

## The Effect of Turmeric (*Curcuma longa*) Powder on Fattening Performance and Slaughter Traits in Quail

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### ABSTRACT

This study was conducted to investigate the effects of adding different levels of turmeric powder to the diet during the rearing period on body weight changes, feed evaluation characteristics, and slaughter traits of quails, and to determine the most suitable ratio of turmeric powder to be added to the feed. The study was conducted with a total of 480 (n=120) one-day-old quails, divided into 4 groups, each comprising 6 replicates. The group characteristics were as follows: the control group was fed with basal feed + 0 g/kg turmeric powder (C), the 0.5Turmeric group was fed with basal feed + 0.5 g/kg turmeric powder (C1), the 2.5Turmeric group was fed with basal feed + 2.5 g/kg turmeric powder (Z2), and the 5Turmeric group was fed with basal feed + 5 g/kg turmeric powder (Z3). Weekly changes in body weight, as well as daily feed consumption and feed utilization rates determined between the start and 5 weeks, and between the start and 6 weeks, showed differences in the turmeric powder-supplemented groups compared to the control group (P<0.05). Slaughter traits exhibited some numerical differences (P>0.05). As a result, for higher body weight gain, reduced feed consumption, and improved feed utilization rate, it is recommended to use ratios of 0.5 g/kg, 2.5 g/kg, and 5 g/kg of turmeric powder during the 1-5 week period, and a ratio of 0.5 g/kg in the 6th week.

**Key words:** Turmeric (*Curcuma Longa*), Feed additive, Fattening performance, Quail carcass yield, Daily feed consumption.

## Zerdeçal (*Curcuma longa*) Tozunun Japon Bildircinlerinde Besi Performansı ve Kesim Özellikleri Üzerine Etkisi

### ÖZ

Bu çalışma, bildircinlerde besi süresince yeme zerdeçal tozunun farklı oranlarda eklenmesinin canlı ağırlık değişimine, yem değerlendirme özelliklerine ve kesim özelliklerine etkisi ve yeme ilave edilecek en uygun zerdeçal tozu oranını belirlemek amacıyla yapılmıştır. Çalışma her bir grup 6 tekrar olmak üzere 4 grup ve toplam 480 (n=120) adet bir günlük yaşta bildircin ile yürütülmüştür. Grup özellikleri; kontrol grubu(C) bazal yem+ 0 g/kg zerdeçal tozu, 0.5Zerdeçal grubu(Z1) bazal yem+0.5 g/kg zerdeçal tozu ilaveli, 2.5Zerdeçal grubu(Z2) bazal yem+ 2.5 g/kg zerdeçal tozu ilaveli, 5Zerdeçal grubu(Z3) bazal+5 g/kg zerdeçal tozu ilaveli olarak belirlenmiştir. Haftalık canlı ağırlık değişim aynı zamanda başlangıç-5 hafta ve başlangıç-6 hafta arasında belirlenen günlük yem tüketimi ve yemden yararlanma oranı bakımından zerdeçal tozu ilaveli gruplar kontrol grup değerinden farklılık göstermiştir (P<0.05). Kesim özellikleri bakımından rakamsal farklılık öne çıkmıştır (P>0.05). Sonuç olarak, yüksek canlı ağırlık artışı, az yem tüketim ve iyileşmiş yemden yararlanma oranı için 1-5 hafta aralığında 0.5 g/kg, 2.5 g/kg ve 5 g/kg oranları ve 6. Haftada ise 0.5 g/kg oranının kullanımı tavsiye edilmektedir.

**Anahtar kelimeler:** Zerdeçal (*Curcuma Longa*), Yem katkı maddesi, Besi performansı, Bildircin karkas verimi, Yemden yararlanma oranı

## INTRODUCTION

In the poultry industry, quails have the shortest fattening period. Quails exhibit high live weight gains from one day old to 35 days of age, and their live weight gains show lower rates of change in later ages (Sarica et al., 1998; Alaşahan, 2022). Despite quail carcass weights being relatively low, the shorter fattening period and lower feed consumption compared to other poultry species indicate their desirability in meat production.

Turmeric (*Curcuma longa*) is used as a spice in many parts of the world. Additionally, due to its active component curcumin (0.3-5.4%), turmeric possesses strong plant-derived antioxidant and antibacterial properties (Cohly et al., 1998; Mani et al., 2002; Çimrin, 2018). There are studies investigating the effects of poultry diets enriched with turmeric at different levels on live weight changes, feed utilization rates, and feed consumption values. The addition of turmeric powder to basal feed has been reported to enhance the growth performance of Japanese quails (Suwarta and Suryani, 2019; Ashayerizadeh et al., 2023). Attia et al. (2017) reported that adding 1 g/kg of turmeric to the feed improved the feed conversion ratio (FCR) as a plant-based feed additive compared to control group values. Durrani et al. (2006) stated that the use of turmeric as a feed additive at a 0.5 g/kg ratio improved the overall performance of broiler chicks. Rajput et al. (2013) found that supplementing feed with 200 mg/kg curcumin improved growth performance and fat metabolism, increased the absorptive area of the small intestine's villi, and thus enhanced nutrient absorption. Turmeric, especially when added to diets during the egg-laying period, has been found to positively influence the performance of poultry (Saraswati et al., 2013; Laganá et al., 2019; Alaşahan et al., 2021).

This study was carried out to determine the effect of adding turmeric to the ratio during the fattening period of quails on the weekly live weight change, feed evaluation characteristics and slaughter characteristics, as well as the most appropriate rate of turmeric powder as a feed additive.

## MATERIAL AND METHOD

This research was conducted within the scope of the approval of Siirt University Animal Experiments Local Ethics Committee dated 26/11/2021 and numbered 2021/04/29. The study was carried out in the poultry unit of Siirt University Faculty of Veterinary Medicine. A total of 480 (120x4) mixed-sex Japanese quails (*Coturnix coturnix japonica*) aged one day old were fed. The groups were divided into 4 main groups and each main group was classified as 6 repetitions (6x20). Group characteristics; The control group (C) was arranged as basal feed + 0 g/kg turmeric powder, 0.5turmeric group(Z1) basal feed + 0.5 g/kg turmeric powder added, 2.5turmeric group(Z2) basal feed + 2.5g/kg turmeric powder added, 5turmeric group(Z3) basal + 5 g/kg turmeric powder added. The study lasted for 6 weeks and feed and water were given to the quails unrestricted. Each week, the quails in the groups were individually weighed and group-based live weights were recorded. To determine the feed consumption, the amount of feed given to each group repetition at the beginning of the week and the amount of feed left at the end of the week were weighed and recorded. At the same time, the number of animals was recorded every week. Daily live weight gains and daily feed consumption values were used to determine the feed conversion ratio. In addition, to determine the amount of feed consumption, the number of dead animals was recorded as a result of daily checking of the cage parts in which the quails were found.

### Feedstuff

Commercial broiler feed based on soy and corn was used in the study. Oath analytical files are presented in Table 1. The compound feed was prepared according to the nutritional values in NRC, (1994). Dry matter, crude ash, crude protein, and crude oil analyzes of the feed material were calculated according to AOAC (1990), crude fibre level was calculated according to Crampton and Maynard, (1983) and Metabolic energy (kcal/kg) was calculated according to the new TSE formula.

Table 1: Nutrients of feedstuff

Dry Matter, %	90.5
Crude Protein, g/kg	1.86
Crude Cellulose, g/kg	0.37
Crude Ash, g/kg	0.56
Crude Fat, g/kg	0.44
Starch, g/kg	4.02
Ca, g/kg	0.078
P, g/kg	0.049
Sugar, g/kg	0.860
Metabolic energy, kcal/kg	2756

## Slaughtering Performance

Quails from each group, based on the average live weight at the end of the fattening period for each group, were separated into 12 females (6x2) and 12 males (6x2) for slaughter. Gender differentiation for the quails designated for slaughter was based on the distinct feather patterns in the chest region. Gender determination was established by the presence of spots in the chest feathers of females and the absence of spots in the chest feathers of males (Alaşahan, 2022). Individual wing tags were attached to the quails designated for slaughter.

To determine slaughter traits, in the first step, measurements such as slaughter weight, eviscerated hot carcass weight, and non-eviscerated hot carcass weight were obtained through weighing. Using these weight values, proportional (%) values were calculated as follows:

- Eviscerated carcass yield = (Eviscerated hot carcass weight / Slaughtering weight) x 100
- Non-eviscerated carcass yield = (Non-eviscerated hot carcass weight / Slaughtering weight) x 100

## Statistical Analysis

The data obtained in the study was used to determine whether there was a statistical difference between the means of the one-way ANOVA test and the independent groups. Duncan's test, multiple comparison tests, was used to identify different groups and determine if this difference was significant. The package program IBM SPSS Statistics 22 was used.

## RESULTS AND DISCUSSION

The weekly live weight, daily live weight gain, daily feed intake amount and feed conversion ratio values of turmeric added to the feed material in different amounts are shown in Table 2. It was found that the addition of turmeric to the diet in varying amounts had no significant effect on body weight values at week 1 and week 3 ( $P > 0.05$ ). In terms of body weight score in the first week of the study, the Z3 group was close to the control group ( $P > 0.05$ ), while the scores of the Z1 group and the Z2 group were significantly lower than those of the control Z3 groups ( $P < 0.05$ ). Furthermore, the turmeric value added to the feed was significantly higher than in the C group in the fourth week ( $P < 0.01$ ), and in the fifth week, the body weight value was found to be higher in the turmeric groups with Z2 and Z3 was significantly higher than in the C group in the quails of the Z1 and C groups ( $P < 0.01$ ). There was no significant difference between the groups in mean daily body weight gain at baseline 5 weeks and baseline 6 weeks ( $P > 0.05$ ). Positive results were found in studies conducted to determine the effect of adding turmeric powder to feed as a feed additive during the fattening period on growth performance in quail. Khalil et al. (2022) 5 g/kg, Atay (2023) and Ashayerizadeh et al. (2023) reported that adding 0.5g/kg turmeric powder to quail feed during the fattening period improved growth performance. These results are consistent with the study's conclusion that adding 0.5g/kg, 2.5g/kg, and 5g/kg turmeric powder to the feed increased the weekly body weights.

In the study, the feed intake level in the control group quails was higher in the early 5 and early 6 periods than in the turmeric powder-added groups (Table 2). Quails in the 2.5 turmeric groups (Z2) consumed significantly ( $P < 0.05$ ) less food than the control groups, particularly at 5 weeks of age. At the same time, it was found that the amount of feed consumption in all groups with turmeric powder aged from birth to 6 weeks was significantly ( $P < 0.05$ ) lower than in the control group. It was found that the addition of turmeric to the feed at different stages of the fattening process significantly affected the feed conversion ratio ( $P < 0.05$ ). It was found that the feed conversion ratio was significantly improved in all the turmeric-supplemented groups compared to the control groups in the first 5-week age. However, the Z1 feed conversion rate was significantly better ( $P < 0.05$ ) than the other groups at the first age of 6 weeks. Many studies examine the addition of turmeric to foods in varying proportions. In the Attia et al. (2017) study conducted on broilers, they found that adding turmeric powder to the feed between 1 and 35 days (0.5 g/kg, 1 g/kg and 2 g/kg) reduced feed consumption and improved the feed conversion ratio. Khalil et al. (2022) found that adding 5 g/kg turmeric to the feed between 7 and 42 days resulted in lower feed consumption than the control and a better feed conversion ratio.

In addition, Ashayerizadeh et al. (2023) found that the addition of 0.5g/kg turmeric powder to the Japanese quail feed was higher than the values of the control group for the period from 1 to 35 days, but better in terms of feed efficiency. It has also been reported that the addition of 0.5g/kg turmeric improves the feed conversion rate. While the results of the study on feed consumption differ from other studies due to seasonal differences, they show similarities in the feed conversion ratio.

Table 2. Growth and Fattening Performance

Group	Control	Z 1	Z 2	Z 3	SEM	P
Day (g/bird)						
initial	8.82±0.06	8.82±0.06	8.70±0.05	8.89±0.06	0.029	0.103
7	19.95±0.24a	19.17±0.27b	18.98±0.22b	19.57±0.26ab	0.125	0.032
14	30.91±0.80c	38.95±0.64a	38.39±0.54a	34.52±0.64b	0.330	0.001
21	70.81±1.28	74.77±1.10	74.44±1.03	73.08±1.19	0.576	0.066
28	106.33±1.53b	112.75±1.38a	113.29±1.16a	113.60±1.26a	0.670	0.001
35	138.18±2.08b	141.02±1.85b	148.90±1.40a	151.20±1.50a	0.863	0.001
42	170.79±2.37b	183.37±2.48a	171.93±2.25b	173.16±2.34b	1.183	0.001
Average Daily Live Weight Gain Ortalama (g)						
initial–35	3.71±0.18	3.78±0.16	3.98±0.04	4.07±0.10	0.065	0.205
initial–42	3.87±0.13	4.15±0.20	3.89±0.06	3.91±0.16	0.072	0.484
Feed Consumption (g/gün)						
initial–35	10.78±0.39a	9.66±0.18b	9.87±0.31b	10.06±0.14ab	0.137	0.046
initial–42	12.63±0.38a	11.33±0.08b	11.63±0.33b	11.80±0.21b	1.137	0.020
Feed Conversion Ratio (g/g)						
initial–35	2.91±0.15a	2.56±0.15b	2.48±0.06b	2.47±0.04b	0.053	0.019
initial–42	3.26±0.10a	2.73±0.11b	2.99±0.08ab	3.02±0.17ab	0.060	0.046

a,b: Means in the same row with the different letters are statistically significant (P<0.05).

Table 3. Slaughtering performance

Groups	Control	Z1	Z2	Z3	P
Slaughtering Weight (g)	191.01±5.73	200.51±5.65	193.72±5.13	203.07±5.45	0.371
Non-eviscerated hot carcass weight (g)	142.54±4.40	150.45±4.62	149.29±4.00	153.65±5.02	0.367
Eviscerated hot carcass weight (g)	113.86±2.43	118.80±3.18	117.34±2.05	120.14±3.28	0.422
Yield of non-eviscerated hot carcass (%)	74.62±1.92	75.03±1.78	77.07±1.93	75.66±1.38	0.752
Yield of eviscerated hot carcass (%)	59.61±1.46	59.25±1.58	60.57±1.27	59.16±1.29	0.854

The features of fattening slaughter in quail are given in Table 3. It was determined how the addition of turmeric to the feed in different amounts on carcass weight, full hot carcass weight, hollow hot carcass weight, solid carcass yield and hollow carcass yield was insignificant (P>0.05). However, based on the properties examined, the numerical values of the groups with turmeric powder were higher than those of the control group. Likewise, Khalil et al. (2022) found that the addition of 5 g/kg turmeric to the feed increased the live weight compared to the control group.

## CONCLUSION AND RECOMMENDATION

The rapid growth characteristic in quails is important for reducing feed costs by minimizing feed consumption and enhancing feed utilization rates. Consequently, studies have been conducted to identify suitable plant-based feed additives and their ratios that do not adversely affect animal health. In this study, it was observed that the addition of turmeric powder to the feed at all ratios resulted in numerical differences compared to the basal feed for the examined traits. The ratios and traits that exhibited significant differences relative to the basal feed were as follows; For weekly live weights, significant differences were observed in the 1st week at Z1 and Z2 groups, in the 2nd and 4th weeks at Z1, Z2, and Z3 groups, in the 5th week at Z2 and Z3 groups, and the 6th week at the Z3 group among quails fed with basal feed. However, the addition of turmeric powder indicated that the ratio should be reduced if the fattening period is extended. Feed consumption was lowest during the start-5 weeks at Z1 and Z2 groups and during the start-6 weeks for all turmeric-added (Z1-Z2-Z3) groups. The feed utilization rate was best during the start-5 weeks for all turmeric-added (Z1-Z2-Z3) groups and during the start-6 weeks at the Z1 ratio. To confirm the positive outcomes of the Z1 for live weight, feed consumption, and feed utilization rates, an extended feeding period should be conducted for a few more weeks.

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