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ADDING LEMON VERBENA (ALOYSIA CITRIODORA) LEAVES POWDER TO THE DIET AND ITS EFFECT ON THE PRODUCTIVE PERFORMANCE OF BROILER

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ABSTRACT

This experiment was conducted to compare the addition of different levels of Aloesia citriodora leaf powder and the antibiotic oxytetracycline to the feed on the productive performance of broilers. The experiment was conducted in the poultry field of the Department of Animal Production at the College of Agricultural Engineering. Sciences - University of Baghdad (Abu Ghraib) during the period from 10/29/2022 until 12/10/2022 for a period of 42 days. In the study, 300 one-day-old unsexed broiler chicks (ROSS 308) were used. The chicks were randomly distributed among five treatments and five replications. One replicate contained 12 chicks, and the treatments were as follows: T1: control, T2: diet with the addition of oxytetracycline powder at a rate of 250 mg/kg feed, the treatment of T3, T4, and T5 diets with the addition of Aloysia Citriodora leaves powder at a rate of 1, 1.5 and 2%, respectively. The results showed that there was a significant increase (P<0.05) in favor of the T2 treatment, which did not differ significantly with T1, T3, and T5 compared to the T4 treatment for both the characteristics of average body weight and weight gain, and both the treatment T2 and T3 achieved a significant increasing (P<0.05) for the feed intake, it did not differ significantly with T1 and T5 compared with the T4 treatment. As for the characteristic of the feed conversion ratio, the enhancement was in favor of the T2 treatment, which did not differ significantly from treatments T1, T3, and T4.

Key words: **herbal medicines, antibiotics, limonene**
***Part of M.Sc. thesis of the 1st author**

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INTRODUCTION

The use of preventive doses of antibiotics in the feeding of poultry has led to an improvement in growth, feed intake, a decrease in pathogens, and a decrease in mortality resulting from diseases. However, the growing concern about the spread of antibiotic-resistant bacteria and the accumulation of these antibiotics in animal products has led organizations to ban them within the European Union since 2006 (Zeng et al., 2015). Therefore, it is necessary to find food additives from natural sources as effective alternatives to improve the general performance of domestic birds, and most importantly, they do not have side effects that affect the health of birds or the health of humans consuming animal products, as new commercial additives derived from medicinal and aromatic plants and their pure components have become part of the alternative future food strategy. These plants contain several effective compounds with antimicrobial activity that make them an alternative to antibiotics because of their different effects, especially therapeutic ones, due to the diversity of their chemical compositions and active substances (Alagawany et al., 2021), and their role in

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stimulating growth and their positive effect on the digestive system by stimulating digestive enzymes juices (Sarker & Oba, 2018), it also improves liver function. In addition to its role as natural antioxidant (Pliego et al., 2022), and as a stimulant for the immune system, as well as improving the productive and physiological performance of birds (Oluwafemi et al., 2020). One of the natural alternatives belonging to medicinal plants and their herbal extracts that can be used as an antibiotic and a natural growth stimulator is the (Aloysia citriodora), which is a plant species belonging to the Aloysia genus of the Verbena family that contains many effective compounds such as terpenoids and phenolic compounds that have antioxidant properties Its leaves are rich in phenolic compounds which has antioxidant and anti-inflammatory properties and its leaves are rich in phenolic compounds that have strong antioxidant activity (Abadi et al., 2014; Lira et al., 2008; Shahhoseini et al., 2013). Therefore, the results of studies conducted on Aloysia citriodora showed an increase in the body's immunity, in addition to containing many other plant compounds with antimicrobial properties and improving the digestion process, such as the compound of curcumin, luteolin, and limonene (Hudaib et al., 2013; Jaradat et al., 2021; Shahhoseini et al., 2013). However, its leaves contain an essential oil that contains many antibacterial and antimicrobial properties such as limonene, citral, geraniol, neral, and linalool (Casamassima et al., 2012; Shahhoseini et al., 2013). The Aloysia citriodora plant is safe to use and has not shown any negative effect due to its use in several fields of cosmetic medicine and nutrition (Oukerrou et al., 2017; Simon et al., 1984), in addition to the functions and effects indicated on the vital characteristics of humans and animals and the absence of any studies on its effects on the productive and microbial performance of broiler chickens. The current research was conducted to achieve the following objectives: Comparison of adding Aloysia citriodora leaves powder as a growth stimulant instead of oxytetracycline to broiler diets on productive performance.

MATERIALS AND METHODS

Diets and management

The experiment was conducted in the poultry field of the Animal Production Department at the College of Agricultural Engineering Sciences - University of Baghdad (Abu Ghraib) for the period from 29/10/2022 to 10/12/2022 for 42 days. 300 one-day-old unsexed broiler chicks (ROSS 308) were used in the study, with average weight of 42.42 g/chick, distributed randomly to five treatments by five replicates for each treatment. One replicate contained 12 chicks, as follows: The first treatment T_1 control treatment (diet without addition), T_2 diet with the addition of oxytetracycline powder at a rate of 250 mg/kg feed, the treatment of T_3, T_4, and T_5 diets with the addition of Aloysia Citriodora leaves powder at a rate of 1, 1.5 and 2%, respectively. The feed and water were provided free during the trial period. The chicks were fed on the starter, growth and finisher diet in Table (1). All treatments were made to meet the nutritional requirements of the chicks according to the requirements of the strain show in Table (1), and artificial light was used in addition to normal daylight to provide a photoperiod of 23 hours/day and one hour of darkness. The hall temperature was controlled using a gas incubator and electric heaters to obtain a temperature of 34ºC during the first three days of the chicks' life, after which it was reduced to 32-33ºC until the end of the first week, and then gradually decreased until the end of the experiment period to stabilize at a temperature of 20ºC -22ºC. The experiment lasted for 42 days, and the productive traits were measured for each week of the experiment, which included body weight, weight gain, feed intake, and feed conversion ratio (FCR).

Plant material

Lemon verbena leaves were obtained from local markets. The chemical composition and detection of phytochemical substance were determined by High performance liquid chromatography (HPLC) technique (Tables 2, 3, 4).

Statistical analysis

The experiment data were analyzed using Complete Randomized Design (CRD) to the

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compare the addition of different levels of *Aloysia Citriodora* leaves powder and the antibiotic oxytetracycline to broiler diets in productive performance. The significant comparison between the averages was done by the Duncan's multiple range test (Duncan, 1955), and the statistical program SAS (SAS Institute, 2012) was used in the statistical analysis.

Table1. Components and chemical composition (%) of the diets used in the experiment (1-42 days)

Component	Starter diet (1-10)	Grower diet (11-24)	Finisher diet (25-42)
Yellow corn	43.8	44.5	47.6
Wheat	14	15.9	15
Soybean Meal	32.7	29	26
Protein concentration(1)	5	5	5
Oil	2.2	3.4	4.2
Limestone	1.1	1.1	1.1
Dicalcium phosphate (DCP)	0.7	0.6	0.6
Salt	0.3	0.3	0.3
Vitamin-Mineral premix(2)	0.2	0.2	0.2
Total	100	100	100
Chemical composition(3)			
Crude protein%	23,01	21.5	20.2
Metabolic Energy keal/kg	3005.83	3108.9	3180.3
Lysine %	1.31	1.2	1.13
Methionine+ cystine %	0.88	0. 84	0.77
Calcium %	0.90	0.88	0.89
Phosphors%	0.47	0.46	0.43

(1) Protein concentrate type BROCON - 5 SPECIAL W Dutch origin. Each kg contains: 40% crude protein, 5% fat, 2.81% fiber, 3.14% calcium, 2.65% phosphorus, 2.50% sodium, 3.88% chloride, 3.85% lysine, 3.70% methionine, 4.12% methionine + cysteine, 2117 kcal / kg dietary energy, 20,000 IU vitamin A, 80,000 IU vitamin D3, 600 mg vitamin E, 50 mg vitamin K3, 50mg Vitamin B1, 140mg Vitamin B2, 80mg Vitamin B6, 700 µg B12, 20mg Folic Acid, 5mg Citric Acid, 2mg Biotin, 800mg Niacin, 1mg Iron, 200mg Copper, 1,600mg Manganese, 1,200mg Zinc, 20 mg iodine, 5 mg selenium, 6 mg cobalt, 33.50 mg antioxidant (BHT).

(2) A mixture of vitamins and minerals that each kg contains: 720,000 IU vitamin A, 168,000 IU D3, 800 mg E, 80 mg B1, 80 mg B2, 80 mg B6, 5, 800 mg niacin, 500 micrograms folic acid 5 mg dicalcium phosphate, 40 mg zinc, 100 mcg cobalt, 50 mg lysine

Table 2. Chemical analysis of *Aloysia Citriodora* leaves powder leaves powder

Ingredients	Chemical composition %
Crude protein	8.22
Crude fats	2.3
Crude Fibers	26
Moisture	6.67
Ash	15
Total carbohydrates	41.81
Energy	2030

Table 3. Estimation of the total content of the active groups in *Aloysia Citriodora* leaves powder

Effective aggregates	Concentration
Total phenolic content (mg /100 gm)	225.9
Total flavonoid content (mg / 100 gm)	185.6
Total alkaloid content %	13.6
Total terpinoid content %	14.5
Total glycoside content %	6.2
Total saponins content %	2.6

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Table 4. The most important active compounds in *Aloysia Citriodora* leaves powder

Active ingredient	Concentration
Camphor %	12.5
Limonene %	8.9
Linalool %	6.5
Myrcene %	8.1
n-Hexane%	0.8
A-Pinene%	4.58
Neral %	20.6
Citral%	28.2
Geraniol%	21.5
Luteolin (mg / kg)	15.49
Curcumin (mg / kg)	6.25
Vit C (mg / kg)	20.5
Vit A (IU)	124.5

RESULTS AND DISCUSSION

The results in Table (5) indicate a comparison of the addition of *(Aloysia citrodora*) leaves powder and oxytetracycline to the diet and its effect on the average live weight of broiler chickens for the period from (1-6 weeks), as it can notice a significant superiority ($P<0.05$) in favor of treatment T_2 compared with treatment T_3, T_4, and T_5 in the first week, and it did not differ significantly with treatment T_1, while there were no significant differences in the treatment of the different experiment at the second week of age. As for the third week, the superiority was significant ($P<0.05$) in favor of treatment T_1 and T_2 compared to treatment T_4, while they did not differ significantly with treatment T_3 and T_5, and the significant superiority ($P<0.05$) continued at the fourth week in favor of T_2 treatment compared with T_4 and T_5 treatment, while it did not differ significantly with T3 and T1, but at the fifth week, T_2 treatment was significantly superior ($P<0.05$) compared with T_1 and T_4, while it did not differ significantly with treatment T_3 and T_5, but at the sixth week, we notice a significant superiority ($P<0.05$) in treatment T_2 compared with T_4, while it did not differ significantly with T_3, T_1, and T_5 treatment. The results of Table (6) indicate a comparison of the addition of (*Aloysia citrodora*) leaves powder and oxytetracycline to the diet and its effect on the weight gain of broiler chickens for the period from (1-6 weeks), as can notice in a significant superiority ($P<0.05$) in favor of treatment T_2 compared with treatment T_3, T_4, and T_5 in the first week, while it did not differ significantly with treatment T_1. Besides, there were no significant differences in the different experiment treatments at the second week of age, but in the third week, the superiority was significant ($P<0.05$) in favor of treatment T_1 and T_2 compared with treatment T_4. While they did not differ significantly with treatment T_3 and T_5, there was a significant superiority ($P<0.05$) in the fourth week in favor of treatment T_2 compared with treatment T_4, while it did not differ significantly with treatments T_1, T_3, and T_5. As for the fifth week, the T_5 treatment was significantly superior ($P<0.05$) compared to the T_1 treatment, while it did not differ significantly from the T_2, T_3, and T_4 treatments. But at the sixth week, there were no significant differences in the different experimental treatments, in terms of the total cumulative increase (1-6 weeks), can notice a significant superiority in favor of treatment T_2 compared with treatment T_4, while it did not differ significantly with treatment T_1, T_3, and T_5.

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Table 5. The effect of adding *Aloysia citrodora* leaves powder on the average live body weight of broiler chickens, g/bird (mean ± standard error)

Treatments *	Average live body weight (g)						
	Weight at one day old	First week	Second week	Third week	Fourth week	Fifth week	Sixth week
T1	42.41 ±0.06	142.58 ±1.59 ab	407.16 ±7.51	914.18 ±7.65 a	1554.92 ±22.68 ab	2248.67 ±37.03b	3068.25 ±24.38 ab
T2	42.10 ±0.13	150.08 ±3.84 a	420.83 ±11.75	914.25 ±31.91 a	1597.58 ±33.11 a	2377.17 ±31.58 a	3176.72 ±77.92 a
T3	42.41 ±0.08	131.25 ±4.73 c	393.08 ±15.36	867.58 ±15.36 ab	1520.92 ±19.65abc	2289.50 ±21.62 ab	3122.67 ±15.01 ab
T4	42.70 ±0.09	130.50 ±3.91 c	384.50 ±19.08	825.75 ±23.65 b	1445.33 ±34.91 c	2218.92 ±38.93 b	2977.67 ±48.49 b
T5	42.50 ±0.00	134.00 ±1.87 bc	385.28 ±6.43	863.50 ±19.52 ab	1497.57 ±26.84 bc	2284.20 ±20.30 ab	3076.42 ±46.56 ab
Significance level	N.S	**	N.S	**	**	**	**

**Different letters within one column indicate significant differences at (p<0.05) level
N.S: indicates that there are no significant differences between the treatments.
* T_1: control treatment (diet without addition) T_2 (adding the antibiotic oxytetracycline at a rate of 250 mg/kg) T_3, T_4 and T_5 (adding *Aloysia citrodora* leaves powder at a rate of 1% and 1.5% and 2%).

Table 6. Effect of adding *Aloysia citrodora* leaves powder on the average weekly and total weight gain of broiler chickens, g / bird (mean ± standard error)

Treatments *	Weight gain (g)						
	First week	Second week	Third week	Fourth week	Fifth week	Sixth week	Cumulative weight gain from 1 to 6 weeks
T1	100.16 ±1.62 ab	264.58 ±6.85	507.01 ±3.39 a	640.73 ±17.81 ab	693.75 ±51.63 b	819.58 ±21.86	3025.83 ±24.36 ab
T2	107.98 ±3.78 a	270.75 ±10.05	493.41 ±26.01 a	683.33 ±27.09 a	779.58 ±22.42 ab	799.55 ±49.62	3134.62 ±77.94 a
T3	88.83 ±4.75 c	261.83 ±5.27	474.50 ±9.34 ab	653.33 ±11.61 ab	768.58 ±12.96 ab	833.16 ±10.18	3080.25 ±15.05 ab
T4	87.80 ±3.84 c	254.00 ±16.54	441.25 ±10.47 b	619.58 ±15.62 b	773.58 ±14.59 ab	758.75 ±19.48	2934.97 ±48.41 b
T5	91.50 ±1.87 bc	244.50 ±2.33	469.33 ±5.67 ab	634.06 ±7.86 ab	786.63 ±17.40 a	792.21 ±28.42	3018.25 ±39.98 ab
Significance level	**	N.S	**	**	**	N.S	**

**Different letters within one column indicate significant differences at (p<0.05) level
N.S: indicates that there are no significant differences between the treatments.
* T_1: control treatment (diet without addition) T_2 (adding the antibiotic oxytetracycline at a rate of 250 mg/kg) T_3, T_4 and T_5 (adding *Aloysia citrodora* leaves powder at a rate of 1% and 1.5% and 2%).

The results of Table (7) indicate a comparison of the addition of (*Aloysia citrodora*) leaves powder and oxytetracycline to the diet and its effect on the rate of feed consumed for broiler for the period from (1-6 weeks), as it is evident a significant increased (P<0.05) in feed intake for the first week of treatment T_5 compared with treatment T_2, while it did not differ significantly with T_1, T_3, and T_4, but in the second week, the increasing was significant (P<0.05) in favor of treatment T_2 compared with T_4 treatment, while it did not differ significantly with treatments T_1, T_3, and T_5. While at the third week, a significant increasing was observed in treatment T_1 and T_2 compared with T_4, while they did not differ significantly (P<0.05) with treatment T3 and T5, but in the fourth week, the results revealed a significant difference in the different experimental treatments, while there was a significant superiority (P<0.05) in the fifth week with treatment T_5 compared with treatment T_1 and T_4, while it did not differ significantly with treatment T_2 and T_3. But at the sixth week, treatment T_3 was significantly superior (P<0.05) compared to treatment T_4, while it did not differ significantly with treatment T_1, T_2, and T_5, and in the rate of cumulative feed intake (1-6 weeks), the enhancement was significant (P< 0.05) in

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favor of treatment T_2 and T_3 compared with treatment T_4, while they did not differ significantly with treatment T_1 and T_5.

Table 7. Effect of adding *Aloysia citrodora* leaves powder at different levels to starter, growth and finisher diets for 1-6 weeks on the weekly and cumulative feed intake for broiler chickens (mean ± standard error)

Treatments *	Average feed intake (g/bird)						
	First week	Second week	Third week	Fourth week	Fifth week	Sixth week	Cumulative average feed intake from 1 to 6 weeks
T1	136.00 ±0.84 ab	338.33 ±17.24 ab	649.33 ±8.44 a	938.16 ±8.31	1153.50 ±18.95 b	1366.33 ±22.18 ab	4581.67 ±34.37 ab
T2	130.66 ±0.19 b	363.91 ±8.75 a	638.08 ±16.27 a	949.16 ±27.08	1238.50 ±47.02 ab	1349 ±58.67 ab	4669.33 ±102.54 a
T3	145.33 ±0.17 ab	333.25 ±5.26 ab	628.75 ±12.25 ab	942.00 ±15.62	1199.50 ±13.13 ab	1411.25 ±15.06 ab	4660.08 ±33.56 a
T4	144.25 ±0.37 ab	328.58 ±7.57 b	590.50 ±15.37 b	889.33 ±23.62	1164.83 ±16.90 b	1292.92 ±28.80 b	4410.42 ±75.75 b
T5	151.29 ±6.09 a	339.22 ±7.76 ab	617.19 ±15.79 ab	918.19 ±20.26	1263.53 ±37.65 a	1397.58 ±34.16 ab	4687.03 ±107.99 ab
Significance level	**	**	**	N.S	**	**	**

**Different letters within one column indicate significant differences at ($p<0.05$) level

N.S: indicates that there are no significant differences between the treatments.

* T_1: control treatment (diet without addition) T_2 (adding the antibiotic oxytetracycline at a rate of 250 mg/kg) T_3, T_4 and T_5 (adding *Aloysia citrodora* leaves powder at a rate of 1% and 1.5% and 2%).

The results of Table (8) indicate a comparison of the addition of *(Aloysia citrodora)* leaves powder and oxytetracycline to the diet and its effect on the feed conversion ratio of broiler chickens for the period from (1-6 weeks), it can notice that there is a significant increased ($P<0.05$) in treatment T_2 compared with treatment T_3, T_4, and T_5, while it did not differ significantly with treatment T_1 at the first week. As for the second, third, fourth, fifth, and sixth weeks, it was evident that there were no significant differences in the different experimental treatments, while in the cumulative feed conversion ratio (1-6 weeks) the enhancement was significant ($P<0.05$) in favor of treatment T_1, T_2, and T_3 and T_4 compared with treatment T_5. It is noted from the production performance data, despite the absence of significant differences between T_2 (oxytetracycline) and the two treatments of adding *Aloysia citrodora* T_3 and T_5 in the average live body weight, average weight gain, feed intake, and feed conversion ratio from the second week to the sixth week, as this is considered a positive increasing if no drug or treatment was used during the breeding period for the treatments of adding *Aloysia citrodora* compared to the chemical growth stimulator (oxytetracycline), which has a harmful effect. This may be due to the fact that *Aloysia citrodora* contains natural growth stimuli that are safe to use and effective compounds, especially flavonoids, phenols, alkaloids and saponins, which are among the compounds that have a positive effect in improving the productive performance of domestic birds, through the effective role of these natural compounds in improving digestion and making optimal use of Nutrients, in addition to their anti-bacterial and anti-fungal role (Yang et al., 2021). Also, the *Aloysia citrodora* leaves powder contains flavonoids, which are characterized by antioxidant properties, as they work to protect body cells and muscle tissues from oxidative stress by preventing free radicals resulting from rapid metabolism from attacking body cells (Muhammad, 2012; Othman et al., 2007). Flavonoids works help get rid of minerals polluting oils and fats during the manufacturing stages, as they act as metal-retracting materials and prevent or delay the phenomenon of rancidity (Mink et al., 2007; Passamonti et al., 2009). In addition to the role of phenolic compounds in bird diet, it

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works to support the intestinal flora, which stimulates it to increase the effectiveness of digestive enzymes such as Amylase, Trypsin, Chemo trypsin, and Lipase, thus increasing the effectiveness of digestive enzymes for nutrients and thus making the most of them (Muthamma Milan et al., 2008; Pliego et al., 2022) In addition, *Aloysia citrodora* added to T_3 and T_5 contains vitamin C at a concentration of 20.5 mg/kg, which shows the natural antioxidant activity that was estimated in the current research. Vitamin C removes free radicals resulting from rapid metabolism and restores the production of fat-soluble vitamin E due to its attachment to the lipophilic inner part of the cell membrane and prevents the oxidation and decomposition of phospholipids within the cell membrane through breaking the reaction chain in cellular membranes and associated with free radicals by donating an electron to them, which prevents the formation of lipid peroxide and the byproduct of lipid peroxide (MDA) Malonyldialdehyde (Bergin et al., 2021; Mahmood Janlow et al., 2002).

Table 8. The effect of adding *Aloysia citrodora* leaves powder in the starter, growth and finisher diets for 1-6 weeks on the weekly and cumulative feed conversion ratio g feed / g weight gain for broiler chickens (average ± standard error)

Treatments *	Feed conversion ratio g feed / g weight gain						
	First week	Second week	Third week	Fourth week	Fifth week	Sixth week	Cumulative Feed conversion ratio from 1 to 6 weeks
T1	1.36 ±0.05 ab	1.27 ±0.05	1.28 ±0.01	1.46 ±0.04	1.69 ±0.09	1.67 ±0.05	1.45 ±0.02 ab
T2	1.21 ±0.06 a	1.34 ±0.03	1.30 ±0.08	1.39 ±0.04	1.59 ±0.08	1.69 ±0.03	1.42 ±0.01 a
T3	1.67 ±0.18 b	1.27 ±0.02	1.32 ±0.01	1.44 ±0.00	1.56 ±0.01	1.69 ±0.02	1.49 ±0.02 ab
T4	1.66 ±0.12 b	1.31 ±0.07	1.33 ±0.03	1.43 ±0.02	1.50 ±0.03	1.70 ±0.02	1.49 ±0.02 ab
T5	1.65 ±0.09 b	1.38 ±0.02	1.31 ±0.02	1.44 ±0.01	1.61 ±0.06	1.76 ±0.02	1.53 ±0.03 b
Significance level	**	N.S	N.S	N.S	N.S	N.S	**

Different letters within one column indicate significant differences at (p<0.05) level
N.S: indicates that there are no significant differences between the treatments .
*** T1: control treatment (diet without addition) T2 (adding the antibiotic oxytetracycline at a rate of 250 mg/kg) T3, T4 and T5 (adding Aloysia citrodora leaves powder at a rate of 1% and 1.5% and 2%).**

CONCLUSION

It is concluded from the results of the current study that it is possible to pass up the addition of antibiotics (oxytetracycline), which may cause harmful effects when adding to the broiler diet in the long term, and replace it with Lemon verbena (Aloysia citrodora) leaf powder at a rate of 1, 1.5 or 2% without causing any side effects on the production performance, meat produced and the health of the birds.

CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

DECLARATION OF FUND

The authors declare that they have not received a fund.

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إضافة مسحوق أوراق اللويزة الليمونية (*Aloysia Citriodora*) الى العليقة وتأثيره في الأداء الإنتاجي لفروج اللحم

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المستخلص

أُجريت هذه التجربة للمقارنة بين اضافة مستويات مختلفة من مسحوق اوراق اللويزة الليمونية والمضاد الحيوي الاوكسي تتراسايكلين للعلائق في الاداء الانتاجي لفروج اللحم، تم إجراء التجربة في حقل الطيور الداجنة التابع لقسم الإنتاج الحيواني في كلية علوم الهندسة الزراعية – جامعة بغداد (أبو غريب) للفترة من 2022/10/29 الى 12/10/ 2022 لمدة 42 يوم، استعمل في الدراسة 300 فرخ فروج اللحم (ROSS 308) غير مجنسة بعمر يوم واحد، وزعت الافراخ عشوائيا على خمس معاملات وخمس مكررات احتوى المكرر الواحد على 12 فرخاً، وكانت المعاملات كالتالي: T1 علائق قياسية، T2 علائق مضافاً إليها مسحوق المضاد الحيوي أوكسي تتراسايكلين بنسبة 250 ملغرام / كغم علف، معاملة T3 وT4 وT5 علائق مضافاً إليها مسحوق اوراق اللويزة الليمونية وبنسبة 1، 1.5، 2 % على التوالي، أظهرت النتائج وجود تفوقاً معنوياً (P<0.05) لصالح المعاملة T2 والتي لم تختلف معنوياً مع T1 و T3 وT5 مقارنة بالمعاملة T4 لكل من صفة معدل وزن الجسم والزيادة الوزنية، وحققت كل من المعاملة T2 وT3 تفوقاً معنوياً (P<0.05) في معدل استهلاك العلف مقارنة مع المعاملة T4 ولم تختلف معنوياً مع T1 وT5، اما لصفة معامل التحويل الغذائي كان التفوق لصالح المعاملة T2 مقارنة مع T5 بينما لم تختلف معنوياً مع T1 و T3 وT4.

الكلمات المفتاحية: الاعشاب الطبية، المضادات الحيوية، الليمونين.

***جزء من رسالة ماجستير للباحث الاول.**