



Research Article

Effect of Feed Supplementation with Anise (*Pimpinella anisum* L.) and Clove (*Syzygium aromaticum* L.) Oils on Some Productive Traits of Broiler Chicks

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Abstract | Supplementation of poultry feed with herbal oils has shown promising effects on feed utilization, growth and performance of broiler chickens. This research work studied the impact of supplementing routine poultry feed with anise (*Pimpinella anisum* L.) and clove (*Syzygium aromaticum* L.) oils on the productive performance of broiler chickens represented by live body weight, weekly weight gain, feed consumption and feed conversion ratio for a period of 35 days. During the experiment, 300 one-day-old chicks of Ross 308 broiler strain were randomly distributed into six equal groups and each group was comprised of two replicates of 25 birds each. Treatments included basic feed without any additions (T1) and basic feed supplemented with anise oil (@ 0.5 and 1.0 ml/kg of feed; T2 and T3) and clove oil (@ 0.5 and 1.0 ml/kg of feed; T4 and T5) and the basic feed provided with both anise and clove oils (@ 0.5 ml/kg each; T6). Results of the study showed that addition of both anise and clove oils either alone or in combination significantly ($P < 0.05$) increased the live body weight, weight gain, feed consumption and feed conversion ratio of boiler chicks as compared to the routine feed (control) treatment. Moreover, the combined supplementation of feed with anise and clove oils (@ 0.5 ml/kg of feed) exhibited more promising results, and hence are recommended to be added as biorational feed supplements for better quality broiler production.

Received | December 25, 2024; **Accepted** | March 15, 2025; **Published** | June 17, 2025

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Citation | Dakhil, M.Y. and M.J. Kadhim. 2025. Effect of feed supplementation with anise (*Pimpinella anisum* L.) and clove (*Syzygium aromaticum* L.) oils on some productive traits of broiler chicks. *Sarhad Journal of Agriculture*, 41(2): 860-866.

DOI | <https://dx.doi.org/10.17582/journal.sja/2025/41.2.860.866>

Keywords | Broiler chicken, Ross 308 breed, Herbal supplements, Anise oil and clove oil, Productive traits, Feed conversion ratio and feed consumption



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Introduction

The poultry industry has witnessed a significant growth and rapid development in the last decade as compared to production of red meat products, accompanied by a considerable increase in the demand

for white meat (USDA, 2020). All over the world, consumers have turned to poultry meat because it is a source of high-quality easy to digest animal protein with a good palatability and taste and nutritional value (Belova et al., 2012). The great development in poultry industry and an increased production and

consumption of white meat has been accompanied by the emergence of many resistant bacterial and viral pathogens due to extensive use of drugs and antibiotics (Kabir, 2009; Abreu *et al.*, 2023), as well as due to the increasing incidence of metabolic diseases as a result of incorrect management practices in poultry farming (Al-Khalf *et al.*, 2010; Arsène *et al.*, 2022; Gržinić *et al.*, 2023; Islam *et al.*, 2024).

Medicinal plants have been of prime interest for a long time in improving human and animal health because these plants are a great source of various bioactive compounds exhibiting anti-microbial, anti-inflammatory and anti-parasitic characteristics (Seidavi *et al.*, 2021; Ivanova *et al.*, 2024). Plants-derived essential oils and extractives for instance are promising animal feed additives and phytogenics and exhibit many advantages over synthetic feed additives and antibiotics being used poultry production sector. These herbal additives, particularly plant oils, have been demonstrated owing a great potential to improve the physiological and productive traits of domestic birds including broiler chicks (Gopi *et al.*, 2014; Sulaiman and Tayeb, 2021; Vlaicu *et al.*, 2023).

This research work was aimed to determine the effect of adding anise and clove bud essential oils in the broiler feed on some production traits of chicks including live body weight, weight gain, feed consumption and feed conversion ratio. Anise (*Pimpinella anisum* L.) and clove (*Syzygium aromaticum* L.) are among two important traditional spices which have been shown with many medicinal and therapeutic effects on animal health. It has been demonstrated that addition of anise seeds to the broiler feed increased the growth rate and significantly improved the production traits as it contains many bioactive compounds including phenols, coniodates, flavonoids, alkaloids and proteins (Christaki *et al.*, 2011; Sun *et al.*, 2019). Similarly, clove bud extractives contain various bioactive compounds and particularly eugenol is the major bioactive compound in cloves constituting 80–70% of the clove bud oil (Al-Shaik and Perveen, 2017; Mandey, 2022).

Materials and Methods

This experiment was conducted in the poultry breeding facility of the Animal Production Technology Department at Al-Musaib Technical College of the Al-Furat Al-Awsat Technical University, Iraq. The experiment was run for 35 days to study the effect

of adding anise seed and clove bud oils to the broiler routine feed on some production traits of the broiler chicks. To this end, 300 one-day-old unsexed Ross 308 broiler chicks were randomly divided into six treatment batches, each having 50 birds which were further subdivided in to two replicates of 25 birds each.

Treatments included a control treatment with basic feed without any oil additions (T1), basic feed supplemented with anise oil (@ 0.5 and 1.0 ml/kg of feed; tagged as T2 and T3, respectively) and clove oil (@ 0.5 and 1.0 ml/kg of feed; coded as T4 and T5, respectively) and the six treatment was basic feed provided with both anise and clove oils (@ 0.5 ml/kg each; marked as T6). The parameters or traits of broiler chicks determined during this 5-week experiment were their average live body weight, average weight gain, average feed consumption and feed conversion ratio.

Essential oils of anise seeds and clove buds used in the experiment were procured from local Iraqi market. The experimental broiler feed was prepared from the raw materials according to the age stage of the birds. There were three age stages *i.e.* the starter stage ranging from 1 to 10 days, the growth stage ranging from 11 to 25 days, and the finisher stage or marketing age stage ranging from 26 to 35 days, the marketing age. Feed was given according to the bird's requirements and needs for the nutritional compounds and elements and according to the Ross 308 broiler production guide for the year 2023 and as per National Research Council (NRC, 1994) recommendations.

Experimental design was completely randomized (CRD). In order to determine the effect of treatments (anise and clove oils) on the productive traits of broiler chicks, data were subjected to statistical analysis using statistical software SPSS (IBM; version 21). Moreover, treatment means were compared using Duncan Multinomial Test (1955) using standard level of significance ($P \geq 0.05$) based on the following mathematical model:

$$Y_{ij} (CRD) = \mu + T_i + e_{ij}$$

Where, ' Y_{ij} ' is the value of the j th view belonging to transaction i . ' μ ' is the general average of the trait. ' T_i ' is the effect of treatment i and ' e_{ij} ' is the random error.

Results and Discussion

Supplementation of poultry feed with plant-derived additives as alternates of synthetic antibiotics have been shown promising results in poultry production sector. A wide array of plant products is being used in boosting growth and development and productive traits of broiler chicks (Gopi *et al.*, 2014; El-Sabrou *et al.*, 2023). This study evaluated the biotic potential of oils of two important medicinal plants *i.e.* anise and clove. Broiler chicks of Ross 308 broiler strain were fed on routine basic diet supplemented with different concentrations of plant oils and productive characters of broiler chicks such as live body weight, weekly weight gain, feed consumption and feed conversion ratio were recorded weekly for a period of 35 days.

Results of the study showed that there were significant differences ($P > 0.05$) among the treatments for all study weeks. In the first week, the highest live body weight (40.26 g) was found in treatment (T6) having both anise and clove oils, significantly different from the treatments T3, T2 and T5. The treatments T4 (having clove oil @ 0.5 ml/kg of feed) and T1 (control) showed lowest average body weight *i.e.* 35.58 and 35.08 g, respectively (Table 1). In the fourth week, there were no significant differences among treatments although all showed higher live body weight than control treatment. Overall treatment T6 excelled on the other treatments in live body weight, as it was followed by the third treatment T3 (having anise oil @ 1.0 ml/kg of feed). High live body weight can be attributed to the use of anise and clove oils which can enhance body immunity to diseases, can improve the chicks' digestion and feed consumption leading to an increase in the

average live body weight. These results are in line with the findings of Al-Zuhairi and Al-Tabari (2013) who showed a significant difference in the body weight of broilers when adding anise seed powder to their feed. However, our results are not in agreement with those of Yazdi *et al.* (2014) demonstrating no significant difference in live body weight of chicks fed on basal diet supplemented with anise seeds.

Similarly, there was significant difference ($P > 0.05$) among treatments for most of the weeks regarding weigh gain (Table 2). For second, fourth and fifth week, treatments with anise oil (@ 1.0 ml/kg of feed) and clove oil (@0.5 ml/kg of feed) and treatment T6 (having both oils) exhibited highest weight gain as compared to control and other treatments. This enhancement of weight gain of chicks provided with basal feed mixed with anise seed oil or clove bud oil can be due to probiotic potential of these plant oils in improving digestion and feed conversion efficiency of the birds as many previous studies proved anise seeds and clove buds as effective bioactive additives of the diet of poultry and other animals (Rehman *et al.*, 2025). The results of this study are consistent with report of Al-Zuhairi and Al-Tabari (2013) who showed a significantly high body weight gain in broiler chicks due to increased feed consumption by adding anise powder to broiler feed. However, contrary to this, Balakt (2021) reported that addition of anise seeds powder to the fee did not affect the weight gain of chicks. Our results are also consistent with the findings of Jamroz *et al.* (2003) and Mukhtar (2011) showing a significant effect of clove and anise oil addition on the performance and body weight gain rate of broiler chickens.

Table 1: The effect of anise and clove oils alone and in combination on the live body weight (g) (average $\pm$ standard error) of Ross 308 broiler chickens.

Treatment	First week	Second week	Third week	Fourth week	Fifth week	Total
T1 (basic feed only)	35.58 $\pm$ 0.21c	147.43 $\pm$ 0.78c	377.40 $\pm$ 0.37c	1018.33 $\pm$ 1.76	1616.49 $\pm$ 27.87c	2349.10 $\pm$ 3.68c
T2 (basic feed provided with anise oil @ 0.5 ml/kg)	37.63 $\pm$ 0.29b	158.62 $\pm$ 1.70b	442.13 $\pm$ 6.23 b	992.0 $\pm$ 59.81	1476.50 $\pm$ 12.25d	2218.17 $\pm$ 9.71d
T3 (basic feed provided with anise oil @ 1.0 ml/kg)	37.70 $\pm$ 0.37b	144.56 $\pm$ 0.12d	500.23 $\pm$ 5.77 a	937.68 $\pm$ 1.34	1716.57 $\pm$ 13.57ab	2397.13 $\pm$ 4.55b
T4 (basic feed provided with clove oil @ 0.5 ml/kg)	35.08 $\pm$ 0.13c	160.50 $\pm$ 0.11b	446.33 $\pm$ 2.02 b	973.50 $\pm$ 6.45	1780.25 $\pm$ 17.10a	2331.92 $\pm$ 20.71c
T5 (basic feed provided with clove oil @ 1.0 ml/kg)	37.13 $\pm$ 0.20b	162.96 $\pm$ 0.27a	439.66 $\pm$ 10.17 b	967.36 $\pm$ 8.80	1695.60 $\pm$ 31.60b	2333.15 $\pm$ 6.13c
T6 (basic feed provided with anise and clove oils @ 0.50 ml/kg of each oil)	40.26 $\pm$ 0.14a	165.16 $\pm$ 0.23a	459.00 $\pm$ 8.02 b	1052.33 $\pm$ 6.91	1677.02 $\pm$ 14.46bc	2463.96 $\pm$ 27.14a
Significance	**	**	**	N.S.	**	**

N.S. = Not significant, ** = Different alphabets within the same column indicate significant differences between the treatment means (Duncan's Multinomial Test @ 5% level of probability; $P < 0.05$).

Table 2: The effect of anise and clove oils alone and in combination on weight gain (g) (average $\pm$ standard error) of Ross 308 broiler chickens.

Treatment	First week	Second week	Third week	Fourth week	Fifth week
T1 (basic feed only)	111.85 $\pm$ 0.68	228.80 $\pm$ 0.40 c	640.93 $\pm$ 1.40	598.10 $\pm$ 29.30 c	732.60 $\pm$ 31.55 ab
T2 (basic feed provided with anise oil @ 0.5 ml/kg)	87.65 $\pm$ 34.71	283.51 $\pm$ 7.94 b	549.86 $\pm$ 59.35	484.50 $\pm$ 61.88 d	741.66 $\pm$ 12.47 ab
T3 (basic feed provided with anise oil @ 1.0 ml/kg)	106.73 $\pm$ 0.38	355.66 $\pm$ 5.86 a	559.28 $\pm$ 115.80	779.88 $\pm$ 13.33 a	677.30 $\pm$ 14.29 bc
T4 (basic feed provided with clove oil @ 0.5 ml/kg)	125.55 $\pm$ 0.13	285.92 $\pm$ 1.91 b	621.26 $\pm$ 99.00	806.75 $\pm$ 17.98 a	551.66 $\pm$ 4.70 d
T5 (basic feed provided with clove oil @ 1.0 ml/kg)	125.83 $\pm$ 0.08	276.63 $\pm$ 9.93 b	527.70 $\pm$ 7.93	728.23 $\pm$ 39.71 ab	637.55 $\pm$ 34.98 c
T6 (basic feed provided with anise and clove oils @ 0.50 ml/kg of each oil)	124.90 $\pm$ 0.28	293.83 $\pm$ 7.89 b	593.33 $\pm$ 3.33	624.68 $\pm$ 12.81 b	787.36 $\pm$ 17.56 a
Significance	N.S.	**	N.S.	**	**

N.S. = Not significant, ** = Different alphabets within the same column indicate significant differences between the treatment means (Duncan's Multinomial Test @ 5% level of probability; $P < 0.05$).

Table 3: The effect of anise and clove oils alone and in combination on feed consumption (g) (average $\pm$ standard error) of Ross 308 broiler chickens.

Treatment	First week	Second week	Third week	Fourth week	Fifth week
T1 (basic feed only)	131.61 $\pm$ 5.35	292.60 $\pm$ 7.20 d	707.85 $\pm$ 12.62 bc	1036.01 $\pm$ 24.19 a	1006.17 $\pm$ 59.69 ab
T2 (basic feed provided with anise oil @ 0.5 ml/kg)	138.25 $\pm$ 4.46	306.11 $\pm$ 8.51 cd	786.66 $\pm$ 34.80 ab	1061.76 $\pm$ 51.34 a	980.06 $\pm$ 28.48 bc
T3 (basic feed provided with anise oil @ 1.0 ml/kg)	134.96 $\pm$ 1.23	379.00 $\pm$ 5.85 a	856.38 $\pm$ 17.37 a	1090.05 $\pm$ 46.12 a	1093.53 $\pm$ 7.52 a
T4 (basic feed provided with clove oil @ 0.5 ml/kg)	147.21 $\pm$ 1.63	370.15 $\pm$ 5.17 a	790.80 $\pm$ 34.78 ab	900.21 $\pm$ 35.56 b	961.88 $\pm$ 41.20 bc
T5 (basic feed provided with clove oil @ 1.0 ml/kg)	139.53 $\pm$ 6.95	331.73 $\pm$ 1.18 b	667.23 $\pm$ 0.14 c	993.06 $\pm$ 40.71 ab	960.00 $\pm$ 28.72 bc
T6 (basic feed provided with anise and clove oils @ 0.50 ml/kg of each oil)	134.85 $\pm$ 3.35	320.81 $\pm$ 12.45 bc	707.33 $\pm$ 31.33 bc	1106.77 $\pm$ 0.622 a	874.91 $\pm$ 20.28 c
Significance	N.S.	**	**	**	*

N.S. = Not significant, ** = Different alphabets within the same column indicate significant differences between the treatment means (Duncan's Multinomial Test @ 5% level of probability; $P < 0.05$).

Regarding the effect of plant oil treatments on average feed consumption of broiler chicks, results are shown in Table 3. There was no significant difference among the treatments in first week of study, while treatment T3 with diet supplemented with anise oil (@ 1.0 ml/kg) exhibited highest feed consumption in all weeks and statistically different from other treatments except for forth week. The minimum feed consumption rate was observed in treatment T6 with the diet supplemented with both plant oils (0.5 ml/kg each) (Table 3). This would be because both oils in combination might worked as growth stimulants, as these contain many bioactive compounds such as methylchvicol, eugenol, anitholimonene, camphor, anisaldehyde, trans-anethol, which can stimulate the

digestive enzymes leading to low feed consumption as compared to control treatment (Mostafa *et al.*, 2015). These findings are in accordance with those of Mukhtar (2011) and Al-Zuhairi and Al-Tabari (2013) who showed an increase in the feed consumption rate of broiler chicks when fed with diet supplemented with clove bud oil and anise seed powder, respectively.

According tot Table 4, there were no significant differences ($P < 0.05$) between the treatments for the first and third weeks regarding the feed conversion rate. Clove oil treatment (@0.5 ml/kg) and control treatments showed highest feed conversion ratios *i.e.* 1.29 and 1.27, respectively followed by clove oil @ 1.0 ml/kg and anise oil treatments. Similar

trend was **Table 4:** *The effect of anise and clove oils (average $\pm$ standard error) of Ross 308 broiler chickens alone and in combination the feed conversion ratio*

Treatment	First week	Second week	Third week	Fourth week	Fifth week
T1 (basic feed only)	1.35 $\pm$ 0.22	1.27 $\pm$ 0.03 a	1.42 $\pm$ 0.32	1.77 $\pm$ 0.11 b	1.37 $\pm$ 0.13 bcd
T2 (basic feed provided with anise oil @ 0.5 ml/kg)	1.24 $\pm$ 0.09	1.05 $\pm$ 0.03 c	1.44 $\pm$ 0.08	2.24 $\pm$ 0.20 a	1.31 $\pm$ 0.04 cd
T3 (basic feed provided with anise oil @ 1.0 ml/kg)	1.26 $\pm$ 0.06	1.06 $\pm$ 0.05 bc	1.64 $\pm$ 0.31	1.39 $\pm$ 0.03 c	1.61 $\pm$ 0.03 ab
T4 (basic feed provided with clove oil @ 0.5 ml/kg)	1.16 $\pm$ 0.01	1.29 $\pm$ 0.02 a	1.31 $\pm$ 0.13	1.11 $\pm$ 0.04 c	1.74 $\pm$ 0.08 a
T5 (basic feed provided with clove oil @ 1.0 ml/kg)	0.10 $\pm$ 0.05	1.16 $\pm$ 0.03 b	1.26 $\pm$ 0.02	1.36 $\pm$ 0.04 c	1.51 $\pm$ 0.13 abc
T6 (basic feed provided with anise and clove oils @ 0.50 ml/kg of each oil)	1.07 $\pm$ 0.03	1.08 $\pm$ 0.05 bc	1.19 $\pm$ 0.06	1.76 $\pm$ 0.03 b	1.10 $\pm$ 0.02 d
Significance	N.S.	**	N.S.	**	**

N.S. = Not significant, ** = Different alphabets within the same column indicate significant differences between the treatment means (Duncan's Multinomial Test @ 5% level of probability; $P < 0.05$).

recorded for forth week. In the fifth week of experiment, treatment T6 (having both plant oils) excelled the rest of the experimental treatments, which did not differ with treatment T1 and T2. These results are consistent with the study of [Al-Zuhairi and Al-Tabari \(2013\)](#) and [Balakt \(2021\)](#) that adding anise seed oil or powder to the feed increased the feed conversion efficiency of broiler chicks. Similarly, [Mukhtar \(2011\)](#) and [Hussein et al. \(2019\)](#) reported that adding clove oil at increasing levels to broiler feed had a significant effect on the feed conversion rate, which could be attributed to an increased utilization of dietary nutrients in broiler chicks fed with anise and clove oil mixed diet ([Ismail et al., 2021](#); [Mandey, 2022](#); [Movahedi et al., 2024](#); [Rehman et al., 2025](#)).

Conclusions and Recommendations

It is concluded that the supplementation of basal or routine feed or diet of broiler chicks with the anise seed and clove bud oils exerted a significant and positive impact on the studied productive traits of birds. All productive characteristics of the broiler chicks improved by the addition of both plant oils in the feed, particularly when both oils were supplied in combination. Overall study results advocate the recommendation of these plant oils to be considered as effective biorational feed additives which can be incorporated in poultry diet as alternatives of synthetic antibiotics. Moreover, developing novel administration technologies such as nanoformulations can improve the bioavailability and stability of these plant oils by mitigating the problems of their low

water-solubility, high volatility and poor intestinal absorption ([Movahedi et al., 2024](#)).

Acknowledgements

The work does not have financial support.

Novelty Statement

Feed supplementation is necessary to enhance broiler production. Our research indicates that a blend of anise and clove oils offers superior results, making it a recommended bio-rational feed additive to improve broiler chick performance.

Author's Contribution

Maytham Youssef Dakhil and Mohammed Jard Kadhim: Conceived of the research idea.

Maytham Youssef Dakhil: performed experimentation and recorded and analyzed the data, wrote the first draft.

Mohammed Jard Kadhim: Provided resources and supervised the project, revised the draft and technically proofread the manuscript.

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