Journal of Sohag Agriscience (JSAS) 2024, 9(2): 172-182

ISSN 2357-0725
https://jsasj.journals.ekb.eg
JSAS 2024; 9(2): 172-182

Received: 06-11-2024
Accepted: 03-12-2024

Zienhom H. S. Ismail
Mohamed Saleh Ali
Emad Samaan Shawky

Poultry Production Department
Faculty of Agriculture
Sohag University
Sohag
Egypt

Corresponding author:
Emad Samaan Shawky
ttony8628@gmail.com

Impact of Curcumin and Ground Anise Seeds dietary Supplementation on The egg quality traits of Laying Hens

Zienhom H. S. Ismail, Mohamed Saleh Ali and Emad Samaan Shawky

Abstract

This study investigates the effects of incorporating curcumin and ground anise seeds into the diets of laying hens on egg quality over a 12- week trial. laying hens fed graded levels of curcumin (0, 100 and 200 mg/kg feed) and ground anise seeds (0, 1%, 2%) during a 12- week trial period. 189 laying hens at 47 weeks of age having almost equal body weight (1603.91± 29.84 gram) and egg production rate (86.22 ± 1.66 %) were weighed and leg banded, Chickens were evenly distributed across 9 treatments, with each treatment consisting of 21 chickens that were further divided into 3 replicates of 7 chickens each. Body weight gain, feed consumption, egg shape index, egg specific gravity, yolk height (mm), yolk diameter (mm) and yolk index, were measured. Results obtained from the present study showed that there were no significant differences in body weight, body weight gain, Treatments supplemented with anise seeds and curcumin, especially at higher doses, showed increased feed intake. The 3rd group (2% anise seeds) consistently had the highest intake. Similarly, the 9th group (200 mg/kg curcumin + 2% anise) also showed high intake, with 117.35 g/bird/day in the third period. We can recommend supplementing diets with curcumin at level of 200 mg/kg and ground anise seeds at level of 2 % to optimize egg quality traits.

Keywords: feed consumption, egg quality, laying hens, productive performance, Curcumin, anise seeds

INTRODUCTION

In recent years, there has been a growing interest in the use of natural phytogenic feed additives as alternatives to synthetic growth promoters in poultry production. This shift has been driven by the need to enhance productivity while addressing consumer concerns about antibiotic residues and antibiotic-resistant bacteria. Among these natural additives, anise (Pimpinella anisum L.) and curcumin, derived from turmeric (Curcuma longa), have garnered significant attention due to their multifunctional roles in improving poultry health and performance. Anise, an aromatic herb from the Apiaceae family, is well-known for its high content of volatile oils, particularly anethole, which constitutes up to 85% of the oil content (Bayram et al., 2014). Anise has been widely used in both human and veterinary medicine for its carminative, antiseptic, and digestive-enhancing properties (Simon et al., 1984). In poultry, anise seeds and their essential oils have demonstrated various beneficial effects, including improved feed conversion, enhanced growth rates, and better egg quality (Ciftci et al., 2005; Christaki et al., 2011). Additionally, anise supplementation has been shown to lower serum cholesterol levels and positively affect the color and quality of egg yolks in laying hens (Christaki et al., 2011). These properties make anise a promising candidate for natural feed additives, particularly in laying hens where egg production and quality are of paramount importance. Curcumin, the active compound in turmeric, has also attracted considerable interest for its antioxidant, anti-inflammatory, and lipid-modulating effects (Sharma et al., 2005). As a natural polyphenol, curcumin exhibits a broad range of biological activities that can help mitigate the negative impacts of environmental stressors, such as heat stress, on poultry (Lara and Rostagno, 2013). Studies have shown that curcumin can improve egg production, feed efficiency, and overall health in laying hens subjected to heat stress conditions by modulating antioxidant defenses and enhancing immune responses (Sahin et al., 2012; Youssef et al., 2022). Furthermore,

Several studies have evaluated the individual effects of anise seeds and curcumin on poultry, but there is limited research on their combined impact, particularly in laying hens. It is hypothesized that the synergistic effects of these two phytogenic additives could provide comprehensive benefits by improving feed efficiency, egg quality, and the birds' overall health. While anise contributes to better digestion and nutrient absorption (Jamroz and Kamel, 2002), curcumin plays a critical role in reducing oxidative stress and enhancing liver function, both of which are vital for optimal egg production (Rajput et al., 2013; Youssef et al., 2022). Given the growing body of evidence supporting the benefits of phytogenic feed additives, the present study aims to evaluate the combined effects of anise seeds and curcumin on, egg quality traits in laying hens

MATERIALS AND METHODS

This study was carried out in the tajarid Farm, Al-Kawthar Sohag, Egypt, during the period from 13/7/2024 to 4/10/2024 .

Birds, Diets *measurements*, and Rearing Conditions:

One hundred and eighty-nine laying hens at 47 weeks of age were weighed and leg banded with almost equal body weight (1603.91 29.84 ± gram) and egg production rate (86.22% ± 1.66), Chickens were evenly distributed across 9 treatments, with each treatment consisting of 21 chickens that were further divided into 3 replicates of 7 chickens each. The birds were housed in three-tiered, three-dimensional cages (60 x 50 x 45 cm) with 7 birds per cage and were fed the designated diets until they reached 59 weeks of age. During the 12-week experimental period, the birds were reared under standard conditions adhering to the conventional standards for the LSL classic strain. This included management of temperature, humidity, ventilation, lighting, hygiene, feeding, and drinking systems. Temperature and ventilation were regulated using cooling cells positioned at the end of the housing unit, supplemented by 29 fans at the farm. The hens were kept at a temperature of 23

ºC and 60-70% humidity, receiving 16 hours of light (16L: 8D) daily throughout the experimental phase. Feed and water were available. The control treatments (T1) were provided with a basal diet based on corn and soybean meal, produced by» Factory on the Farm for Poultry Diets «in Sohag, Egypt. All diets were formulated in accordance with the NRC (1994) guidelines to satisfy the daily nutritional requirements of laying hens during their peak production period, as well as the recommendations for essential amino acids in laying hen diets. The basal diet was enhanced with a minerals and vitamins premix prepared by »Multi-Veta for Animal Nutrition Company « . The composition and nutrient levels of the basal diet are detailed in table 1

Table 1. Composition of the basal diet

Ingredients	%	**Calculated analysis**	%
Corn	57	ME (Kcal/Kg)	2679
Soybean meal (46%)	23	Crude protein	19.47
Plant concentrations	10	Crude fiber	2.86
Limestone	9	Ether Extract	2.62
Mono-calcium phosphate	0.5	Lysine	0.81
NaCl	0.05	Methionine	0.49
DL-Methionine	0.08	Methionine + Cysteine	0.65
L-Lysine	0.01	Calcium	3.93
Choline chloride	0.03	Total Phosphorus	0.7
Anti-Mycotoxin	0.01	Non phaytate phosphorus	0.43
Vitamins and minerals premix1	0.32		
Total	100		

*Each 3 kg of vitamin mineral premix per tone of the diet contains: vitamin A, 10,000,000 IU; vitamin D3, 3,000,000 IU; vitamin E, 10,000 mg; vitamin K3, 2000 mg; vitamin B1, 1,000 mg; vitamin B2, 5,000 mg; vitamin B6, 1,500 mg; vitamin B12, 10 mg; Niacin, 30,000 mg; Biotin, 50 mg; folic acid, 1,000 mg; pantothenic acid, 10,000 mg; iron, 30,000 mg; copper, 4,000 mg; iodine, 1,000 mg; sulfur, 100 mg; selenium, 100 mg.

Plant concentrations; this product is manufactured by Nashional Egypt Company in the Sharqia Governorate industrial zone. It contains Crude protein: 40%, Calcium: 5.73% , Available phosphorus: 3.09%, Methionine: 2.22%, Lysine: 1.58% and Metabolizable energy: 2564 kcal/kg

2. The Experimental Design:

curcumin was supplemented to the basal diet at 100 mg/kg and 200 mg/kg, respectively.(2) and anise seeds was supplemented to the basal diet at 1% and 2% respectively. The nine treatments were as shown in (Table 2).

Table 2. The experimental design

Treatments	**curcumin**	**anise seeds**
T1 (Control)	Zero	Zero
T2	Zero	1%
T3	Zero	2%
T4	100mg/kg	Zero
T5	100mg/kg	1%
T6	100mg/kg	2%
T7	200mg/kg	Zero
T8	200mg/kg	1%
T9	200mg/kg	2%

Methods and Measurements

Productive Performance

Body Weight: Hens were individually weighed at the beginning (47 weeks) and end (58 weeks) of the experiment to assess body

weight changes. Feed Intake (FI): Birds were provided 115 grams of feed daily, with remaining feed weighed weekly. The average daily feed intake was calculated across the entire 84-day period. Egg quality was determined with 12 eggs which were collected randomly from each treatment (4eggs for every replicate) Egg Width and Length: Measured using an electronic digital caliper with 0.01 mm accuracy. Egg Shape Index: Calculated as (egg width/egg length) × 100. Specific Gravity (SG**)**: Calculated as SG = EW / [0.9680 × (EW - ESW) + (0.4921 × ESW)], where EW is egg weight, and ESW is eggshell weight. Yolk Height and Diameter: Measured with a digital caliper, with yolk index calculated as yolk height/yolk diameter.

Statistical Analysis**
The statistical model used as following:

Yijk= μ+ Curi+ Anisj + eijk
Where: Yijk = An observation of traits.
μ= The overall mean.
Curi= The fixed effect of the curcumin (where i = 1, 2 and 3).
Anisj= The fixed effect of the anised (where j = 1, 2 and 3
eijk=The Experimental random error.

Data were analyzed using ANOVA to determine the effect of treatments. Significance was set at $P < 0.05$, and means were compared using the Duncan's multiple range test (Duncan, 1955)

RESULTS AND DISCUSSION

Body weight: The effect of curcumin and ground anise seeds on body weight parameters of layer hens was assessed throughout a 12-week experimental period. The results are summarized in Table (3) presenting initial body weight (IBW) at 47 weeks of age, final body weight (FBW) at 58 weeks, and the body weight change (BWCh). No significant differences ($P > 0.05$) were observed between the treatment groups for any of the body weight parameters, indicating that the inclusion of anise seeds (at 1% and 2%) and curcumin (at 100 mg/kg and 200 mg/kg) did not significantly influence growth performance compared to the control group. The control group's initial and final body weights were 1603.91 g and 1637.10 g, respectively, with a body weight change of 33.18 g. Notably, the group supplemented with 2% anise seeds exhibited the lowest body weight change (27.85 g), suggesting a potential stabilizing effect of the bioactive compounds present in anise seeds, such as anethole, on weight fluctuations. This aligns with previous studies, which found no significant differences in body weight or weight gain when anise seeds were included in broiler diets (Barakat et al., 2016). Similarly, curcumin supplementation, even at the highest level of 200 mg/kg, showed no statistically significant effect on body weight parameters. The group receiving 200 mg/kg curcumin had a slight reduction in body weight change (27.14 g) compared to the control, which suggests a tendency of curcumin to help maintain stable weight. This outcome is consistent with previous findings that curcumin is safe for use in poultry diets without negative impacts on growth performance (Xie et al., 2019; Badran et al., 2020). The ability of curcumin to enhance lipid metabolism and antioxidant defenses may contribute to this trend, though the changes were not marked enough to reach statistical significance.

Feed Intake

The results presented in Table (4) shows the effect of different levels of curcumin and anise seed supplementation on feed intake rate during three consecutive experimental periods. The control group displayed the lowest feed intake, averaging 113.39 g/bird/day over the entire period. In contrast, groups supplemented with higher levels of anise seeds and curcumin demonstrated increased feed consumption, particularly those receiving 2% anise seeds. The group supplemented with 2% anise seeds (3rd group) recorded the highest feed intake, averaging 115.94 g/bird/day, with a peak of 117.50 g/bird/day during the third experimental period. Additionally, Supplementation with 2% anise seeds and 200 mg/kg curcumin resulted in the highest feed intake, particularly during the latter trial phases. This increase in feed intake could be attributed to the enhanced palatability

and appetite-stimulating properties of anise seeds, which are known to contain aromatic compounds like anethole. These findings are consistent with previous studies indicating improved feed appeal when anise seeds are added to poultry diets (Bayram et al., 2007). Furthermore, curcumin's potential role in promoting digestive health and nutrient absorption might have contributed to the observed increase in feed intake, particularly when combined with anise seeds. Although some studies suggest that curcumin alone may not significantly alter feed intake (Gumus et al., 2018), the combination of curcumin with other bioactive compounds appears to have a synergistic effect, enhancing overall feed consumption. Overall, the findings indicate that while anise seeds and curcumin supplementation may not significantly alter body weight parameters, they do have a noticeable impact on feed intake. This suggests that the main benefit of these additives lies in their potential to improve feed palatability and nutrient absorption efficiency rather than direct influence on growth metrics.

Table 3. Effect of curcumin and anise seeds dietary supplementations on Initial body weight (IBW), final body weight (FBW) and body weight change (g) during experimental periods

Body weight			
Period / Treatment	IBW	FBW	BWCh
1st group (Control)	1603.91	1637.10	33.18
2nd group (1% anise seeds)	1653.57	1685.47	31.90
3rd group (2% anise seeds)	1691.19	1719.04	27.85
4th group (100 mg/kg curcumin)	1656.90	1686.66	29.76
5th group (100 mg/kg curcumin + 1%anise)	1606.66	1638.57	31.90
6th group (100 mg/kg curcumin + 2%anise)	1695.71	1724.52	28.80
7th group (200 mg/kg curcumin)	1633.57	1660.71	27.14
8th group (200 mg/kg curcumin + 1% anise)	1689.04	1721.42	32.38
9th group (200 mg/kg curcumin + 2% anise)	1668.57	1696.42	27.85
SEM ±	29.84	29.28	2.016
P-Value	0.2242	0.2329	0.2643

Table 4. Effect of curcumin and anise seeds dietary supplementations on feed intake (FI) during different experimental periods and overall periods

Feed intake (FI) (g/bird/day)				
Period / Treatment	1st period (47-50w)	2nd period (51-54W)	3rd period (55-58)	From (47-58w)
1st group (Control)	111.22^{cd}	114.44^{d}	114.51^{c}	113.39^{c}
2nd group (1% anise seeds)	111.54^{cd}	114.34^{d}	114.31^{c}	113.40^{c}
3rd group (2% anise seeds)	113.79^{a}	116.53^{a}	117.50^{a}	115.944^{a}
4th group (100 mg/kg curcumin)	110.83^{d}	113.63^{e}	114.38^{c}	112.95^{c}
5th group (100 mg/kg curcumin + 1%anise)	111.394^{cd}	113.57^{e}	114.52^{c}	113.16^{c}
6th group (100 mg/kg curcumin + 2%anise)	113.42^{ab}	116.54^{a}	117.47^{a}	115.81^{a}
7th group (200 mg/kg curcumin)	111.60^{bcd}	115.36^{c}	115.77^{b}	114.24^{b}
8th group (200 mg/kg curcumin + 1% anise)	111.90^{bcd}	115.64^{bc}	117.006^{a}	114.85^{b}
9th group (200 mg/kg curcumin + 2% anise)	113.14^{abc}	116.26^{ab}	117.35^{a}	115.58^{a}
SEM ±	0.55	0.21	0.18	0.214
P.Value	0.0145	<.0001	<.0001	<.0001

Means within the same clumn without mutual superscripts are significantly differen ($P < 0.05$)

Egg Quality

External Egg Quality

The results presented in Table (5 & 6) show the effects of curcumin and anise seed supplementation on the egg shape index (%) and Egg Specific Gravity across various experimental periods. Throughout the experiment, no statistically significant differences were observed in either the egg shape index or the Egg Specific Gravity among the different treatment groups, indicating that supplementation with curcumin, anise seeds, or their combinations did not significantly influence these parameters. For the egg shape index, the values remained consistent across all treatments and periods. The control group showed an average range of 75.42% to 76.84% over the three periods, while the groups receiving 1% and 2% anise seeds or curcumin at different levels displayed similar stability in their egg shape index percentages. This suggests that the egg shape was not impacted by the dietary inclusion of these supplements. Aligning with the results of the current experiment, which showed no significant changes in shell-related parameters. Liu et al. (2020) reported that while curcumin enhances certain health parameters and antioxidant status in hens, its direct influence on egg shape and shell characteristics remains minimal, Similarly, Samia et al. (2018) suggested that turmeric (which contains curcumin) did not significantly alter shell-related traits, such as shell weight or thickness, reinforcing the stability observed in shell surface measurements in this experiment. The Egg Specific Gravity, which reflects the eggshell's density and overall quality, exhibited minimal fluctuations across the treatments. This suggests that the physical properties of the eggshell, essential for quality assurance, were not impacted by the supplementation. The lack of significant changes in both parameters implies that curcumin and anise seeds, whether used separately or in combination, do not alter the external characteristics of the eggs. These results are consistent with previous studies, such as those by Yu et al. (2018) and Liu et al. (2020), which also reported stable shell quality traits with similar dietary interventions. Therefore, the supplementation can be considered safe for maintaining consistent shell quality while potentially offering additional health benefits without compromising the eggs' physical attributes. Based on the findings of this study, it can be concluded that Sohagi ewes have strong productive and reproductive potential. Because Sohagi sheep as a local breed adapts to the dry climate of Upper Egypt and small breeders depend on it as a main source of income, attention must be paid to providing environmental conditions, management treatments, and their nutritional needs to achieve maximize benefit from this local breed by increasing its productive life span and increasing the yield of offspring.

Table 5. Effect of curcumin and anise seeds dietary supplementations on egg shape index (%) during different experimental periods and overall period

Egg shape index (%)				
Period / **Treatment**	1st period (47-50w)	2nd period (51-54W)	3rd period (55-58)	From (47-58w)
1st group (Control)	75.97	76.64	75.42	75.84
2nd group (1% anise seeds)	76.88	76.72	75.82	76.27
3rd group (2% anise seeds)	77.61	76.89	75.18	75.61
4th group (100 mg/kg curcumin)	76.66	76.10	76.59	76.51
5th group (100 mg/kg curcumin + 1%anise)	76.94	76.18	75.30	75.99
6th group (100 mg/kg curcumin + 2%anise)	75.59	75.18	75.636	75.97
7th group (200 mg/kg curcumin)	75.75	76.58	75.80	76.31
8th group (200 mg/kg curcumin + 1% anise)	76.86	77.55	76.22	76.99
9th group (200 mg/kg curcumin + 2% anise)	76.26	76.50	76.83	76.69
SEM ±	0.65	0.747	0.561	0.358
P.Value	**0.108**	**0.6524**	**0.4174**	**0.1684**

Table 6. Effect of curcumin and anise seeds dietary supplementations egg specific gravity (g/cm^3) during different experimental periods and overall period

egg specific gravity (g/cm^3)				
Period / Treatment	1st period (47-50w)	2nd period (51-54W)	3rd period (55-58)	From (47-58w)
1st group (Control)	1.102	1.094	1.092	1.097
2nd group (1% anise seeds)	1.09	1.092	1.091	1.092
3rd group (2% anise seeds)	1.09	1.094	1.093	1.094
4th group (100 mg/kg curcumin)	1.09	1.093	1.094	1.093
5th group (100 mg/kg curcumin + 1%anise)	1.09	1.093	1.094	1.095
6th group (100 mg/kg curcumin + 2%anise)	1.09	1.093	1.097	1.094
7th group (200 mg/kg curcumin)	1.09	1.093	1.095	1.095
8th group (200 mg/kg curcumin + 1% anise)	1.09	1.094	1.095	1.094
9th group (200 mg/kg curcumin + 2% anise)	1.09	1.095	1.096	1.096
SEM ±	0.0028	0.0012	0.0017	0.0010
P.Value	**0.7054**	**0.9689**	**0.4251**	**0.1666**

Internal egg quality:

The results presented in Table (7 & 8) show the effects of curcumin and anise seed supplementation on yolk height and yolk diameter across various experimental periods. The results indicated that there were no statistically significant differences in yolk height and yolk diameter across the different experimental periods. However, some trends of improvement were observed in the groups supplemented with curcumin and anise seed powder. Throughout the study, groups that received curcumin and anise supplements exhibited slight increases in yolk height and diameter compared to the control. The highest yolk height was noted in the group with 200 mg/kg curcumin and 2% anise, reaching 15.05 mm during the second period. Similarly, this group showed a slight increase in yolk diameter, particularly in the second period, suggesting a potential positive effect of the supplements.

Although these increases point towards a possible improvement in yolk quality, the absence of statistical significance implies that these changes were not consistent enough to be conclusive. This trend is consistent with the findings of Radwan et al., (2008) who reported non-significant improvements in yolk traits with natural antioxidants like curcumin, highlighting the subtle nature of such changes. Additionally, Yu et al., (2008) observed slight, non-significant increases in yolk characteristics with anise supplementation, indicating that its effects might be mild and dependent on other factors.

The slight increases observed in yolk height and diameter can be linked to the potential effects of curcumin and anise. Curcumin's antioxidant properties may enhance nutrient absorption and yolk quality by supporting liver function, as indicated by Rahardja et al., (2015) who noted its positive influence on yolk formation and protein synthesis. Anise, known for its digestive-stimulating properties, might contribute to better nutrient uptake, indirectly affecting yolk traits, as observed by Christaki et al. in their studies on herbal supplementation

Impact of curcumin and anise seed supplementation on yolk index

The results presented in Table (9) show the effects of curcumin and anise seed supplementation on yolk height and yolk diameter across various experimental periods

The control group exhibited an average yolk index of 37.05 across the experimental periods, serving as a baseline for assessing the impact of supplementation. Groups supplemented with 1% and 2% anise seeds showed increases in yolk index. The 1% anise group (2nd group) averaged 37.74, while the 2% anise group (3rd group) showed a slightly higher average of 38.36. These results indicate a positive trend compared to the control, but they did not reach statistical significance, suggesting limited impact from anise seed supplementation alone.

Supplementation with 100 mg/kg curcumin, whether alone or in combination with anise seeds, resulted in moderate increases in yolk index. The averages in these groups ranged from 37.07 to 38.04, indicating a slight improvement over the control. However, these differences were not statistically significant, implying a modest but not substantial effect. As indicated by Liu et al., (2024) curcumin supplementation had no significant effect on yolk index, unit during wk 1 to 4 and 5 to 8 of the dietary feeding experiment. Additionally Azouz (2020) indicated that no significant differences were observed due to turmeric powder supplementation in yolk index during the experimental period. The groups receiving 200 mg/kg curcumin, particularly when combined with anise seeds, exhibited the highest yolk indices. The 7th group (200 mg/kg curcumin) achieved a peak of 38.42, while the 8th group (200 mg/kg curcumin + 1% anise) reached 37.83. Despite these higher values, the statistical analysis did not show significant differences, suggesting that the increases were not strong enough to be considered statistically meaningful.

Table 7. Effect of curcumin and anise seeds dietary supplementations on Yolk height (mm) during different experimental periods and overall periods

Yolk height (mm)				
Period / **Treatment**	1st period (47-50w)	2nd period (51-54W)	3rd period (55-58)	From (47-58w)
1st group (Control)	13.77	15.22	15.12	14.72
2nd group (1% anise seeds)	14.33	15.77	15.22	15.111
3rd group (2% anise seeds)	14.72	15.05	15.00	14.92
4th group (100 mg/kg curcumin)	14.11	14.94	15.44	14.83
5th group (100 mg/kg curcumin + 1%anise)	14.611	15.277	15.00	14.96
6th group (100 mg/kg curcumin + 2%anise)	14.27	15.44	15.00	14.90
7th group (200 mg/kg curcumin)	14.94	15.44	15.44	15.27
8th group (200 mg/kg curcumin + 1% anise)	14.77	15.38	15.33	15.16
9th group (200 mg/kg curcumin + 2% anise)	14.88	15.055	15.22	15.05
SEM ±	0.289	0.204	0.190	0.130
P.Value	**0.0765**	**0.1382**	**0.5164**	**0.0985**

Table 8. Effect of curcumin and anise seeds dietary supplementations on yolk diameter (mm) during different experimental periods and overall periods

yolk diameter (mm)				
Period / **Treatment**	1st period (47-50w)	2nd period (51-54W)	3rd period (55-58)	From (47-58w)
1st group (Control)	40.472	39.76	40.09	40.25
2nd group (1% anise seeds)	40.50	39.38	40.00	39.72
3rd group (2% anise seeds)	40.00	39.72	39.66	39.96
4th group (100 mg/kg curcumin)	40.38	40.00	41.00	40.35
5th group (100 mg/kg curcumin + 1%anise)	40.61	39.55	39.33	39.55
6th group (100 mg/kg curcumin + 2%anise)	39.94	39.66	40.22	39.88
7th group (200 mg/kg curcumin)	39.88	39.72	40.22	40.20
8th group (200 mg/kg curcumin + 1% anise)	40.00	39.72	40.22	40.05
9th group (200 mg/kg curcumin + 2% anise)	40.44	40.11	40.33	40.37
SEM ±	0.2901001	0.226	0.373	0.129
P.Value	**0.4715**	**0.5158**	**0.1673**	**0.0945**

Table 9. Effect of curcumin and anise seeds dietary supplementations on Yolk index during different experimental periods and overall periods

yolk index				
Period / Treatment	1st period (47-50w)	2nd period (51-54W)	3rd period (55-58)	From (47-58w)
1st group (Control)	34.04^{d}	38.31	37.74	37.05
2nd group (1% anise seeds)	35.40^{abc}	40.077	38.06	37.74
3rd group (2% anise seeds)	36.82^{ab}	37.91	37.80	36.85
4th group (100 mg/kg curcumin)	34.97^{cd}	37.39	37.68	37.46
5th group (100 mg/kg curcumin + 1%anise)	35.94^{abc}	38.64	38.15	38.04
6th group (100 mg/kg curcumin + 2%anise)	35.75^{abc}	38.92	37.31	37.71
7th group (200 mg/kg curcumin)	37.477^{a}	38.88	38.42	37.24
8th group (200 mg/kg curcumin + 1% anise)	36.97^{ab}	38.76	38.15	37.83
9th group (200 mg/kg curcumin + 2% anise)	36.79^{ab}	37.55	37.75	37.33
SEM ±	0.69	0.543	0.5058	0.32
P.Value	**0.0148**	**0.0843**	**0.8976**	**0.2024**

CONCLUSION

The study concluded that supplementing laying hens' diets with 2% anise seeds and 200 mg/kg curcumin enhances feed consumption and may improve nutrient absorption without negatively affecting body weight or egg quality. This combination is recommended for optimizing productivity in laying hens

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