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Effect of different calcium iodate levels on performance, carcass traits and concentration of thyroid hormones in broiler chickens

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ABSTRACT

Effect of iodine supplementation on growth performance, carcass traits and levels of thyroid hormone were studied in broilers. Five hundred 1-d-old female broiler chicks were randomly divided into 5 groups (100 birds / group) with 4 replicates each .from d1, the diet were supplemented with calcium iodate at levels of 0 , 0.74 , 1.48 , 2.22 and 2.96 mg/kg of feed respectively. The birds were reared to 49d of age under standard conditions. Average feed intake, body weight gain and feed conversion ration of the broilers during 0 to 3 wk, 3 to 6wk and 6 to 7 wk were measured. Blood samples were collected at the end of each period from wing vein.T3 and t4 were measured by radioimmunoassay (RIA). Four birds per group were slaughtered at 49 d. Feed intake body weight gain and feed conversion ratio were affected by added levels of calcium iodate during the starter (0-21) period. Iodine supplementation did not significantly affect the carcass traits. adding levels of calcium iodate were significantly increased the concentration of thyroxine at 42 days of age. T3 hormone was not significantly affected by adding calcium iodate in to the diets at 21 , 42 and 49 days of age .The result from current study suggest that the addition of calcium iodate to broiler diets has not benefit effect on broiler performance.

Key words: thyroid hormones, broiler, calcium iodate.

INTRODUCTION

Iodine is the one of the trace minerals, which essentially required for birds in small amounts to normal production and metabolic functions.Over thousands of years iodine was washed from the soil in many mountainous as well as continental regions .it has been estimated that about 800 million people worldwide are deficient in iodine [1]. The only known roles of iodine in metabolism are its incorporation in to the thyroid hormone and in to the precursor iodotyrosines [15]. The avian thyroid gland is similar in all respects to the mammalian one. Thyroxine, or tetra iodothyronin (T4) a from of thyroid hormones is the major principle hormone secreted by the follicular cells of thyroid gland. It is a pro hormone and the reservoir for the active thyroid hormone triiodothyronine (T3).The T3 is converted from 5'– monde iodination (the outer ring) of T4 by type I iodothyronine deiodinase in the liver and kidney, or by type II deiodinase in the brain, pituitary gland, brown adipose tissues [9]. Thyroid hormones are involved in the regulation of both anabolic and catabolic path ways of protein [4], lipid [24] and carbohydrate [6] metabolism. Many studies have examined the impact of different factors on T3 and T4 levels in poultry, including species [7] age [19] , energy intake and dietary composition [2], feeding regimen [16] , photoperiod [11] , and ambient temperature [23]. Thyroid hormones are important for thermo regulation , energy metabolism, reproduction, tissue differentiation, growth and development, blood circulation and muscular activity. They control oxidation intensity of all cells, activity of other endocrine glands and food metabolism. Thyroid activity interacts with environment and iodine deficiency or it excess may cause thyroid pathology [3]. Stanly and bailey [21] studied the effect of iodine enriched drinking water on broilers grown at different density. They found that adding 2 ppm iodine to the drinking water significantly improved broiler growth. Chicken can sustain a certain amount of iodine

deficiency without significantly production loss, but serious thyroid hormone deficiency will result in reduced growth rate, egg production and hatchability. [8-22]. rottger et al [20] studied the effect of iodine supplementation on performance of broilers. They found no significantly effect on performance of broiler.

MATERIALS AND METHODS

In this experiment a total of 500 one – day – old female broiler chicks from Arian strain were used. Broilers randomly allocated into 5 treatment groups with 4 replicates each and 25 chicks per replicate.Corn and soybean meal – based feeds were formulated according to the requirements suggested by national research council [7].Diets were formulated as starter (1-21) grower (22-42) and finisher (43-49) diets. Food and fresh water were available adlibitum. The lighting schedule provided 23h light per day. The birds were housed in an environmentally controlled room. The room temperature was set at 32°C on day one, which was lowered in a step wise manner to 23-24°C for rest of experiment.From day 1, the diets were supplemented with calcium iodate at levels of 0, 0.74, 1.48, 2.22 and 2.96 mg/kg of feed respectively. The composition and nutrient levels of the basal diets are shown in table 1 and 2 respectively. Small amounts of the diet were first mixed with the respective amount of iodine as small as batch, then with a larger amount of the basal diet so that the total amount of the respective diets was homogeneously mixed. For better assurance about correct mixing of calcium iodate in diets, feed mixed samples were analyzed according to procedures of AOAC. The iodine levels of the diets are shown in table 3. Body weight gain feed intake and feed conversion ration were measured at the day, 21, 42 and 49 of the experiment. At the end of starter, grower and finisher periods two birds from each replicate were randomly selected and their blood samples were collected from the wing vein. For measuring the concentration of thyroid hormones, serum blood samples were separated. Blood sample were kept at 4°C until centrifugation. Serums were stored at -20°C until assayed for thyroid hormones. Total T3 and T4 levels were analyzed by radioimmunoassay (with automatic Gama counter) using standard commercial kits (kavoshyar kit).According to the procedure of kloss et al [12]. Mortality was recorded daily basis and feed intake data were corrected for body weight of dead birds. The feeding was ended two hours before slaughtering. One chicken from each pen, which was nearest to the average live weight, was slaughtered to obtain the carcass and edible organs included heart and liver. Edible organs and abdominal fat percentage was calculated on the basis of live body weight. Data obtained were analyzed using the spss software for windows. Data were subjected to analysis of variance according to the method of completely randomized design. Mean were compared by using duncan's multiple – rang test and significance was determined when the p-value was less the 0.05 [5].

Table1: percentage diet composition

Ingredient %	Starter (0-21)	Grower (22-42)	finisher (43-49)
Corn	60.9	69.1	72.18
Soybean meal	33.06	27.55	22.74
Fish meal	1	0	0
Veg.oil	1	0	0
DCP	1.4	0.98	0.9
Calcium carbonate	1.3	1.33	1.38
Salt	0.34	0.23	0.25
Vitamin premix	0.25	0.25	0.25
Manufactured mineral premix	0.25	0.25	0.25
DL-methionine	0.2	0.11	0.08
l-lysine-Hcl	0.3	0.2	0.16
Wheat bran	0	0	1.81

Table2: nutrient level of diet

Calculated nutrient content	Starter (0-21)	Grower (22-42)	Finisher (43-49)
ME(kcal/kg)	2900	2900	2900
Crude protein (%)	21	18.2	16.6
Crude fiber (%)	4.1	4	4
Calcium (%)	0.95	0.82	0.8
Available phosphorus (%)	0.42	0.32	0.3
Sodium (%)	0.16	0.11	0.11
Lysine (%)	1.15	0.92	0.8
Methionine(%)	0.48	0.36	0.33
Methionine + cysteine (%)	0.82	0.68	0.6

Table3: iodine levels of experimental diets. (mg /kg)

Treatment	Starter (0-21)	Grower (22-42)	Finisher (43-49)
1	0.27	0.17	0.18
2	0.60	0.50	0.50
3	1	0.80	0.90
4	1.3	1.2	1.2
5	1.6	1.5	1.5

RESULTS AND DISCUSSION

Data on body weight gain are summarized in table 4. body weight gain were influenced significantly by different levels of iodine supplementation in broilers during 0-3 wk and 3-6 wk. Body weight gain at 2.22 mg/kg calcium iodate supplementation was significantly lower than that of control group at 1-21 of age ($p \leq 0.05$). Dietary calcium iodate supplementation had no significant effect on body weight gain in finisher period. The effect of different calcium iodate levels on broiler feed intake are summarized in table5. Feed intake of broiler chickens at 0-21 days of age was significantly higher in treatment with 2.96 mg/kg calcium iodate supplementation than other treatments. Calcium iodate supplementation had no significantly effect on feed intake of broilers in grower and finisher periods. Data on feed conversion ratio are summarized in table 6. Feed to gain ratio of broiler chicken at 0-21 days of age were significantly increased as the level of calcium iodate increase in the diets. Feed conversion ratio was not influenced significantly by calcium iodate supplementation in broilers during grower and finisher periods.The objective of the present study was to compare the effect of different calcium iodate levels on performance, carcass traits and on mean blood concentration of T3 and T4 in female broiler chickens. In the present study, it was clearly demonstrated that dietary calcium iodate supplementation reduced performance in broilers during 0 to 3 wk and 3 to 6 wk.These result were in agreement with an earlier report by rottger et al [20] who showed that use of iodine supplementation had no significantly effect on broiler performance. Many minerals, when fed in excess to broiler chickens, cause toxic effects such as depressions in growth, decreases in feed intake and increased mortality [13-17].Results of Maroufyan and Kermanshai [14] showed that addition calcium iodate in to the diets with different levels of rapeseed meal had no significant effect on performance of broiler chicken in any periods. The results regarding rearing performance agree with previously published studies, which found no significant effect on performance when similar feed with different iodine concentration were supplied [10-18]. As observed at results of experiment (table 7), there exist significant difference among treatments ($P \leq 0.05$) in a way that first treatment (148) and second treatment (144.4) had the highest production index while fourth treatment (130.4) had the lowest production index.

Table 4: effects of different calcium iodate levels on weight gain of broiler (gr)

Treatment	Starter (0-21)	Grower (22-42)	Finisher (43-49)	Whole period
1	485^{b}	1034^{ab}	327	1846
2	465^{ab}	1081^{b}	323	1869
3	479^{ab}	1048^{ab}	322	1849
4	459^{a}	1007^{a}	333	1799
5	472^{ab}	1005^{a}	351	1828

Different alphabetic words referred as existence of significant difference between treatments ($p \leq 0.05$).

Table5: effects of different calcium iodate levels on feed intake of broiler (gr)

Treatment	Starter (0-21)	Grower (22-42)	Finisher (43-49)	Whole period
1	900^{a}	2538	981	4419
2	886^{a}	2593	970	4449
3	937^{ab}	2548	965	4450
4	888^{a}	2572	954	4414
5	961^{b}	2526	1042	4529

Different alphabetic words referred as existence of significant difference between treatments ($p \leq 0.05$).

The results of carcass traits of broilers fed different calcium iodate are given in table 8. No significant difference was found in the mass of different organs and fraction or in their proportions of final body weight as influenced by calcium iodate supplementation. The results of the slaughter traits are in agreement with previous studies [14-20].The effects of calcium iodate supplementation on concentration of T3 and T4 are shown in table9. The results showed that triiodothyronine concentration of broilers was not affected by different levels of calcium iodate supplementation. Result of maroufyan and kermanshahi, [14] showed that addition of extra iodine had no significant

effect on concentration of T3 and T4 hormones. The present experiment demonstrated that blood level of thyroxin increased significantly in broilers that fed on high calcium iodate diets compared with those fed on low – calcium iodate diet in grower period. Iodine supplementation had not significant effect on levels of blood thyroxine in other periods. The amount of blood concentration of thyroxine in the present study were approximately similar to the results that reported by maroufyan and kermanshahi[14].

Table 6: effects of different calcium iodate levels on feed conversation ratio of broiler. (gr feed/gr gain)

Treatment	Starter (0-21)	Grower (22-42)	Finisher (43-49)	Whole period
1	1.85[a]	2.45	3.0	2.39
2	1.90[ab]	2.4	3.0	2.38
3	1.95[ab]	2.43	2.99	2.4
4	1.93[ab]	2.55	2.86	2.45
5	2.03[b]	2.52	2.97	2.48

Different alphabetic words referred as existence of significant difference between treatments (p≤0.05).

Table 7: effect of different calcium iodate levels on production index of broiler

	Treatment 1	Treatment 2	Treatment 3	Treatment 4	Treatment 5
production	148[c]	144.4[bc]	131.6[ab]	130.4[a]	143[abc]

Different alphabetic words referred as existence of significant difference between treatments,(p≤0.05).

Table8: effects of different calcium iodate levels on carcass traits of broiler

Treatment	Carcass yield	Thigh yield	Breast yield	Liver percentage	Heart percentage	Abdominal fat percentage
1	68.4	29	26.5	2.7	0.39	2.1
2	70	28.2	26	2.7	0.48	2.23
3	71	29.01	28.1	2.9	0.49	2.2
4	70.7	30.1	28.5	2.6	0.50	1.64
5	70.8	30.0	29.0	2.4	0.53	1.94

Different alphabetic words referred as existence of significant difference between treatments (p≤0.05).

Table 9: effects of different calcium lodate levels on thyroid hormones of broiler. (nmol/L)

Treatment	T3 (0-21)	T3 (22-42)	T3 (43-49)	T4 (0-21)	T4 (22-42)	T4 (43-49)
1	4.53	2.55	2.57	47.37	51.75[a]	58.25
2	4.24	2.28	2.56	47.25	54.50[ab]	54.12
3	4.97	2.15	2.57	46.00	55.00[ab]	56.87
4	4.91	2.61	2.70	47.24	61.87[b]	60.12
5	5.17	2.88	2.85	48.14	55.00[ab]	60.62

Different alphabetic words referred as existence of significant difference between treatments (p≤0.05).

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