were raised on the bed of sawdust, and the chicks were distributed randomly on 6 treatments with 4 replications for each treatment. Each replicate contained 10 chicks. The chicks were raised in a hall divided by metal wire barriers in the form of pens (Pens), each with an area of 2 x 1.5 m. The frequencies were randomly homogeneously distributed among the two populations since the first day of the chicks' lives. Water and fodder were provided freely (adlibitum) during the experiment period. Feed dishes were used to feed the chicks in the first week, and one dish was placed for each of the animals, after which they were replaced with hanging cylindrical plastic feeders with a diameter of (45 cm). Manual plastic sieves with a capacity of (5 liters) for the experiment and the continuous lighting system (23 hours a day) give an hour of darkness per day to accustom the chicks to the darkness and prevent their disturbance when the electricity suddenly cuts out.

The room temperature was controlled using the gas incubator and electric heaters to obtain a temperature of 34º - 35º C for the first three days of the chicks' life. Then, it was reduced to 33-32º C until the end of the first week, and then it was gradually reduced to the end of the experiment period to settle at a temperature of 22-20º C. The experiment continued for 42 days, and the productive traits were measured each week, including body weight, weight gain, consumed feed and food conversion ratio. The complete randomized design (CRD) was used, and a significant comparison was made between the means of the Duncan polynomial test (1995) and the ready-made statistical program (SAS 2010) was used in the statistical analysis.

T6	T5	T4	T3	T2	T1	treatments
41.66	40.76	39.9	41.33	41.23	40.8	Lamb weight (g)

Table 1. weight of chicks (g) at one day age

final diet 25- 42 days	growth diet 11 - 24 days	starter diet 1 – 10 days	%Feed material
47.6	44.5	43.7	Crushed yellow corn
15	16	14.7	Crushed wheat (local)
26	29	32.5	soybean meal 48%
5	5	5	Protein Concentrate (1)
4.2	3.4	2	sunflower oil
1.1	1.1	1.1	limestone
0.6	0.6	0.6	Dicalcium Phosphate DCP
0.3	0.2	0.2	table salt
0.2	0.2	0.2	Vitamins & Minerals Blend (2)
100	100	100	total
Chemical Analysis Calculated Based on NRC (1994)			
20.2	21.5	23,01	Crude protein (%)
3180.3	3108.9	3000.94	Represented energy (kilocalories/kg of feed)
1.13	1.2	1.31	Lysine (%)
0.77	0. 84	0.88	Methionine + Cysteine (%)
0.89	0.88	0.90	Calcium (%)
0.43	0.46	0.47	Available phosphorous (%)

Table 2. Ingredients and chemical composition (%) of the diets used in the experiment 1-42 (day). (1) BROCON-5 SPECIAL W, of Dutch origin. Each kg contains 40% crude protein, 5% fat, 2.81% fiber, 3.14% calcium, 2.65% phosphorous, 2.50% sodium, 3.88% chloride, 3.85% lysine, 3.70% methionine, 4.12% methionine + cysteine, 2107 Kilo Calories/Kg Represented Energy, 20000 IU Vitamin A, 80000 IU Vitamin D3, 600 mg Vitamin E, 50 mg Vitamin K3, 50 mg Vitamin B1, 140 mg Vitamin B2, 80 mg Vitamin B6, 700 µg B12, 20 mg Acid Folic, 5 mg citric acid, 2 mg biotin, 800 mg niacin, 1 mg iron, 200 mg copper, 1,600 mg manganese, 1,200 mg zinc, 20 mg iodine, 5 mg selenium, 6 mg cobalt, 33.50 mg antioxidant (BHT).(2) A mixture of vitamins and minerals, each kg of which contains 5000 IU Vitamin A, 600 IU D3, 10 mg E, 2 mg K3, 2 mg B1, 2 mg B2, 2 mg B6, 5 micrograms B12, 10 mg C, 15 mg niacin, 500 mcg folic acid, 5 mg D-calcium phosphate, 40 mg zinc, 100 mcg cobalt, l50 mg lysine.

The feed entered by installing the rations was crushed using a vertical electric grinder. Small quantities of crushed corn were mixed with lemongrass leaves powder with a small amount of oil due to its low added quantity and to gradually ensure a homogeneous manual mixing. The bags were marked with the transaction numbers.

RESULTS

Average body weight (g/bird):

The data in Table (3) indicate the effect of adding different levels of lemongrass leaf powder to broiler diets for 1-6 weeks on average live body weight, as we note that there are no significant differences between the experimental treatments at week (1, 2 and 3 of the experiment) among all treatments. At the same time, we notice a significantly excelled($0.05 \leq p$) in favor of treatment T6, which recorded (1405.93 g) compared to each of the control treatments T1, t2 and t4, which recorded (1317.03, 1307.87, 1272.3 g) respectively at the fourth week. This did not differ significantly from each of the treatments t3 and t5 with the control treatment and the rest of the other treatments at the fifth week, all the addition treatments did not differ from the control treatment t1 but the significant difference was between the same addition treatments, if we notice a significantly excelled in favor of treatment t6 compared to both treatment t2 and t4. This did not differ significantly from the rest of the treatments, both t3 and t5. As for the sixth week of the experiment, we noticed no significant differences between the experimental treatments.

Average body weight (g) for weeks						treatments
Sixth week	Fifth week	, fourth week	, third week	, second week	first week	
2638.77±15.47	1988.97±28.28 B.A.	1317.03± 25.93 B	791.83±18.16	427.73±18.9	151.03±7.14	T1
2673.87±27.89	1963.67±24.99 B	1307.87±6.87 B	788.33±17.84	425.66±7.44	146.8±4.044	T2
2734.23±15.38	2042.43±25.63 B.A.	1338.47±10.64 B.A.	779.1±15	432.66±10.68	147.9±7.95	T3
2645.5±26.72	1943.67±23.16 B	1272.3±18.32 B	793.6±38.4	421.53±16.27	147.53±2.36	T4
2702.87±18.41	1997.53±81.55 B.A.	1352.1±36.1 B.A.	788.1±58.31	452.13±21.68	157.5±5.65	T5
2761.67±100.98	2126.20±38.72 A	1405.93±30.52 A	838±16.04	448±20.66	151.53±5.27	T6
N.S.	*	*	N.S.	N.S.	N.S.	significance level

Table 3. The effect of adding lemongrass powder (Cymbopogon citratus) to the diets on the average live body weight of broilers, g/bird (mean ± standard error) for 1-6 weeks

Weight gain (g/bird):

Table (4) results indicate the effect of adding different levels of lemongrass, vitamin and vitamin C to broiler diets on the weekly and cumulative weight gain rates for 1-6 weeks. We noticed no significant differences between the different experimental treatments at weeks 1, 2, 3, 5, and 6 of the experiment, while we noticed a significant excel ($0.05 \leq p$) in the fourth week in favor of treatment T6. It was recorded (567.93 g) compared to the T4 treatment, which recorded the lowest level during the experiment period for live weight (478.7 g). Among the treatments, adding all of them with the control treatment did not differ significantly. The same is true for the cumulative period if we notice significant differences between all the experimental treatments.

Average cumulative weight gain 1-6 weeks	Weight gain rate (gm/bird) for weeks						treat-ments **
	Sixth week	Fifth week	fourth week	third week	sec-ond week	first week	
2597.97±16.46	649.8±33.32	671.93±4.54	525.2±8.24BA	364.1±4.565	276.7 ± 13.25	110.2± 5.93	T1
2632.63±28.10	710.2±18.49	655.8±18.2	519.53 ± 11.16BA	362.66±10.56	278.86 ± 10.98	105.56±3.91	T2
2692.9±15.25	691.8±36.94	703.96±16.68	559.36 ± 16.74A	346.43±24.7	284.76 ± 6.66	106.56±8.23	T3
2605.6±26.45	701.83±22	671.36±24.6	478.7± 30.33 B	372.00± 28.00	274.00 ± 14.30	107.63± 2.400	T4
2662.1±..9919	705.33±99.73	645.43±51.39	564± 23.94 A	335.96±42.31	294.63 ± 16.34	116.73±5.18	T5
2720±100.86	635.46±69.67	720.26±36.1	567.93 ± 14.70 A	390.00±5.68	296.46 ± 17.93	109.86±5.05	T6
N.S.	N.S.	N.S.	*	N.S.	N.S.	N.S.	signifi-cance level

Table 4. Effect of adding lemongrass powder (Cymbopogon citratus) to the starter, growth and final diet for 1-6 weeks on the average weekly and total weight gain of broilers, g/bird (mean ± standard error).*Different letters within the same column indicate significant differences at the level ($p < 0.05$).N.S.: Indicates that there are no significant differences between the treatments. T1 control treatment (diet without additions) T2, T3, T4 and T5, adding lemongrass powder (0.4, 0.2, 0.6, 0.8, 1) g, respectively, and T6 vit c 0.5% g.**

Feed consumption rate

The data in Table (5) shows that the addition of lemongrass leaf powder to the diets for 1-6 weeks in the amount of feed consumed showed that there was a significant excel of treatment T6 significantly ($p<0.05$), which recorded (807.2 g/bird) over treatment T1, T4, the control that recorded the lowest rate of consumption. Feed (723.06 g/bird) and (735 g/bird). At the same time, no significant difference was observed between the treatments T2, T3, and T5, while they excelled in the control and T4 treatments in the fourth week. Whereas treatment T6 excelled on both T2 and control treatment in the fifth week of the experiment. Also, treatment T6 excelled the control treatment and the rest of the treatments at the cumulative feed consumption rate from 1 to 6 weeks and treatment T6, T4. The results of the statistical analysis of Table () related to the effect of adding lemongrass leaf powder to Ross308 broiler diets for 1-6 weeks on the average feed conversion ratio during the trial period showed that there was a significant improvement in treatment T5 compared to the control treatment and the T4 treatment. It was noted that there were no significant differences between the control treatments and the rest of the treatments in the third week of the experiment. In contrast, in the fifth week, it was noted that the T5 treatment was superior to the control and the rest of the experimental treatments.

Feed consumed rate (g/bird(							treat-ments **
Cumulative feed con-sumption rate from 1-6 weeks	Sixth week	Fifth week	, fourth week	, third week	, second week	first week	
4054.17± 56.39 B	1341.3±39. 29	1041.6±6.7 B.A.	735± 9.79 C	481.66±20 .58	320.4±1 1.9	134.2±3.8	T1
4164.1± 23.91 BA	1413.7±35	1029.7±10. 64 B	773.433±19. 85B	486.33±18 .17	338.46 ±8.42	122.46±13 .18	T2
4193.03±2 2.68 B.A.	1430.2±17. 81	1075.53±1 9.56 B.A.	753.63±6.11 CB	487.83±2. 19	315.4 ±14.24	130.4±14. 49	T3
4171.67±1 0.57 B.A.	1478.27±4 1.2	1062±15.3 B.A.	723.06±2.03 C	461.4±16. 61	321.6±9. 1	125.33±7. 7	T4
4143.43 ±50.59 BA	1337.03±5 9.19	1056.8±27. 51 B.A.	772.33±2.29 B	501.53±25 .78	337±11. 22	138.73±6. 13	T5
4231.8±57. 4 A	1347.07±6 6.63	1101.07±2 9.38 A	807.2±10.94 A	519.26±18 .59	324.33± 8.05	132.86±5. 21	T6
*	N.S.	*	*	N.S.	N.S.	N.S.	signifi-cance level

Table 5. Effect of adding lemongrass powder (Cymbopogon citratus) to the starter, growth and final diet for 1-6 weeks on the average weekly and total feed consumption of broilers, g/bird (mean ± standard error).*Different letters within the same column indicate significant differences at the level ($p < 0.05$). N.S.: Indicates that there are no significant differences

between the treatments. ** T1 control treatment (diet without additions) T2, T3, T4 and T5, adding lemongrass powder (0.4, 0.2, 0.6, 0.8, 1) g, respectively, and T6 vit c 0.5% g.

Food Conversion ratio(g/g) Weight gain							treatments **
Nutritional and cumulative conversion ratio from 1 to 6 weeks	Sixth week	Fifth week	, fourth week	, third week	, second week	first week	
1.56±0.01	2.07±0.072	1.55±0.009 B.A.	1.399±0.007	1.32±0.06 B	1.159± 0.01	1.22±0.04	T1
1.58±0.01	1.99±0.02	1.57±0.03 BA	1.48±0.01	1.34±0.029 BA	1.21±0.07	1.15±0.08	T2
1.55±0.006	2.07±0.09	1.52±0.01 B	1.34±0.03	1.42±0.11 B.A.	1.1±0.02	1.21±0.05	T3
1.6±0.02	2.11±0.09	1.58±0.03 B.A.	1.52±0.1	1.25±0.09 B	1.17±0.04	1.162±0.05	T4
1.54±0.04	1.87±0.4	1.69±0.14 A	1.36±0.09	1.64±0.26A	1.1±0.05	1.19±0.003	T5
1.56±0.029	2.15±0.13	1.54±0.03 B	1.41±0.02	1.32±0.04 B	1.11±0.046	1.2± 0.02	T6
N.S.	N.S.	*	N.S.	*	N.S.	N.S.	significance level

Table 6. Effect of adding lemongrass powder (Cymbopogon citratus) to the starter, growth and final diet for 1-6 weeks on the weekly and cumulative feed conversion ratio (g. feed/weight gain) for broilers (mean ± standard error).*Different letters within the same column indicate significant differences at the level (p < 0.05).N.S.: Indicates that there are no significant differences between the treatments. T1 control treatment (forage without additions) T2, T3, T4 and T5, adding lemongrass powder (0.4, 0.2, 0.6, 0.8, 1) g, respectively, and T6 vit c 0.5% g.**

DISCUSSION

Lemongrass is cultivated mainly for its essential oil, which has several medicinal uses, including a pain reliever [6, 7]. It is antibacterial [8], antifungal [9], an antioxidant, anticancer, and anti-inflammatory [10], in addition to being antitussive and general antiseptic [11].

CONCLUSIONS

The study concludes by evaluating lemongrass as a food additive in poultry diets and identifying how adding lemongrass to poultry diets affects physiological performance.

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