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Effect of Choline Chloride Supplement on Liver's and Blood's Cholesterol and Triglyceride Contents in Japanese Quail

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ABSTRACT

This experiment was conducted to evaluation usage different levels of Choline Chloride Supplement (CCS) (0, 500mg/kg and 1000mg/kg) in the basal diet (corn and soybean meal) and effects on the Japanese quail liver and blood chemical parameters include cholesterol (HDL and LDL) and triglyceride contents. A total of 135 Japanese quail were randomly divided in to 3 experimental treatments with 3 replicates (15 birds per pen) and arranged in a completely randomized design. The experimental period lasted 6 weeks and during this period, the birds had free access to feed and water. Experimental diets consisted of: Basal diet without choline chloride supplement, basal diet with 500mg/kg choline chloride supplement and basal diet with 1000mg/kg choline chloride supplement. These diets were isonitrogenous and isoenergetic were given to Japanese quail throughout a 42-d growth period. Data was analyzed with one way ANOVA and means compared with Duncan test. Result for liver chemical analyses showed choline chloride supplement in levels of 500mg/kg and 1000mg/kg (T3 and T2 respectively) decrease the cholesterol and triglyceride contents numerically, and blood chemical analyses showed treatment of 3 and 2 (contain 1000mg/kg and 500mg/kg choline chloride supplement, respectively) decrease the cholesterol and triglyceride contents significantly ($P<0.0001$), too choline chloride supplement could increase significantly high density lipoprotein cholesterol (HDL) content in blood, and no significantly affected on blood low density lipoprotein cholesterol (LDL) content. Choline chloride supplement was decrease LDL content in blood numerically.

Key words: Japanese quail, choline chloride, liver, blood, cholesterol and triglyceride.

INTRODUCTION

Many studies have examined the interrelationship between choline and betaine [11]. Choline is an essential nutrient for the chicken. One of its functions is to furnish methyl groups [10, 14 and 15]. 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 and pig [17]. In poultry, choline's methyl group is available after the conversion to betaine in the liver. Recent work suggests that betaine and choline has an energy sparing role by reducing maintenance requirement poultry and pig [17]. But in this study the alone effect of choline was estimated on the quail. Choline has three essential metabolic roles e.g. as a constituent of phospholipids, hepatic lipid metabolism to prevent fatty liver and as a precursor for acetylcholine synthesis [5 and 21]. Additionally, choline has further non-essential metabolic function as a labile methyl group as well as prevention of perosis and fatty liver syndrome in poultry [5 and 21]. In the other hand Japanese quails has a lab animal and this subject on the Japanese quail not carried out, so the aims of this study are the measured amounts of the cholesterol, triglyceride contents in blood and liver, and HDL and LDL levels in blood in Japanese quail with consumption of dissimilar choline chloride supplement in diets. About quail in this subject not the similar research, so this experimental is an initiatory research and it has seem results in this study was interesting.

MATERIALS AND METHODS

Table 1: Percentage composition of experimental diet in starter period

Ingredients	(%)
Corn	53.5
Soybean	34.5
CCS	0
Starch	8
Wheat bran	0
DL-Methionine	0.54
Lysine	0
DCP	1.38
Oyster	1.33
Vitamin	0.25
Mineral	0.25
Salt	0.25
Coccidiostat	0
Sand	0
	100
Calculated nutrient content	
ME kcal/kg	2920
Crude protein (%)	21
Calcium (%)	0.94
Available P (%)	0.43
ME/CP	139.7
Ca/P	2.1

1:Vitamin content of diets provided per kilogram of diet: vitamin A, D, E and K.2: Composition of mineral premix provided as follows per kilogram of premix: Mn, 120,000mg; Zn, 80,000mg; Fe, 90,000mg; Cu, 15,000mg; I, 1,600mg; Se, 500mg; Co, 600mg

Animals and diets: A total of 135 one-day old Japanese quail chicks of from male and female sex were placed in 9 pens of 1×1 meters with ten birds per each pen. Feed and water were provided *ad libitum*. The experimental design consisted in a completely randomized design with 3 treatments [T1 Control (soybean + corn), T2 (500mg/kg Choline Chloride Supplement) and T3 (1000mg/kg Choline Chloride Supplement)] with three replication. The treatment diets of were isonitrogenous and isoenergetic.

Diets were formulated by adding 0, 500 and 1000mg/kg choline chloride supplement (60%) be based diet (corn and soybean meal) that met requirement recommended by the National Research Council (1994).

Table2: Percentage composition of experimental diet in grower period

	Experimental diets		
Ingredient	T1	T2	T3
Corn	64	64	64
Soybean	27.4	27.4	27.4
CCS	0	0.000084	0.000168
Starch	3.74	3.74	3.74
Wheat bran	1	1	1
DL-Methionine	0	0	0
Lysine	0	0	0
DCP	1.13	1.13	1.13
Oyster	1.5	1.5	1.5
Vitamin	0.25	0.25	0.25
Mineral	0.25	0.25	0.25
Salt	0.25	0.25	0.25
Coccidiostat	0.15	0.15	0.15
Sand	0.33	0.33	0.33
	100	100	100
Calculated nutrient content			
ME kcal/kg	2920	2920	2920
CP (%)	18.2	18.2	18.2
Calcium (%)	0.9	0.9	0.9
Available P (%)	0.35	0.35	0.35
ME/CP	160.1	160.8	160.7
Ca/P	2.5	2.5	2.5

1:Vitamin content of diets provided per kilogram of diet: vitamin A, D, E and K.2: Composition of mineral premix provided as follows per kilogram of premix: Mn, 120,000mg; Zn, 80,000mg; Fe, 90,000mg; Cu, 15,000mg; I, 1,600mg; Se, 500mg; Co, 600mg

The control diet, which was not enriched with choline chloride supplement and was administered throughout the 21 days of experimental period (starter). The levels of choline chloride supplement were replaced with corn in diets during 2 different periods (grower and finisher). Ingredient composition and nutrient analysis for each treatment is described in Table 1-3. Four birds from each replicate were slaughtered after bleeding at days 42 and liver frozen in -21 centigrade and translated bloods and liver samples to lab for analyses a cholesterol and triglyceride content. One gram the liver tissue is cut and homogenized in the TRISS dilution and determined cholesterol and triglyceride content in autoanalyser system.

Statistical analyses

Data were analyzed in a complete randomized design using the GLM procedure of SAS version 12 (SAS Inst. Inc., Cary, NC).

$$Yij = \mu + \alpha i + \varepsilon ij$$

Where:

Yij = All dependent variable

μ = Overall mean

αi = The fixes effect of CCS levels (i = 1, 2, 3)

εij = The random effect of residual

Duncan multiple ranges used to compare means.

Table3: Percentage composition of experimental diet in finisher period

	Experimental diets		
Ingredient	T1	T2	T3
Corn	66.5	66.5	66.5
Soybean	24.1	24.1	24.1
CCS	0	0.000084	0.000168
Starch	3.81	3.81	3.81
Wheat bran	0	0	0
DL-Methionine	0.44	0.44	0.44
Lysine	0.043	0.043	0.043
DCP	0.89	0.92	0.89
Oyster	1.38	1.36	1.31
Vitamin	0.25	0.25	0.25
Mineral	0.25	0.25	0.25
Salt	0.25	0.25	0.25
Coccidiostat	0.15	0.15	0.15
Sand	1.937	1.937	1.937
	100	100	100
Calculated nutrient content			
ME kcal/kg	2920	2920	2920
CP (%)	16.5	16.5	16.5
Calcium (%)	0.8	0.8	0.8
Available P (%)	0.3	0.3	0.3
ME/CP	176.8	176.4	176.6
Ca/P	2.6	2.6	2.6

1:Vitamin content of diets provided per kilogram of diet: vitamin A, D, E and K.2: Composition of mineral premix provided as follows per kilogram of premix: Mn, 120,000mg; Zn, 80,000mg; Fe, 90,000mg; Cu, 15,000mg; I, 1,600mg; Se, 500mg; Co, 600mg

RESULTS AND DISCUSSION

Blood chemical analyses: Results for blood chemical analyses shown in table 4. Treatment content with 1000mg/kg choline chloride supplement is the highest effect on the triglyceride and cholesterol contents in blood as significantly decrease bloods triglyceride and cholesterol contents in Japanese quail. That with usage different levels of choline chloride supplement in

experimental diet the contents of cholesterol in blood significantly (P<0.0001) decrease and from 0.4900 for treatment without Choline Chloride Supplement reached to 0.4161 and 0.3610, respectively for T2 (500 mg/kg choline chloride supplement) and T3 (1000 mg/kg choline chloride supplement), too contents of triglyceride in blood significantly (P<0.0001) decrease from 2.9999 for T1 (without Choline Chloride Supplement treatment) reached to 2.2786 and 1.9681 respectively for T2 (500 mg/kg choline chloride supplement) and T3 (1000 mg/kg choline chloride supplement). In same study has shown the choline and betaine could affect blood cholesterol and triglyceride contents numerically in broiler [18 and 21]. But in this presence study finding about blood cholesterol and triglyceride content in Japanese quail is significant. This result about the Japanese quail is interesting because it has seemed the usage of the choline chloride supplement in the quail diets; it has prevented than the fatty liver syndrome in the Japanese quail. Result shown choline chloride supplement is the significant effects on the High Density Lipoprotein cholesterol (HDL) in relationship to control treatment, so that with usage different levels of choline chloride supplement in experimental diet (T3 = 1000mg/kg choline chloride supplement and T2 = 500mg/kg choline chloride supplement) the contents of High Density Lipoprotein cholesterol (HDL) in blood significantly increase (P<0.0001).

Table 4: Least square means for liver and blood chemical analyses

	Treatment				
	T1	T2	T3	SEM	P>F
Liver cholesterol	0.65a	0.86a	0.87a	0.248	0.0001
Liver triglyceride	3.10a	3.36a	3.38a	0.328	0.0001
Blood cholesterol	0.4900	0.4161	0.3610	0.050255	0.0012
Blood triglyceride	2.9999	2.2786	1.9681	0.040640	0.0002
Blood-HDL	16.17a	16.55a	16.74a	0.404677	0.0268
Blood-LDL	14.9824a	14.3318a	14.1812a	0.398	0.2059

But bloods Low Density Lipoprotein cholesterol (LDL) contents a little decrease for treatment T2 (500 mg/kg choline chloride supplement) and T3 (1000 mg/kg choline chloride supplement) in relationship with control treatment, but no significant. In the some experiments, the presence of choline chloride supplement and betaine produced a decrease amount of harmful LDL-Cholesterol in the blood and liver and increase beneficial HDL-Cholesterol levels in blood and liver numerically in the broiler and lying hen [1 and 21]. Ours findings about the Japanese quail corresponding with these results. It has seem choline chloride supplement have an effectively role in decrease the bloods fat because choline chloride with a methyl group donor has an important role in the fat metabolism [7]. This subject need to another research about this project. It has seemed choline chloride supplement it has increase High Density Lipoprotein in the tissue and the carcass of the Japanese quails and consumption the meat of the Japanese quail it has beneficial for human health.

CONCLUSION

Choline Chloride Supplement, decrease the bloods triglyceride and cholesterol contents in Japanese quail and too Choline Chloride Supplement, decrease the liver triglyceride and cholesterol contents in Japanese quail, in the other hand Choline Chloride Supplement increase the HDL content in the bloods of the Japanese quail. It has seem the usage of the choline chloride supplement in the quail diets, it has prevent than the fatty liver syndrome in the Japanese quail.

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