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Effect of sesame meal supplementation to the feed on performance, blood parameters and physiology characteristics in Japanese quail

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ABSRACT

This study was conducted to investigate the effect of different levels of sesame meal (SM) on performance, blood parameters and physiology characteristics of Japanese quail. One hundred eighty day-old Japanese quail chick were equally distributed into six treatments, three replicates per treatment 10 birds and reared to 42 days of age. The treatments consisted of SM0, SM10 and SM20 (%). The diet for SM0 treatment had no SM (control), while those for treatments SM10 and SM20 included 10 and 20 percentage of SM, respectively. Each dietary treatment was fed ad libitum to three replicate groups of 10 birds at the beginning of experimental period. Chicks and feed were weighed on days 10, 24 and 42 and carcass characteristics were measured on day 42. Results indicated that, daily weight gain, feed intake and feed efficiency weren't significantly affected by experimental treatments. However, diet containing 20% SM improved the weight gain and feed conversion ratio of Japanese quail, numerically. As well as, diets containing SM no had the significantly affect on weight of gizzard and liver than control diet (p>0.05). Thus, SM can be used as an alternative feedstuff in quail's diets, at inclusion levels up to 20% without negative effects on performance and carcass traits.

Key words: Physiology, Japanese quail, Performance, Sesame Meal.

INTRODUCTION

Sesame meal (SM) is the residue after extracting the oil from the seed. It is an excellent source of protein and has an amino acid composition similar to that of soybean meal [12]. An average crude protein content of 400 g/kg and crude fiber content of 65 g/kg are typical for expeller-extracted SM, but these values may vary widely depending on the variety used, degree of decortications and method of processing. SM is an excellent source of methionine, cysteine and tryptophan but is deficient in lysine, indicating that it cannot be used effectively as the sole protein supplement in poultry diets [4 and 15]. Additionally, it consists of polyunsaturated fatty acids such as linoleic acid, oleic acid and saturated fatty acids such as palmitic acid and stearic acid [6]. It is also a rich source of minerals; however, mineral availability from SM may be lower due to the presence of high levels of oxalates (35mg/100 g) and phytate (5g/100 g) in the hull fraction of the seed.

Moreover, high amount of phytate may be reduced the protein availability in poultry diets [7, 9 and 11]. Removal of hull not only improves mineral availability, but also reduces the fiber content of SM and increases the protein level and availability in poultry diets [15].

Daghir *et al* [5] reviewed the very early work on the nutritive value of SM and the extent to which it can replace soybean meal in broiler rations. Studies showed that SM could be partially replacing by soybean meal in poultry diet

[3]. Ravindran and Blair [15] proposed that, use of SM in starter diets should be limited because of its high fiber content and possible availability problems associated with phytates and oxalates. Bell *et al* [3] reported that SM might provide an acceptable alternative to soybean meal in broiler diets when the substitution level is 150 g/kg or less.

Other research also showed that good-quality SM can be included up to 150 g/kg in poultry diets, but for optimal growth and feed conversion efficiency, it should be supplemented with high-lysine ingredients such as soybean meal or fishmeal [10, 15 and 19]. Mamputu and Buhr [12] reported that, growth performance of broiler chicks fed diet containing 150g/kg SM was not different from chicks fed the control diet; however, at dietary inclusion level of 300g/kg chick's performance was depressed. In addition, Yamauchi *et al* [18] showed that up to 200g/kg SM could be incorporated into diets fed to male birds of laying strains in the developer period.

Although there was some research about of SM and its effects on broiler chicks performance; however, there are no reported studies on the effect of use the SM in Japanese quail diets. Therefore, in the present study, our aim was to investigate the effect of different levels of sesame meal on performance, blood parameters and carcass characteristics of Japanese quail.

MATERIALS AND METHODS

Chemical Composition

Sample of sesame meal (SM) was obtained from commercial plant and was analyzed for dry matter (DM) by drying at 60°C for 48h in a forced air oven, crude protein (CP), crude fiber, ash, calcium, phosphorus and gross energy (GE) (kcal/g) (Table1) according to methods 90.49, 35.65, 8.82, 9.37, 2.03, 0.73, and 4265 kcal/g respectively of AOAC [2].

Table1. Chemical composition of sesame meal[1]

Item	Amount (%)
Gross Energy	4265 (kcal/g)
Dry Matter	90.49
Crude Protein	35.65
Crude Fiber	8.82
Ash	9.37
Calcium	2.03
Phosphor	0.73

[1]Sesame meal was analyzed for dry matter, crude protein, crude fat, crude fiber, ash, calcium and phosphorus according to AOAC (1990).

Bird Management and Dietary Treatments

One hundred eighty day-old male Japanese quail chicks were obtained from a commercial hatchery. Quails with similar initial weight (75.64±2 g), were randomly divided into six groups (cage dimensions: 50cm wide × 50cm long × 40cm high) in a curtain-sided house. Three replicate pens of 10 birds per pen were allotted for each dietary treatment group. During the 42 days experimental period, from 1- 42 days of age, all chicks in the four treatments received three different diets (Table 2), according to nutrient requirements of Japanese quail as given by NRC [13]. The diet for SM0 treatment had no SM (control), while those for treatments SM10 and SM20 included 10 and 20 g/kg of SM, respectively. All diets were is nitrogenous and is energetic, having the same level of the amino acids lysine, methionine and cysteine, according to NRC [13] nutrient composition values (Table2). During the experimental period, conventional management procedures were employed, natural and artificial light was provided for 23 h per day, ambient temperature was controlled and birds were fed and watered *ad libitum*.

Performance and carcass traits

Quails were weighed at 10, 24 and 42 d of age and feed intake (FI, g) was determined at 24 and 42 d of age. At the end of experiment, six birds per treatment were randomly selected for carcass measurements. Quails were fasted for approximately 8h and then individually weighed, sacrificed, de-feathered and eviscerated. Whole carcass, breast, thigh, intestine, pancreas and gizzard were weighted. Daily feed intake (DFI, g), average daily gain (ADG, g), body weight (BW, g), feed efficiency (FE, g feed/g weight gain), and carcass weight and organs were also calculated. Data from DFI and ADG were adjusted for mortality and carcass weight and parts calculated as percentage of BW.

Statistical analysis

Data from chick assay was subjected to GLM for completely randomized designs using SAS [16]. Statistical significance of differences among treatments was assessed using the Duncan's test [17]. Regression analysis was also used to determine linear and quadratic relationships in the chick assay.

Table2. Composition of experimental diets (as fed basis)

Ingredient (g/kg)	Treatment[1]		
	SM0	SM10	SM20
Yellow corn	53	53.36	54.93
Soybean meal (440 g/kg CP)	43	33.03	22.84
Sesame meal (350 g/kg CP)	0	10	20
Bicarbonate Calcium	135	0.72	0.09
Di-Calcium Phosphate	0.73	0.72	0.71
Di- L- Methionine	0.13	0.05	0.05
Salt	0.34	0.33	0.33
Vitamin premix[2]	0.5	0.5	0.5
Mineral premix[3]	0.5	0.5	0.5
Weight	1	1	1
AMEn (kcal/kg)	2900	2900	2900
Crude protein	24	24	24
Ether Extract	2.55	4.48	7.2
Crude Fiber	4.29	4.76	5.22
Calcium	0.8	0.8	0.8
Available Phosphor	0.3	0.3	0.3
Sodium	0.15	0.15	0.15
Potassium	1.04	0.97	0.91
Color	0.26	0.27	0.3
Lysine	1.35	1.3	1.3
Arginine	1.57	1.84	2.1
Methionine+ Sistine	0.89	0.89	0.91
Threonine	0.24	0.42	0.59
Tryptophan	0.35	0.37	0.39

[1] SM0: control treatment; SM10: treatment with 10 g/kg sesame meal; SM20: treatment with 20 g/kg sesame meal.
[2] Provided per kg of diet: vitamin A: 9000 IU; vitamin D: 2000 IU; vitamin E: 18 IU: vitamin K_3: 3 mg; vitamin B_1: 1.78 mg; vitamin B_2: 6.6 mg; vitamin B_6: 3 mg; vitamin B_{12}: 0.015 mg; Niacin: 30 mg; Pantothenic acid: 10 mg; Biotin: 0.15 mg and Choline: 1500 mg.
[3] Provided per kg of diet: Cu: 10 mg; I: 0.99 mg; Fe: 50 mg; Mn: 100 mg; Se: 0.08 mg and Zn: 100 mg.

RESULTS AND DISCUSION

Growth performance

The results for performance of Japanese quail are presented in Table 3. No significant differences were noted between treatments for quail ADG, FE and DFI at 10 to 24 d and 24 to 42 d. Moreover, no significant differences were observed in quail performance parameters from 10 to 42 d of age. However, ADG and FE in diets containing SM (especially at inclusion levels of 150 g/kg) were improved numerically, compared with control diet. There were linear trend in ADG and FE by increasing level of SM, but poor linear or quadratic regression was observed between DFI and dietary SM concentration. In addition, in contrast comparison for performance, there was no significant difference in comparison of diets containing SM vs. control diet for ADG, FE and DFI (Table 3).

Table3. The effect of diets containing sesame meal on performance of Japanese quail (g/bird)

Treatment[1]	Average daily gain			Daily feed intake			Feed efficiency		
	1 week	6 week	total	1 week	6 week	total	1 week	6 week	total
SM0	17.31	30.67	237.21	35.65	226.52	880.94	2.08	7.38	3.74
SM10	17.46	30.78	238.81	34.65	221.5	863.17	1.97	7.19	3.63
SM20	17.18	31.42	236.82	31.33	214.63	830.99	1.83	6.83	3.5
SEM	0.04	0.02	0.02	0.02	0.02	0.02	0.02	0.08	0.01

[1]SM0: control treatment; SM10: treatment with 10 g/kg sesame meal; SM20: treatment with 20 g/kg sesame meal.
[2]Single degree of freedom contrasts were not significant (P>0.05) for average daily gain, daily feed intake and feed efficiency for control diet vs. diets containing SM (treatment SM0 vs. treatments SM10 and SM20).
SEM: standard error of the means.

This result can be attributed to the similar energy, protein and amino acid contents in the diets of all treatments (Table 2). Moreover, similar performance of quails fed diets containing SM compared to control diet, showed that the SM sample that used in this study might be lower in phytates or oxalates. Our results shows that ADG, FE and DFI of quails were not affected by the in-creasing level of SM are in agreement with earlier studies in broiler and layers chicks [3, 12, 15 and 18] that SM could safely be used up to 150 g/kg in the broiler diets without negative effect on performance. In contrast, Farran *et al* [7] reported that weight gain of broiler chick in diet containing 120 g/kg SM was reduced than that control diet. These researchers concluded that an increase in oxalate and phytate of the diet containing SM could decrease the weight gain. It seems that, this inconsistency in weight gain between last study, with a diet with 120g SM/kg, and our study, with a diet with 20g SM/kg, may be due to the addition of phytase enzyme to diets in our study.

Carcass traits

The results for final BW and carcass characteristics and organ (as percentage of BW) of Japanese quail are presented in Table 4. No significant difference was observed between treatments for quail final BW; however there was significant difference in comparison of diets containing SM vs. control diet for final BW. Moreover, at the end of the experiment (42 d), thigh, breast and pancreas weight were similar among all treatments. However, there weren't significant differences in carcass and gizzard weight (P>0.05).

The highest and lowest carcass weights were observed in treatments SM10 and SM20, respectively. Additionally, gizzard weight in diets containing SM were higher than those of the control diet (P<0.05). Moreover, in contrast comparison, there was no significant difference in comparison of diets containing SM vs. control diet for carcass, breast, thigh, gizzard and pancreas weights.

Table4. The effect of different levels of sesame meal on carcass traits of Japanese quail (g)

Treatment[1]	carcass	carcass Randoman[2]	Breast weight (%)	Thigh weight (%)	Gizzard weight (%)	Heart weight (%)	Liver weight (%)
SM0	165.75	61.56	62.12	35.63	4.29	1.76	6.53
SM10	165.05	69.11	65.48	42.7	4.4	2.32	6.25
SM20	164.21	68.37	63.54	40.79	4.98	1.88	4.69
SEM	1.94	0.85	0.72	0.55	0.06	0.05	0.08

[1]*SM0: control treatment; SM10: treatment with 10 g/kg sesame meal; SM20: treatment with 20 g/kg sesame meal.*
[2]*Carcass traits calculated as a proportion of weight to live weight.*

Carcass weight in diets containing SM was similar to that found for control diet, but it decreased more in SM20 than in SM10. In agreement with our results, Rama Rao *et al* [14] showed that the use of sesame meal in broiler diet leads to an increase in the size of digestive system and thus it decreases the carcass weight. The pancreas weight in diets containing SM was similar to control diet (P>0.05), but there was a tendency to increase in pancreas weight in quail fed on SM diets than control diet. It seems that the small increase in pancreas weight for quails fed diets containing SM could be related to an increase in endogenous enzyme activities and secretion volume required to digest SM.

Finally, the larger gizzards observed in quails fed on SM diets as compared with gizzards of quails fed the control diet were in accordance with results reported earlier with high fiber feedstuffs in broiler chicks [1, 8 and 9]. This result is a consequence of the increased grinding activity of the gizzard.

Table4. The effect of different levels of sesame meal on blood parameters of Japanese quail (mg/100mL)

Treatment[1]	Glucose	Uric Acid	Triglyceride	Cholesterol	LDL	HDL
SM0	378	4.6	84	196	45.2	134
SM10	344	9.6	92	195	48.6	128
SM20	422	5.7	98	183	34.4	129
SEM	5.73	0.58	7.16	6.46	2.23	6.42

[1]*SM0: control treatment; SM10: treatment with 10 g/kg sesame meal; SM20: treatment with 20 g/kg sesame meal.*

Blood Parameters

The results for performance of Japanese quail are presented in Table 5. No significant differences were noted between treatments for quail Glucose, Uric acid, Triglyceride, LDL and HDL at period experiment. But this difference, were significant for cholesterol.

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