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Effect of Choline Chloride Supplement on the Internal Organs and Carcass Weight of Broilers Chickens

P. Fouladi, R. Salamat Doust Nobar, A. Ahmadzade, H. Aghdam Shahriar and A. Noshadi
Department of Animal Science, Islamic Azad University, Shabestar Branch, Shabestar, Iran

Abstract: This experiment was carried out to evaluation usage different levels of Choline Chloride Supplement (CCS 60%) (0, 500 and 1000 mg kg^{-1}) in the basal diet (corn and soybean meal) and their effects on the different parts of carcass weight (breast and thigh) and internal organs weight (liver, heart, spleen, gizzard, proventriculus and abdominal fat) in broiler chick's. A total of 90 Ross 308 strain mail broiler were randomly divided in to 3 experimental treatments with 3 replicates (10 chicks 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 0 mg kg^{-1} choline chloride supplement, basal diet with 500 mg kg^{-1} choline chloride supplement and basal diet with 1000 mg kg^{-1} choline chloride supplement. These diets were isonitrogenous and isoenergetic were given to broiler chickens throughout a 42 day growth period. Data was analyzed with one way ANOVA and means compared with Duncan test. Three male birds selected with each pen and slaughtered. Result showed choline chloride supplement in all levels not significantly effects on the chilled carcass weight, breasts, thighs, gizzards and proventriculus weight. But, result showed choline chloride supplement in levels of 1000 and 500 mg kg^{-1} (T3 and T2, respectively) significantly decrease the livers, spleen, hearts weight and abdominal fat deposition ($p<0.0001$) in relationship to basal diet, as the 3 treatment include of 1000 mg kg^{-1} has a highest effects.

Key words: Broiler, choline chloride supplement, internal organs and carcass

INTRODUCTION

Broiler industry is increasing dramatically throughout the developing countries. There have been a notable increase in growth rate and feed efficiency in commercial broiler chickens in last 30 years. Nowadays human need a foremost food for a attain the best peace. Hereof, advert to alimentation of human is very important for a nutrition critic. Choline is an essential nutrition for the chickens. One of its functions is to furnish methyl groups that can also be furnished by betaine and methionine (Pesti *et al*., 1980; Lowry *et al*., 1987; Pesti, 1989). Choline is essential for the prevention of fatty liver and perosis in poultry. Chicks fed corn-soybean meal diets containing (total) choline is excess of the NRC (1994), requirement will display a growth response to supplemental choline (Berry *et al*., 1943; Marvel *et al*., 1943; Lowry *et al*., 1987), indicating a choline bioavailability of less than 100% in these diets. Molitoris *et al*. (1976) estimated a choline bioavailability of 60-75% for soybean meal. 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 (Schrama and Gerrits, 2000). 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 (Scharma and Gerrits, 2000).

The aims of this study are the measured the internal organs and carcass weight in the broiler chickens with consumption of dissimilar levels of choline chloride in diets.

MATERIALS AND METHODS

Animals and diets: A total of 90, one-day old broiler chicks of a commercial strain (Ross-308) from mail sex were placed in 9 pens of 2×2 m with 10 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 (500 mg kg^{-1} CCS) and T3 (1000 mg kg^{-1} CCS)] with 3 replication. The treatment diets of were isonitrogenous

Corresponding Author: Peyman Fouladi, Departement of Animal Science, Islamic Azad University, Shabestar Branch, Shabestar, Iran

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,120,000 mg; Zn, 80,000 mg; Fe, 90,000 mg; Cu, 15,000 mg; I, 1,600 mg; Se, 500 mg; Co, 600 mg

Table 2: 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
Crude protein (%)	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, 120,000 mg; Zn, 80,000 mg; Fe, 90,000 mg; Cu, 15,000 mg; I, 1,600 mg; Se, 500 mg; Co, 600 mg

and isoenergetic. Diets were formulated by adding 0, 500 and 1000 mg kg^{-1} choline chloride supplement (60%) be based diet (corn and soybean meal) that met requirement recommended by the National Research Council (1994). 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

Table 3: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
Crude protein (%)	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, 120,000 mg; Zn, 80,000 mg; Fe, 90,000 mg; Cu, 15,000 mg; I, 1,600 mg; Se, 500 mg; Co, 600 mg

diets during 2 different periods (grower and finisher). Ingredient composition and nutrient analysis for each treatment is described in Table 1-3. In the end of experiment, 3 birds from each replicate were slaughtered and different part of body weighted. Mortality was also recorded for each treatment.

Statistical analyses: Data were analyzed in a complete randomized design using the GLM procedure of SAS (2000) version 12:

$$Y_{ij} = \mu + \alpha_i + \varepsilon_{ij}$$

Where:

Y_{ij} = All dependent variable.
μ = Overall mean.
α_i = The fixes effect of choline levels (i = 1, 2, 3).
ε_{ij} = The random effect of residual.

Duncan multiple ranges used to compare means.

RESULTS AND DISCUSSION

Carcass weight: Result for carcass weight shown in Table 4. Result shows that with usage levels of choline chloride supplement in experimental diet (T3 = 1000 mg kg^{-1} choline chloride supplement and T2 = 500 mg kg^{-1} choline chloride supplement, respectively) numerically increase the carcass, breasts and thighs weights ($p<0.0001$) in relationship to basal diet,

Table 4: Least square means for carcass, breast and thigh weight

	Treatment				
	T1	T2	T3	SEM	p>F
Carcass weight	98.21a	97.32a	97.58	9.386236	0.0001
Breast weight	20.58a	20.20a	20.81a	0.3988847	0.0001
Thigh weight	19.87a	20.01a	20.21a	0.513333	0.0001

but no significant. In the some experiments, it has showed the presence of choline chloride supplement and betaine in diets no improvement effects on meat yield and carcass weight (breast and thigh) in broiler (Siljander *et al*., 1999; Attia *et al*., 2005). These finding is an according with this study finding. Whitherward these researchers has reported the presence of choline chloride supplement in diets no improvement the feed intake and feed conversion ratio in the broiler chickens, so it has seem the quail of the carcass weight in relationship with the quail of feed intake and feed conversion ratio in broiler. These observe has conformed to our finding in this study.

Internal organs weight: Result for internal organs weight shown in Table 5. Result shown that with usage high levels of choline chloride supplement in experimental diet (T3 = 1000 mg kg^{-1} choline chloride supplement and T2 = 500 mg kg^{-1} choline chloride supplement, respectively) significantly decrease the livers, spleens, hearts weight and decrease the abdominal fat deposition ($p<0.0001$) in relationship to basal diet, as the 3 treatment include of 1000 mg kg^{-1} choline chloride supplement has a highest effects and too result shown that with usage high levels of choline chloride supplemen in experimental diet (T3 = 1000 mg kg^{-1} choline chloride supplement and T2 = 500 mg kg^{-1} choline chloride supplement, respectively) significantly decrease the livers, spleens, hearts weight and decrease the abdominal fat deposition ($p<0.0001$) in relationship to basal diet, as the 3 treatment include of 1000 mg kg^{-1} choline chloride supplement has a highest effects and too result shown that with usage high levels of choline chloride supplemen in experimental diet (T3 = numerically decrease gizzards and proventriculus weight respectively but not significantly. Harms and Russell (2002) and Jason *et al*. (1997) in their experiment, it has showed the presence of choline chloride supplements in diets decrease the livers, spleens and heart weights in the broilers chicks. They are recognize these effects in relationship with the donor methyl group by choline and there are contributed in the fats metabolism in these organs. These observe has conformed to our finding in this study. In the some experiments, it has showed the presence of choline chloride supplement and betaine in diets no improvement effects on the gizzard weight in broiler (Siljander *et al*., 1999; Attia *et al*., 2005; Waldroup and Fritts, 2005). These researchers observe has conformed to our finding in this study. In the many of research proventriculus weight not measured, accordingly no that the good references about the effects of choline chloride supplement on the proventriculus weights and size, but in this study it has showed that with usage high levels of choline chloride supplement in experimental diet no significantly effect on the proventriculus weight in the broiler. The primary objective of the present trial was to evaluate if dietary choline chloride supplementation use in diet, decrease significantly abdominal fats (Siljander *et al*., 1999; Attia *et al*., 2005; Waldroup and Fritts, 2005).

Table 5: Least square means for internal organs weight

	Treatment				
	T1	T2	T3	SEM	p>F
Liver weight	1.70a	1.56b	1.33c	0.11011	0.0001
Spleen weight	0.0729ab	0.0739a	0.0700b	0.03387	0.0001
Heart weight	0.398a	0.387ab	0.370b	0.06354	0.0011
Gizzard weight	1.9906a	1.9812a	1.9781a	0.12459	0.0121
Proventriculus weight	0.37122a	0.37132a	0.36999a	0.06684	0.0221
Abdominal fat	138.34a	110.24b	98.81c	10.22165	0.0001

In a recent study shown that with usage high levels of choline chloride supplement in experimental diet (T3 = 1000 mg kg^{-1} choline chloride supplement and T2 = 500 mg kg^{-1} choline chloride supplement, respectively) significantly decrease abdominal fats respectively in broiler chicks. It has seemed these effects on the abdominal fat deposition in relationship with the donor methyl group by choline chloride supplement and there are contributed in the fats metabolism in these organs.

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