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The effect of additional choline supplement and its effect on Japanese quails (*Coturnix coturnix japonica*) performance and visceral organs weight in corn and Iranian soybean meal based diet

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ABSTRACT

This experiment was carried out to evaluation usage different levels of additional choline supplement (0, 400 and 800 mg/kg) and its effect on performance and visceral organs weight of Japanese quails in corn and Iranian soybean meal based diet. In this one, it was used of 240 one-day quails. This one was designed based on completely randomized designed in 3 treatments, 4 replicates and in every one 20 pieces was designed. Experimental treatments were: 1) basal diet (control), 2) basal diet + 400 mg/kg of choline supplement and 3) basal diet + 800 mg/kg of choline supplement. Time length of breeding was 42 days. Under consideration factors including performance factors (weight gain, food consumption, food conversion ratio) in total 1-42-day period and visceral organs weight (heart, pancreas, spleen, carcass and liver) which has been calculated as percentage of live body weight for both sexes, were analyzed. Results showed that addition of additional choline supplement into corn-soybean meal based diet had no effect on chick's performance in full period, also results showed that addition of various levels of choline to diet based on corn and soybean meal had no meaningful effect on visceral organs weight compared to control group, but the sexual effect on liver, pancreas, heart weight ($p < 0.01$) and carcass weight ($p < 0.05$) was meaningful which shows the difference between two sexes in these cases.

Key words: Choline, performance, quail and feed consumption.

INTRODUCTION

Soybean is one of the best protein sources in birds and animals feed and includes all of necessary Amino-Acids but lacks cystin and methionine. Also, this soybean includes some of anti-feed and preventive materials, which the most important, was Anti-trypsin preventive and in case treating soybean doesn't done in correct way, this preventive does not lost and remains into intestine (gut) with trypsin then cause in growth reduction in birds.

Waldroup et al. (2006) showed that in chickens fed with corn-soybean-basal diet, adding 1000 mg of choline and 1000 mg/kg betaine in diet and also mix of both of them up 500 mg/kg

improved feed conversion ratio and led in chest weight increase in chickens [1]. Attia et al. (2005) revealed that supplementing basal diet with choline (300 mg/kg) improved Body weight gain by 3.2% and feed conversion ratio by 3.3% compared with control diet [2]. Pesti et al. (1981, 1980) declared that choline can increase methionine mead to grow up in fleshy ones [3, 4]. In research done by Blair et al. (1986) it was revealed that choline adding in fleshy ones in presence or non-presence of methionine had no effect on body weight increase [5] and Ketola et al., (1974) declared that when chickens used diet including 64% protein, they need 1000 mg/kg to reach maximum growth rate that this amount increased up 1500 mg/kg choline to prevent prosis [6]. Scharama et al. (2000) declared that Choline has three chemically reactive methyl groups attached to the nitrogen atom of the glycine molecule; therefore, it can be used as a methyl group donor partially to replace methionine in poultry [7]. Fouladi et al (2008) reported that using 500 and 1000 mg/kg levels of choline complement decreased liver weight [8].

Therefore, the aim of this study was adding additional choline supplement into mead and its effect on quail's performance in case likelihood unsuitable treating of soybean due to economical effect of methionine.

MATERIALS AND METHODS

This experiment was done in order to evaluate different levels of additional choline supplement (0, 400 and 800 mg/kg) and its effect on performance and Internal organs weight of Japanese quails in corn- Iranian soybean basal diet. In this one, it was used of 240 one-day quails. This one was designed based on completely randomized designed in 3 treatments, 4 repetitions and in every one 20 pieces was designed. Dietary treatments were: 1) basal diet (control), 2) basal diet + 400 mg/kg of choline supplement and 3) basal diet + 800 mg/kg of choline supplement. Time length of breeding was 42 days.

Table 1: Percentage composition of experimental diet during 1-42 d of age

Ingredients	%
Corn	53.3
Iranian Soybean meal	42.17
Soybean oil	1.34
Oyster sell	1.55
DCP	0.78
Common salt	0.25
Vitamin premix ^a	0.25
Mineral premix ^a	0.25
DL-Methionine	0.07
L-Lysine HCL	0.04
Calculated nutrient content	
ME Kcal/kg	2850
Crude protein (%)	23.58
Calcium (%)	0.8
Available P (%)	0.3
Met + Cys (%)	1.8
Lysine (%)	1.3
Tryptophan (%)	0.35

a- Vitamin and mineral mix supplied/ kg diet: vitamin A, 11000 IU; vitamin D₃, 1800 IU; vitamin E, 11 mg; vitamin K₃, 2 mg; Vitamin B₂, 5.7 mg; Vitamin B₆, 2mg; vitamin B₁₂, 0.024 mg; Nicotinic acid, 28 mg; folic acid, 0.5 mg; pantothenic acid, 12 mg; choline chloride, 250 mg; Mn, 100 mg; Zn, 65 mg; cu, 5 mg; Se, 0.22 mg; I, 0.5 mg; Co, 0.5 mg.

During this period, food and water was provided ad-libitum for chickens. Under consideration factors including performance factors (gain weight, food consumption, food conversion ratio) in total 1-42-day period and visceral organs weight (heart, pancreas, spleen, carcass and liver) which has been calculated as percentage of live body weight for both sexes, were analyzed. It should also be mentioned that in cases where sexual effect was meaningful, mean comparison for both of the sexes (male and female).

Food demands of chickens during 6-weeks regards to recommendations and table of food demands by national bird research Association (NRC, 1994) was adjusted and balanced using software UFFDA, in which difference of test basal diets was only in amount of choline. General linear Models (GLM) procedures of SAS[®] (SAS Institute 1990) [9] software was employed and significant differences between treatments were separated using Duncan's multiple range test (Duncan's, 1955) [10].

RESULTS AND DISCUSSION

Performance

The mean effects of different levels of choline on quail's performance are shown in table 2. Results showed that adding different levels of choline into corn-Iranian soybean-basal diet to control treatment have no effect on chicken's performance in whole period of breeding (1-42). The results showed that using the levels of Choline Chloride supplements in the experimental diet couldn't have significant effect on increasing body weight in Japanese quail. In addition, this can be related to choline supplement effect on decreasing chest lipids as well as lipid tissues in all birds [11]. The more results were based on this experiment, Waldroup et al., (2005) that they represented that the levels of 100-500 mg/kg choline supplement had not any effects on treatments [12], the results of Siljaner (1999) where in this regard, too [11].

Table 2: The mean effect of various supplemental levels of choline on the body weight, food consumption and food efficiency of broilers (1-42 days)

Treatments	Body weight gain (g)	Feed intake (FI) (g)	Feed conversion ratio (FCR)
T1: basal diet (control)	218.49	824.55	3.87
T2: basal diet + 400 mg/kg choline	211.74	810.37	3.86
T3: basal diet + 800 mg/kg choline	213.43	811.32	3.87
SEM	4.81	13.7	0.09
P-Value	0.6037	0.7243	0.9958

Feed intake and feed conversion ratio, the results showed that, levels of choline chloride supplement along with basal diet corn-Iranian soybean could not have a meaningful effect on feed intake as well. Considering that choline supplement for supplying diets methionine deficiency has been used based on corn soybean meal, it is inferred that diet soybean meal sample had appropriate processing and it is methionine level has been provided; therefore choline supplement had less effect on Japanese quails performance. Also, It seems that, in meal diets that have high protein levels, choline supplement have not any effect on feed intake but decrease in protein level causing a kind of recovery in feed intake [13, 14]. In contrast to the results of this research, Attia et al. (2005) showed that intake of 300 mg/kg choline increases feed conversion ratio 3.3 % [2]. Swain et al. (2000) reported that using 1000 and 2000 m/kg choline supplement in experimental treatments had no meaningful effect on weight increase [15]. Siljander-Rasi et al. (1999) reported that addition of choline supplement to broilers diets had no effect on their performance [11]. Moreover, Pesti et al. (1980) and Harms et al. (2005) reported in their studies that choline supplement had no meaningful effect on growth and gain weight

during breeding period [16]. Contrary to performed research, Jason (1996) and Attia et al. (2005) showed that various levels of choline supplement had meaningful effect on live weight [17, 2].

Visceral organs weight

Results of various level effect of were carried out. Results of choline complement on visceral organs weight of Japanese quails have been represented in the following table 3. Results showed that addition of various levels of choline to diet based on Iranian soybean meal and corn had no meaningful effect on visceral organs weight compared to control group, but the sexual effect on carcass ($p < 0.05$), liver, pancreas and heart weight ($p < 0.01$) was meaningful which shows the difference between two sexes in these cases.

Table 3: The mean effect of various supplemental levels of choline on the visceral organs weight (as percentage of live body weight) at 1-42 days

Treatments	Carcass	Pancreas	Heart	Spleen	Liver
T1: basal diet (control)	65.78	0.34	0.825	0.045	2.37
T2: basal diet + 400 mg/kg choline	66.04	0.33	0.812	0.053	2.18
T3: basal diet + 800 mg/kg choline	66.11	0.28	0.826	0.047	2.14
SEM	1.5	0.02	0.03	0.008	0.1
P-Value	0.9742	0.0914	0.9286	0.5839	0.2967
P-Value for sexual	0.0123	0.0002	0.0023	0.2061	0.0008

Table 4: The mean effect of various supplemental levels of choline on the visceral organs weight in male sex (1-42 days)

Treatments	Carcass	Pancreas	Heart	Liver
T1: basal diet (control)	68.07	0.28	0.90	2.06
T2: basal diet + 400 mg/kg choline	66.90	0.23	0.83	1.82
T3: basal diet + 800 mg/kg choline	68.07	0.29	0.90	2.06
SEM	0.93	0.02	0.04	0.11
P-Value	0.6228	0.3110	0.4374	0.2946

Studying the comparison of mean carcass weight of both sexes showed that male sex with 800 mg/kg level of choline complement had that Iranian soybean meal which has high levels of choline on the other hand, can cause protein digestibility and carcass weight, the most amount has been related to male sex with 400 mg/kg level of choline complement. This loss of weight can be related to methyl-don ring activity of choline. Methyl groups could decrease liver weight thought transmitting its fat reserves to them which is in good agreement with zanini et al., (2006) findings. Moreover, results of comparing mean heart weight showed that male sex with 400 mg/kg level of choline complement has had the least heart relative weight [18]. Therefore, it is inferred that high level of choline can decrease heart relative weight which has been in line with fat decrease around heart, and fat depositions within ventricular and coronary arteries by choline. These findings are in agreement with the results of Attia et al., (2005) and Waldroup et al., (2005) [2, 12].

Results showed that male sex with 800 mg/kg level of choline complement has had the lowest pancreas weight. It is inferred that high levels of choline in diets based on corn and Iranian soybean meal prevents pancreas hyperactivity of this sex unwontedly.

Table 5: The mean effect of various supplemental levels of choline on the internal organs weight in female sex (1-42 days)

Treatments	Carcass	Pancreas	Heart	Liver
T1: basal diet (control)	63.50	2.69	0.74	2.69
T2: basal diet + 400 mg/kg choline	65.16	2.54	0.79	2.54
T3: basal diet + 800 mg/kg choline	64.16	2.22	0.75	2.54
SEM	1.9	0.03	0.18	0.03
P-Value	0.8306	0.2507	0.2300	0.6553

Siljander et al., (1999) and Attia et al., (2005) suggested that using choline complement in feeding broilers has no effect on results of this research [11, 2]. Taylor et al., (2001) and Attia et al., (2005) reported in their studies that various levels of choline complement has no meaningful effect on liver weight [19, 2]. Fouladi et al., (2008) reported that using 500 and 1000 mg/kg levels of choline complement decreased liver weight [8]. Contrary to results of this study, Waldroup et al., (2005) studied young cocks and reported that using 1000 mg/kg choline complement increases carcass weight [12].

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