Journal homepage
www.ajas.uoanbar.edu.iq
Anbar Journal of Agricultural Sciences
(University of Anbar – College of Agriculture)

EFFECT OF DIETARY SUPPLEMENT GINGER AND TURMERIC POWDER ON JAPANESE QUAIL (COTURNIX JAPONICA) PERFORMANCE, CARCASS TRAITS AND BLOOD PARAMETERS

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Article info

Received: 2022-07-28
Accepted: 2022-08-30
Published: 2022-12-31

DOI -Crossref:
10.32649/ajas.2022.176660

Cite as:
Khalil, A. J., D. D. Maulod, and S. M. Ahmed. (2022). Effect of dietary supplement ginger and turmeric powder on japanese quail (coturnix japonica) performance, carcass traits and blood parameters. Anbar Journal of Agricultural Sciences, 20(2): 471-484.

Abstract

Completely randomized design were used as the quails were distributed to four feed treatments randomly (45 birds/ treatment) with three replications (15 birds/ replicate). Treatments were: basal diet without additives (control), basal diet with 5g/kg of ginger powder, basal diet with 5g/kg of turmeric powder and equal mixture of 10g/kg ginger and turmeric powder. Results showed all treatment additives significantly increased ($p\leq0.05$) in live body weight with body weight gain. Feed intake until 21 days of age significantly decreased ($p\leq0.05$) in turmeric treatment but as a whole study until 42 days of age, there were no considerable variations ($p\leq0.05$) between treatments. Significant decrease ($p\leq0.05$) of feed conversion ratio was occurred in turmeric treatment. Addition of ginger and turmeric significantly increased ($p\leq0.05$) male and female eviscerated dressing percentage, breast percentage and back percentage. Inclusions ginger and turmeric powder significantly decreased ($p\leq0.05$) blood cholesterol, triglycerides and LDL in both of males and females but HDL in males did not changed significantly ($p\leq0.05$) while in females significantly reduced ($p\leq0.05$). In conclusion, dietary supplementation with 5g/kg of ginger and 5g/kg turmeric powder either alone or as a mixture as an effective supplement could be used to enhance growth performance, carcass characteristics and blood lipids.

Keywords: Japanese quail, Ginger powder, Turmeric powder, Carcass characteristics, Blood lipids.

تأثير مسحوق الزنجبيل ومسحوق الكركم على الكفاءة الانتاجية وصفات الذبيحة وبعض الصفات الدم لطائر السمان الياباني (Coturnix coturnix japonica)

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الخلاصة

تم استخدام التصميم العشوائي الكامل في هذه التجربة وقد تم تقسيم الافراخ عشوائياً إلى أربع معاملات (45 طائراً في كل معاملة) بواقع ثلاث مكررات (15 طائراً لكل مكرر). كانت عليقة المعاملة الاولى T1 بدون إضافات (معاملة سيطرة). المعاملة الثانية T2 اضافة 5غم/ كغم من مسحوق الزنجبيل. المعاملة الثالثة T3 اضافة 5غم/ كغم من مسحوق الكركم. المعاملة الرابعة T4 اضافة 5غم/ كغم من مسحوق الزنجبيل مع 5 غم /كغم مسحوق الكركم. أظهرت النتائج زيادة الوزن الحي ومعدل الزيادة الوزنية للجسم بشكل معنوي ($p\leq0.05$). انخفض استهلاك العلف حتى عمر 21 يوم بدرجة معنوية ($p\leq0.05$) في معاملة مسحوق الكركم T3، ولكن في عمر 42 يوم لم تكن هناك فروقات معنوية ($p\leq0.05$). وجد انخفاض معنوي ($p\leq0.05$) في معامل التحويل الغذائي في معاملة مسحوق الكركم T3. أدت إضافة الزنجبيل ومسحوق الكركم إلى زيادة معنوية ($p\leq0.05$) في نسبة التصافي للذكور والإناث ونسبة الصدر والظهر. ادت اضافة الزنجبيل ومسحوق الكركم الى انخفاض معنوي ($p\leq0.05$) في نسبة الكوليسترول والدهون الثلاثية وLDL في الدم لكل من الذكور والإناث لكن HDL في الذكور لم يتغير بشكل معنوي ($p\leq0.05$) بينما انخفض بشكل معنوي ($p\leq0.05$) في الإناث. ان استخدام 5غم/ كغم من الزنجبيل و5غم/ كغم من مسحوق الكركم اما بشكل منفرد أو على شكل خليط كإضافات علفية فعالة لتحسين الاداء الانتاجي وخصائص الذبيحة والدهون الدم.

كلمات مفتاحية: السمان الياباني، مسحوق الزنجبيل، مسحوق الكركم، خصائص الذبيحة، نسبة الدهون في الدم.

Introduction

In the poultry industry, to increase growth and productivity as well as to cure different diseases antibiotics are often used (8). At the beginning of January 2006, the utilization of antibiotics as a growth enhancer in poultry and animal diet has been forbidden in the European Union (9). The natural growth enhancers can be fed to poultry without affecting their performance like probiotics, synbiotics, prebiotics, enzymes and herb extract (7).

As natural growth promoters turmeric and ginger plant can be used instead of antibiotics and other chemical growth promoters (11). Around the world the ginger rhizome (Zingiber officinale) is a well-known spice used in a variety of foods and as

a herbal therapy (3). Ginger in general grown in Pakistan, India, China and Central Asia and all over the world it will be sold (13). Ginger and its derivatives could be suggested as a harmless plant because of no severe toxicological side effect outcomes (2). Extracts of ginger include flavonoids and phenolic chemicals (gingerdiol, gingerol, gingerdione, and shogaols) (50). Using ginger instead of an antibacterial growth promoter improves poultry productivity, diet palatability and appetite, nutrient absorption, and flowing of gastric enzymes (25). Ginger has anti-bacterial, anti-inflammatory, immunomodulatory, androgenic properties and anti-oxidant effects that may either decrease or inhibit free radicals formation (5). Preclinical studies of ginger oil have shown that it has antifungal, antibacterial, anti-inflammatory, analgesic, and immunomodulatory properties (28). Turmeric (Curcuma longa) is a valuable medicinal plant, which is mostly used as a medicinal or in human nutrition, either fresh or powdered (19). Active physiological compounds in turmeric powder are curcumin, tetrahydrocurcumin, bismethoxycurcumin, and dimethoxycurcumin. Curcumin is the main biologically active ingredient in turmeric, representing 3-5% of turmeric (26). Turmeric rhizome, as turmeric known in general, is a popular spice, coloring component and nutrition preservative with remedy properties (4), turmeric is farmed mostly in Southern and Southeast Asia.

The aim of this study is to find the impact of inclusions different levels of ginger and turmeric powder either alone or in a mixture on growth performance, carcass traits and some blood parameters of Japanese quail.

Materials and Methods

Source of birds, diet and management: This research was performed in Grdarasha poultry farm/ College of Agricultural engineering sciences-University of Salahaddin/ Erbil-Iraq from 20/02/2021 to 2/4/2021. Eggs of Japanese quail (*Coturnix coturnix japonica*) were provided by the quail project of Grdarasha farm. A private hatchery has been used for hatching the eggs. Chicks were reared in cages 70, 50, 30 cm with the same environmental and management conditions till 7 days of age, after that 180 quail chicks were randomly classified into four dietary treatments, 45 quails per treatment had three replicates, 15 birds in each replicate. Free access to water and feed of their own treatment dietary (ad libitum) was provided. Treatment 1 (T1) was control (basal diet without additives), treatment 2 (T2) fed the basal diet with 5g/ kg of ginger powder, treatment 3 (T3) fed basal diet with 5g/ kg of turmeric powder also treatment 4 (T4) fed the basal diet with 10g/ kg of ginger and turmeric powder which is mixed equally. Feed was provided in the form of mash table 1 presents the ingredients of the feed and its chemical composition. From the local market of Erbil ginger and turmeric as dried ground and fine powder were acquired. According to the research design, the feed has been mixed with ginger and turmeric powder every week. At the beginning of the study temperature was provided 37º C and gradually decreased by 2º C/ week till the temperature reached 25º C, continued till the last of the study. Each box is provided with long deep feeders 50×15 cm and two automated water droppers. During the experiment, 23 hours/ day of continuous light with 100 watt lamps was provided.

Table 1 Basal diet ingredients with chemical composition.

Ingredients	Amount (kg)
Wheat	449.75
Soybean Meal 47%	336
Corn	150
Vegetable Oil	15
Limestone	15
MCP[1]	7
Enzyme[2]	0.25
Toxin binder	2
Premix 2.5%[3]	25
TOTAL	1000
Chemical Composition[4]	**Calculated**
Crude protein %	23
ME.Kcal/kg	3000
Available Ca %	1.05
Available P %	0.5
Na %	0.21
Lysine %	1.46
Methionine %	0.6
Fat %	4.03
Fiber %	2.82

1- MCP: contains 16% calcium and 22.7 % phosphorous.
2- Enzyme: consists of a mixture of enzymes Xylanase, b-glucanase, Amylase, and Protease.
3- Premix 2.5% was used in the diets, which contain 16.7% protein, energy 3879 kcal/kg, %, lysine 8.1%, methionine 9.6, Methionine + cysteine 9%, phosphorous available 7.2%, sodium 6.4%, salinomycin sodium 120 g/kg 2400 ppm, with a group of vitamins and minerals.
4- Chemical analysis of the feed and Ingredients of the diet was carried out in the laboratory of the Kosar Feedmill.
5- Ginger and turmeric powder were added to the experimental diets according to their percentage in each treatment.

Growth performance: The average body weight was estimated by weighting each cage individually on 7, 21, and 42 days of age, then dividing the weight on their numbers. By subtracting the weight of day 7 from the weight of 21 and 42 days of age body weight gain was measured. Ration were weighted before being supplied for the feeders in each box, then any leftover diet was weighted again to determine the feed intake. By dividing total diet intake by total body weight gain per pen on day 21, then accounting for mortality, feed conversion ratio (FCR) was measured. The same procedure was performed to determine feed intake and FCR at 42 days of age (10).

Carcass portion percentages: On day 42 of the research period, after 3 hours of fasting, twelve quails were chosen randomly for each treatment (six males and six females). After slaughtering viscera was removed directly, by using a sensitive digital scale weights of the eviscerated dressing, breast, wings, legs, and back were calculated. Relative weights of eviscerated dressing and those portions as a percentage of live body weight were measured (10).

Blood sample preparation and analysis: 12 quails per treatment (2 males and 2 females in each replicate) were slaughtered after the diet was banned for about 3 hours, 4ml blood of each bird was collected using a gel tube separately (serum separating tube, SST tube). To get blood serum and evaluating biochemical traits, tubes with 3000 rpm/ 10 min. were centrifuged (10). A Cobas integra 400 plus auto-analyzer machine (Iraq, kurdistan region, Erbil, Pzishkan st. Bio lab.) was used according to the recommended

procedures of producing company to measure triglyceride, total cholesterol, high density lipoprotein (HDL) and low density lipoprotein (LDL).

Statistical Analysis: The acquired data were statistically evaluated using standard methods. SAS 2005 was used to evaluate the data and account for the effect of the treatments. The significance among means was determined by using Duncan's multiple range tests ($p \leq 0.05$).

Results and Discussion

Growth performance: Table 2 presents the effect of ginger and turmeric powder added to feed on growth performance. The value of live body weight in T3 was increased significantly ($p \leq 0.05$) at 21 days of age comparing with the rest of treatments but at 42 days of age T2, T3 and T4 were increased significantly ($p \leq 0.05$) comparing to T1. About body weight gain, from 7 to 21 days of age T3 increased significantly ($p \leq 0.05$), but at 22 to 42 days of age T2 was significantly ($p \leq 0.05$) increased comparing with the other treatments, moreover in 7 to 42 days T2, T3 and T4 were significantly increased ($p \leq 0.05$) in compare with T1. Feed intake in T3 reduced significantly ($p \leq 0.05$) in 7-21 days of age in comparing with the other treatments but there were no significant differences ($p \leq 0.05$) among treatments in 22 to 42 days of age, as a whole experiment from 7-42 days of age there were significant increases ($p \leq 0.05$) in T2 in comparing with the other treatments. FCR from 7 to 21 days of age improved significantly ($p \leq 0.05$) in T3 comparing with the other treatments, but in 22 to 42 days there were no significant differences ($p \leq 0.05$) among treatments, but as a whole experiment from 7-42 days of age there was significant improvement ($p \leq 0.05$) of FCR in T3 comparing with control treatment.

Table 2 Impact of ginger powder and turmeric powder on quail's performance.

Treatments / Traits	T1	T2	T3	T4
Live body weight 21 Day (g)	122.5±0.7 ^{c}	129.93±0.58 ^{ab}	132.86±0.63 ^{a}	128.35±0.53 ^{b}
Body wt. gain 7-21 Day (g)	84.2±0.7 ^{c}	91.63±0.57 ^{ab}	94.56±0.63 ^{a}	90.05±0.53 ^{b}
Feed intake 7-21 day (g)	250±7.21 ^{a}	271.54±7.84 ^{a}	205.12±5.92 ^{b}	255.33±7.37 ^{a}
Feed conversion ratio 7-21 day	2.96±0.09 ^{a}	2.97±0.14 ^{a}	2.17±0.06 ^{b}	2.83±0.06 ^{a}
Body wt. gain 22-42 Day (g)	142.93±2.72 ^{b}	163.73±8.24 ^{a}	152.00±3.49 ^{ab}	159.84±5.29 ^{ab}
Feed intake 22-42 day (g)	798.00±23.03	829.57±23.94	769.44±22.21	788.65±22.76
Feed conversion ratio 22-42 day	5.58±0.11	5.09±0.28	5.07±0.25	4.95±0.3
Live body weight 42 Day (g)	265.43±2.28 ^{b}	293.66±6.33 ^{a}	284.86±3.13 ^{a}	288.20±5.00 ^{a}
Body wt. gain 7-42 Day (g)	227.13±2.28 ^{b}	255.36±6.33 ^{a}	246.56±3.13 ^{a}	249.9±5.00 ^{a}
Feed intake 7-42 day (g)	1048±30.25 ^{ab}	1101.11±31.78 ^{a}	974.56±28.13 b	1043.98±30.13 ^{ab}
Feed conversion ratio 7-42 day	4.61±0.09 ^{a}	4.32±0.16 ^{ab}	3.95±0.16 ^{b}	4.18±0.2 ^{ab}

a and b mean within the same row followed by different superscripts are significantly different (p≤0.05).

- T1 = basal diet.
- T2 = basal diet with 5g/kg of ginger powder.
- T3 = fed basal diet with 5g/kg of turmeric powder.
- T4 = fed basal diet with 10g/kg of ginger and turmeric powder which is mixed equally.
- Initial body weight at 7 days old= 33.8 g.

Carcass and carcass portions: Table 3 declares the impact of various levels of ginger and turmeric powder added to diet on quail eviscerated dressing percentage and carcass portions percentage at the age of 42 day. Male eviscerated dressing percentage and breast percentage increased significantly (p≤0.05) in T2, T3 and T4 comparing with T1 but in females eviscerated dressing percentage and breast percentage significantly increased (p≤0.05) in T2 in compare with the control group. Males wings percentage increased significantly (p≤0.05) in T4 compared with the other treatments but in females T2 and T3 significantly decreased (p≤0.05) compared with others. Legs percentage in males significantly increased (p≤0.05) in T4 comparing with the other treatments, but in females there were no significant differences(p≤0.05) among treatments. Males and females back percentage significantly increased (p≤0.05) in T2, T3 and T4 in comparison with T1.

Table 3 Effect of ginger powder and turmeric powder on eviscerated dressing percentage and carcass portions percentage of Japanese quail at 42 days of age.

Treatments / Traits		T1	T2	T3	T4
Eviscerated dressing percentage %	Male	64.11±1.8 ^{b}	76.31±2.2 ^{a}	74.74±2.1 ^{a}	76.09±2.1 ^{a}
Breast %	Male	22.98±0.6 ^{b}	26.31±0.7 ^{a}	26.26±0.7 ^{a}	26.34±0.7 ^{a}
Wings %	Male	6.05±0.1 ^{bc}	6.31±0.1 ^{ab}	5.55±0.1 ^{c}	6.87±0.1 ^{a}
Legs %	Male	16.13±0.4 ^{b}	16.84±0.4 ^{b}	17.82±0.6 ^{b}	20.48±0.5 ^{a}
Back %	Male	15±0.1 ^{c}	20±0.5 ^{a}	21.21±0.6 ^{a}	17.07±0.4 ^{b}
Eviscerated dressing percentage %	Female	66.26±1.91 ^{b}	75.9±2.19 ^{a}	71.58±2.06 ^{ab}	72.65±2.09 ^{ab}
Breast %	Female	24.49±0.7 ^{b}	27.71±0.8 ^{a}	25.26±0.73 ^{ab}	26.94±0.77 ^{ab}
Wings %	Female	6.02±0.17 ^{a}	4.82±0.13 ^{b}	5.26±0.15 ^{b}	6.53±0.19 ^{a}
Legs %	Female	15.26±0.43 ^{a}	16.06±0.46 ^{a}	16.84±0.48 ^{a}	16.32±0.47 ^{a}
Back %	Female	13±0.37 ^{c}	18±0.52 ^{a}	16.14±0.46 ^{b}	15.51±0.45 ^{b}

a and b mean within the same row followed by different superscripts are significantly different (p≤0.05).

- T1 = basal diet.
- T2 = basal diet with 5g/kg of ginger powder.
- T3 = fed the basal diet with 5g/kg of turmeric powder.
- T4 = fed the basal diet with 10g/kg of ginger and turmeric powder which is mixed equally.

Serum lipids: At 42 days of age blood lipids in quails tested, details in table 4 show that cholesterol in males in T2 and T4 reduced significantly (p≤0.05) comparing to the other treatments but in females T2, T3 and T4 significantly reduced (p≤0.05) compare to T1. Triglycerides in males significantly reduced (p≤0.05) in T2, T3 and T4 comparing with T1 but in females T2 significantly reduced (p≤0.05) comparing with the other treatments. No significant differences (p≤0.05) in males HDL occurred between T1 and T2 with T3 and T4 but a significant increase (p≤0.05) was found in T3 comparing with T4. Females HDL decreased significantly (p≤0.05) in T3 and T4 in comparing to T1 and T2. LDL in males decreased significantly (p≤0.05) in T2, T3 and T4 comparing to

T1 while in females T2 reduced significantly ($p \leq 0.05$) in comparison to the other treatments.

Table 4 Impact of different levels of ginger powder and turmeric powder on cholesterol, triglyceride, HDL and LDL (mg/dl) based on the sex of quails in 42 days of age.

Treatments	Male			
	Cholesterol	**Triglycerides**	**HDL**	**LDL**
T1	215±6.2 [a]	138±3.98 [a]	105±3.03 [ab]	85±2.45 [a]
T2	194±5.6b [c]	123±3.55 [b]	103±2.97 [ab]	63.9±1.84 [b]
T3	203±5.86 [ab]	102±2.94 [c]	112±3.23 [a]	70.6±2.03 [b]
T4	178±5.13 [c]	72±2.07 [d]	97±2.8 [b]	66.8±1.92 [b]
Treatments	**Female**			
	Cholesterol	**Triglycerides**	**HDL**	**LDL**
T1	240±6.92 [a]	772±22.28 [c]	52±1.5[a]	159.7±4.61 [a]
T2	173±4.99 [c]	613±17.69 [d]	52±1.5 [a]	85.2±2.46 [b]
T3	220±6.35 [b]	1315±37.96 [a]	38±1.09 [b]	151±4.35 [a]
T4	148±4.27 [d]	1037±29.93 [b]	42±1.21 [b]	149±4.3 [a]

a and b mean within the same columns followed by different superscripts are significantly different ($p \leq 0.05$).

- T1 = basal diet.
- T2 = basal diet with 5g/kg of ginger powder.
- T3 = fed the basal diet with 5g/kg of turmeric powder.
- T4 = fed the basal diet with 10g/kg of ginger and turmeric powder which is mixed equally.
- HDL= high-density lipoprotein, LDL= low-density lipoprotein.

Values of live body weight and body weight gain increased significantly ($p \leq 0.05$) with inclusions of ginger and turmeric powder with various levels or their mixture into the diet. Our result strongly agree with (20) results who show that broiler's body weight gain significantly higher in feed added with 0.5% ginger and 0.75% turmeric. (34) demonstrated that ginger addition powder 4 and 8 g/kg of feed significantly enhanced weight gain. Our result is also consistent with (16) results who reported that there is a significant impact of ginger root powder (7.5g/ kg of diet) on live body weight and body weight gain in broilers at 22 days of the research, but there were no clear differences among treated groups about body weight after 42 and 49 days of age. Also agree with (32) results who noted that the significant effect of addition 0.5% turmeric powder to diet inclusions broiler body weight gain. Also agree with (24) results as they observed higher body weight in quails fed turmeric-enzyme feeds. Also (14) found that a dietary additive with turmeric powder 5g/kg of feed, significantly increased body weight than the control group. Our results agree with (6) results, they reported that turmeric inclusions improved broilers growth performance.

Ginger includes a variety of active substances, such as gingerol, gingeron, gingerdiol, brunel, camphon, limonene, humolin, and several phenolic ketone derivatives, as well as volatile oils, alkaloids, saponins, and flavonoids, these active compounds of ginger may connect to serotonin receptors and influence the function of gastrointestinal which can increase secretion of digestive enzymes such as disaccharides and maltase, also lipase and protease, they are digestive enzymes found in ginger, might be responsible for the improvement of performance (13, 49). Indeed, the digestion and absorption of nutrients are strongly influenced by (bile and biliary bile acids) enzymes. According to

(14) these effects led to better performance and increased metabolism in quails. (32) reported that the best antioxidant activity of turmeric is at 0.5% level which causes a significant increase in body weight by stimulating protein synthesis of birds enzymatic system. Another researcher (22) reported that turmeric contains bioactive ingredients like curcumin and curcumoinoids that could stimulate the feed bioavailability and utilization by the quails.

As a whole experiment results showed that the feed intake (FI) did not differ significantly ($p\leq0.05$) in ginger treatment (T2) and in ginger with turmeric mixture treatment (T4) but decreased significantly ($p\leq0.05$) in turmeric treatment (T3). In agree with the present research (16) indicated that there were no clear differences among treated groups about FI with inclusions of ginger powder (7.5g or 15g /kg of diet) in broiler chickens after 42 and 49 days of age. Our result partially agree with (20) who declared that broilers FI did not affect significantly ($p\leq0.05$) between non-additive treatments and additive treatments with 0.5% and 0.75% ginger powder and 0.5% and 0.75% turmeric powder. In consist with our result (24) noted a non-significant impact ($p\leq0.05$) of turmeric powder on diet intake in Japanese quail. In agree with our result (22) reported feed additive with turmeric powder reduced daily feed consumption in Japanese quails. Our result contrary with (32) findings who reported that broilers FI in turmeric dietary groups significantly increased ($p\leq0.05$) from the age 1 to 14 days, but at the age 15 to 28 days and 1 to 28 days non-significant differences ($p\leq0.05$) were observed. Also in inversion with the present study, ginger powder at a level 4 and 8 g/kg feed significantly decreased FI in broilers (34). Also (35) noted a significant reduce ($p\leq0.05$) of Japanese quail FI when fed diet supplemented with ginger powder. Also feed conversion ratio (FCR) as a whole experiment from at the age 7 to 42 days was not effected significantly ($p\leq0.05$) in ginger treatment (T2) and in ginger with turmeric mixture treatment (T4) but significantly improved ($p\leq0.05$) in turmeric additive treatment (T3). In line with our finding, studies stated that ginger powder has no significant impact on FCR in broilers (45) also in laying chickens (46). (16) reported that there were no clear changes about broiler's FCR between treated groups with ginger powder and control group after 42 and 49 days of age. In opposite with our result (35) reported that Japanese quail FCR improved significantly ($p\leq0.05$) in treatments with additive ginger powder. Also (20) reported that a diet supplement with ginger powder enhanced FCR in broilers. Our result is in line with (32) results who reported that FCR improved with an addition of 0.5%, 1.0% and 1.5% turmeric powder to broilers feed. This results agree with (1) findings which declared that the additive feed with 0.5% turmeric powder was improved broilers FCR. On the other hand (47) declared that non-significant impact of FCR obtained when a diet supplemented with 0.4 and 0.8% turmeric powder. Turmeric has antimicrobial characteristics against viruses, bacteria, and fungi also affects like a prebiotic which stimulates essential gut microbiota growth (12). Such as antibiotics, turmeric maybe inhibits the development and colonization of a different types of bacteria species (pathogenic and non-pathogenic) in the poultry's gut, balanced gut microbial ecosystems is the result with better feed consumption as indicated by improving feed conversion ratio. This is may

enhance feed digestion and digestive enzyme activity, that led to increasing FI and improving FCR (31).

Quail eviscerated dressing and carcass portions percentages increased significantly ($p \leq 0.05$) by adding different levels of ginger and turmeric powder to the diet. Our result agree with (44) result, they found a significant increase in dressed carcass weight and back percentage in quails fed a diet with supplemented 0.5% and 1% of ginger powder. On the other hand our results disagree with (20) result, they declared that the dressing percentage was not considerably changed among different additive groups (turmeric powder, ginger powder and non-additive group) but reported a significant improvement of wing and breast percentages by powder ginger addition in broiler feeds. Other researcher did not observe any significant differences with using ginger powder and turmeric powder 1 g/kg and 2 g/kg diet as feed additives on dressing percentage in broilers (37). Moreover, there were non-significant impact about broiler's carcass characteristics as fed 0.25% ginger powder up to 6 weeks of age (33). Our findings in harmonize with (22) results who found a significant increase in Japanese quail's dressing percentage fed diet inclusions 1% of turmeric powder. (14) reported dietary 0.5% turmeric powder additive increased broiler dressing percentage, breast and thigh weight. Also inclusions 7g (turmeric powder)/ kg diet significantly increased the breast and thigh weight in broilers (16). Furthermore, other studies have shown significant improvement in broilers dressing percentage fed turmeric powder (32 and 48). (17) reported that carcass improvement is may refer to turmeric's antioxidant effect because of the existence of curcumin, artumerones and curlones, which is enhance production of protein by enzymatic system.

Quails lipid profile is affected by supplementing different levels of ginger and turmeric powder to diet. Cholesterol, Triglyceride and low-density lipoprotein (LDL) were significantly lowered but high density lipoprotein (HDL) did not differ in males while significantly reduced in females. (43) observed that cholesterol of serum and levels of triglyceride decreased significantly of quail's diet inclusions with turmeric powder. Also (39) reported a significant decrease in the cholesterol content from 177.4 mg/dl to 97mg/dl by increasing levels of turmeric powder. (36) mentioned that the inclusion of turmeric powder of 108 mg/ bird / day can decrease cholesterol levels in quail's blood. (30) revealed that the inclusion of 0.6 g turmeric powder can decrease a broiler's cholesterol levels by 3.42 mg/dl. In another study ginger powder significantly decreased triglyceride levels of blood but its impact was not beneficial on cholesterol levels of serum (35). In agree with our findings, researches have reported that using ginger extract (0.4 and 0.6mg/g) to feed as a dietary additive significantly reduced cholesterol and triglyceride levels (41). In the line with our findings (23) reported that quail fed with additive ginger powder, results showed that the serum had minimum total cholesterol levels and decrease of LDL but an increase in HDL occurred, compared with the control.

Curcumin plays a role in enhancing lipid metabolism in the liver (42) such as improving the performance of lipoproteins to modulate the tissue's levels of lipid, cholesterol, and

triglycerides (15). (39) reported that turmeric contain 6.73% of phytoestrogens. Phytoestrogens have the same impact like estrogen by stimulating vitelogenin synthesis activity in the liver to use cholesterol as a precursor in the production of vitelogenin (27). Blood cholesterol levels decreased due to cholesterol's distribution to the other tissues, such as ovary's muscles and follicular hierarchy (38). Strong ginger's anti-lipidemic impact has previously been shown on serum cholesterol and triglyceride levels (18). The inhibition of cholesterol synthesis may be refer to β-hydroxy-β-methylglutaryl coenzyme A (HMG-CoA) (41). Also, ginger is a powerful (3-hydroxy-3-methyl-glutaryl coenzyme A reductase) HMGR-inhibiting drug believed to have liver-specific suppression of cholesterol production (29). Beneficial performance by ginger's effect depends on the ginger's dose, bird types, its derivatives and interaction with other dietary ingredients.

Conclusion: Feed additive with 5g/kg of ginger and 5g/kg turmeric powder either alone or as a mixture could be utilize as an effective diet supplement to enhance performance of growth, carcass characteristics and blood lipids in quail. Our recommendation is performing further researches which is necessary to conclude and discover more information about the impact of different levels of ginger and turmeric powder only or as a mixture with the other plants on poultry performance and biochemical traits in the future.

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