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THE STUDY OF EFFECTS OF DIFFERENT SOURCES OF ORGANIC AND INORGANIC CHROMIUM ON BROILER CHICKENS PERFORMANCE

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ABSTRACT

This work has been carried out in order to study the effects of using different resources of organic and inorganic Chrome on production performance of broilers. 200 broilers, in a completely random plan, were allocated with five treatments and four repetitions with ten chickens per repetition within a period of six weeks. The respective supplements were used in treatments for Zero levels (control) (T1, 200 micrograms of Chloride Chrome per kg of feed (T2) and 200 micrograms of (Chrome Yeast) per kg as feed (T5). The performances of poultries, analysis of body were measured on the 21st and 42nd days respectively. Using different resources of Chrome has had no significant effect on consuming feed and conversion coefficient (<p0.05). and only increase consuming feed from among different resources of Chrome, only Chloride Chrome has had a significant effect on decrease of body weight in growth and final period (<p0.05). Using different resources of Chrome has had no significant effect on conversion coefficient but using Chloride Chrome and organic Chrome increase the conversion coefficient. The results of this study have revealed that using Chrome supplement have positive effects on function of broilers (especially during growth period). The utmost effects can be seen in the group of Chrome Yeast and Methionine chrome accordingly.

Key words: Organic Chrome, Mineral Chrome, Function, Broilers

INTRODUCTION

Mineral in the nutrition of plant and animal are important and enough amounts for maintenance, growth, production and reproduction of animals is necessary. Minerals have different tasks and essential in the body, which in general include catalytic and physiological functions, and in particular affecting their reproduction. One of the most important factors in relation to minerals nutrition and needs is balance of different minerals. Because many elements interact with each other increase or decrease to attract and influence on other elements. Thus, on the metabolism and absorption of each have bilateral and complex effects. For example, the interaction of the elements copper, molybdenum, iron and sulfur on metabolism, reproduction and production in feeding ruminant is amazing [Underwood and Suttle 1999]. Chromium (PbCrO4) as first essential minerals by Schwarz and Mertz (1959) in rats and humans was detected in 1977. The most common symptoms of chromium deficiency in humans include decreased glucose tolerance factor and increased insulin, total cholesterol, blood Triglycerides. In experimental animals in addition to the above changes, the reduction in life expectancy, reduction in reproductive activities, growth and other negative effects are observed. In the last decade indicated that Trivalent chromium for normal metabolism of carbohydrates, proteins and lipids in humans and animals is essential [Pechova et al. 2002] and also involved in the formation and expression of genetic information in the animal. Trivalent chromium in organic and inorganic forms in feeding different animal and such as broiler chickens is used.

Mineral form of the element (chloride chrome, chromium oxide), very little is absorbed and the absorption rate is 0.4-2 per cent, while the bioavailability of organic chromium 10 times longer than mineral chromium. Organic compounds such as nicotine chromium, chromium picolinate, chromium methionine chromium yeast chromium noted. However, the chromium chloride is most important of mineral form of the element used as a dietary supplement. Hexavalent chromium (Cr + 6) the second form of chromium in terms of stability, this form of chromium passes easily through biological membranes and the combination of proteins and nucleic acids inside the cell reacts to when the Cr + 3 deoxygenated. The reaction with the genetic material is

carcinogenic properties Cr + 6 [Pechova, and Pavlata, 2007].

Old study by Schwarz and Mertz (1957 and 1959) chromium activities in organisms associated with a substance called glucose tolerance factor, but more recently attention to the oligo-peptide called chromium daulin that is altered 3and glucose tolerance factor is simply an analysis compound of the bioactive of chromium [Sahin et al. 2003]. [Sahin et al. 2002] reported that use of levels (200, 400, 800, and 1200 mg/kg), chromium picolinate in broiler chickens diets under conditions of stress lead to increased body weight, and the feed. Also reported that the use of zinc and chromium in the diet of laying hens were reared in conditions of cold stress and improve body weight, feed intake, egg production and feed efficiency [Sahin et al. 2001].

[Kim et al. 1996] found that the use of chromium picolinate on the amount 1600kg/µg, in broiler chickens diets without affecting the FCR, increase weight gain and feed consumption. Anandhi et al [Anandhi 2006], the effects of different level 250,500,750 kg/µg, organic chromium in broiler diets were investigated. Based on their observations, there was no difference in weight gain, feed aggregate intake and feed conversion ratio between the groups that had used chromium and control group.

[Uyanik 2000] in his study on broilers chickens did not report the effect of chromium on body weight. [Eren et al. 1999] reported that the 20 ppm, chromium chloride was increased body weight in broilers chickens. [Lein et al. 1999] reported that chromium picolinate, body weight and feed intake increased significantly in broilers chickens.

MATERIALS AND METHODS

To study the effect of different sources of food chromium supplements in both form of organic (chromium methionine, chromium picolinate, chromium yeast) and minerals (chromium chloride) on the performance of broiler chickens Ross 308, in a 42-day growing period, 200 chicks in groups of 10 chicks were weighing and randomly assign into testing units. The chickens were randomly divided into 5 experiment groups with 4 replicates and 10 chickens in each repetition were divided.

Light sources were provided by 5 rows of light bulb 60 watt. During the first 5 days, lighting 24 hours were exposed. After 4 days on the exposure, every day for 15 minutes, there was darkness. During the experiment, two types of diets grow and the final in order

to 21-0 and 42-21 days in broilers chicken diet were used. Diets based on standards recommended in the catalog top 308 were set.

Table 1: Experiment group related to growing period

Sample Group	Chrome Level in each Period	
Ration	Grow (0-21 Day)	Final (21-42 Day)
T1	0	0
T2	200 micro grams (Chloride chrome)	200 micro grams (chloride chrome)
T3	200 micro grams (Methionine chrome)	200 micro grams (Methionine chrome)
T4	200 micro grams (Picolinate chrome)	200 micro grams (Picolinate chrome)
T5	200 micro grams (Yeast chrome)	200 micro grams (Yeast chrome)

In this experiment, the statistical model is as follows:

$Y_{ij}= \mu+T_i+e_{ij}$

In which Yij represent value of each observation in the test, μ mean observations, Ti represents supplement effect of chromium and eij is the impact of experiment error. The numerical value of each observation of totals the effects of treatment and experiment error and means total community will be achieved. Data were analyzed with SAS software and means were compared by Duncan's multiple range test.

Table 2: diets used in different periods

0-21 Day					
Ration	T1	T2	T3	T4	T5
Corn	54.93	54.93	54.93	54.93	54.93
Soya	37.90	37.90	37.90	37.90	37.90
Fat	3.39	3.39	3.39	3.39	3.39
Bone meal	2.18	2.18	2.18	2.18	2.18
Bone shell	0.29	0.29	0.29	0.29	0.29
Salt	0.47	0.47	0.47	0.47	0.47
Mineral supplements	0.25	0.25	0.25	0.25	0.25
Vitamin supplements	0.25	0.25	0.25	0.25	0.25
DL-Methionine	0.34	0.13	0.13	0.13	0.13
Chromium chloride supplements	0	2000mg	0	0	0
Chromium methionine supplements	0	0	2000mg	0	0
Chromium picolinate supplements	0	0	0	2000mg	0
Chromium yeast supplements	0	0	0	0	2000mg
Dietary compounds					
Metabolic energy (kcal/kg)	3000	3000	3000	3000	3000
Crude protein (%)	20.95	20.95	20.95	20.95	20.95
Calcium (%)	0.88	0.88	0.88	0.88	0.88
Available phosphorus (%)	0.43	0.43	0.43	0.43	0.43
Sodium (%)	0.21	0.21	0.21	0.21	0.21
Lysine (%)	1.26	1.26	1.26	1.26	1.26
Threonine (%)	0.86	0.86	0.86	0.86	0.86
Methionine + cysteine (%)	0.99	0.99	0.99	0.99	0.99
Tryptophan (%)	0.28	0.28	0.28	0.28	0.28

21-42 Day					
Ration	**T1**	**T2**	**T3**	**T4**	**T5**
Corn	**56.75**	**56.75**	**56.75**	**56.75**	**56.75**
Soya	**36.71**	**36.71**	**36.71**	**36.71**	**36.71**
Fat	**3.05**	**3.05**	**3.05**	**3.05**	**3.05**
Bone meal	**1.87**	**1.87**	**1.87**	**1.87**	**1.87**
Bone shell	**0.33**	**0.33**	**0.33**	**0.33**	**0.33**
Salt	**0.42**	**0.42**	**0.42**	**0.42**	**0.42**
Mineral supplements	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**
Vitamin supplements	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**
DL-Methionine	**0.38**	**0.38**	**0.38**	**0.38**	**0.38**
Chromium chloride supplements	**0**	**2000mg**	**0**	**0**	**0**
Chromium methionine supplements	**0**	**0**	**2000mg**	**0**	**0**
Chromium picolinate supplements	**0**	**0**	**0**	**2000mg**	**0**
Chromium yeast supplements	**0**	**0**	**0**	**0**	**2000mg**
Dietary compounds					
Metabolic energy (kcal/kg)	**3000**	**3000**	**3000**	**3000**	**3000**
Crude protein (%)	**20.64**	**20.64**	**20.64**	**20.64**	**20.64**
Calcium (%)	**0.80**	**0.80**	**0.80**	**0.80**	**0.80**
Available phosphorus (%)	**0.39**	**0.39**	**0.39**	**0.39**	**0.39**
Sodium (%)	**0.19**	**0.19**	**0.19**	**0.19**	**0.19**
Lysine (%)	**1.23**	**1.23**	**1.23**	**1.23**	**1.23**
Threonine (%)	**0.85**	**0.85**	**0.85**	**0.85**	**0.85**
Methionine + cysteine (%)	**0.85**	**0.85**	**0.85**	**0.85**	**0.85**
Tryptophan (%)	**0.28**	**0.28**	**0.28**	**0.28**	**0.28**

2.1. Study Traits

1. The increase in body weight (day/chicken/g),

To calculate the impact of the experimental groups on chickens daily gain (day/ chicken/g), chickens each experimental treatment using electronic digital scale with an accuracy of 5 grams at the end of the days 10, 21 and 42 were weighing. The results of which are shown in Table 3. Weight and fatalities to correct increase in body weight entered into account. With the help of the following equation body weight gain in both treatments was calculated for each period:

$$\text{Weight gain (grams per chicken per day)} = \frac{\text{Weight at beginning of the period - weight at end of the period}}{\text{Chicken Day}}$$

The following formula was used to calculate the chicken:

Chicken Day= (a b) - (c d) = ab – cd

a = The total number of days in a specified period

b = Number of live chickens at the beginning of the period

c = The number of days until the end of the period

D= The number of chicken that died in that period

Table 3: The impact of the experimental groups on chicken's daily gain (day/chicken/ g) at different periods. Different letters in each column indicate significant differences at the level of 5%

	0-21 Day	21-42 Day	0-42 Day
T1	**43.71**	**86.88[a]**	**65.30**
T2	**44.7**	**79.98[b]**	**63.03[b]**
T3	**44.88**	**85.16[a]**	**65.02[a]**
T4	**42.98**	**87.12[a]**	**65.05[a]**
T5	**43.57**	**87.92[a]**	**65.75[a]**
P-Value	**0.8748**	**0.0257**	**0.0471**
SEM	**1.294**	**1.519**	**0.787**

Chromium supplements in the organic form had no significant effect on daily weight gain chickens (P>0.05). But the effects of mineral chromium supplementation on average daily weight gain in the final period and total growing period, causing a significant reduction in daily weight gain, while the weight of the chickens in the total experimental period using chromium supplementation increased. Lowest daily weight gain related to chromium chloride (62.03 g/d) gram and the greatest increase is for chromium yeast (75.65 g/d) gram. Average daily weight gain in the first three weeks of breeding between experimental groups, did not show significant differences (P>0.05).

During this period, the largest daily weight gain in chromium-methionine group (44.88) and lowest daily weight gain in chromium picolinate group (4.98 g/d) has been observed. Average daily weight gain in weeks, fourth, fifth and sixth rearing among treatments group, show a significant reduction in chromium chloride treatment (0.05> P). The highest and lowest daily weight gain in three weeks, respectively, related to yeast chromium group (87.92 g/d) and chromium chloride group (79.98 g/d). The effect of experiment treatments on average daily weight gain in the rearing period showed a significant reduction in the treatment chromium chloride (0.05> P), the highest average daily weight gain related to the yeast chromium treatment (65.75 g/d) and the lowest in the chromium chloride treatment (62.03 g/d).

2.2. Consumption Feed (feed day/chicken/g)

Consumption feed daily were weighed and intake the chicks, the results of the impact of different sources of chromium supplementation in different periods over the average feed consumption of broilers

chickens in the period 21-0, 42-21 42-0 days is given in Table 4. Changing in consumption diet from the beginning to the growth and from the growth to the final value of the remaining food was measured and the rate of food consumption reduced. If there are losses in the experiment treatments, the amount of food consumption in terms of number of live chickens and each treatment was corrected.

$$\text{feed consumption (grams per chicken per day)} = \frac{\text{The total feed consumption in a certain period}}{\text{Chicken days in the same period}}$$

Chicken calculation formulas of the day are as follows:

a) If there is not loss:
Number of chicks in each replication × during breeding = Chicken Day

b) If the loss is:
(Number of live chickens at the end of each iteration × length of the growing period) + Number of days when chickens died was alive.

Table 4: The effect of experiment treatments on feed consumption (day/chicken/g) in a different period

	0-21 Day	21-42 Day	0-42 Day
T1	**60.68**	**158.45**	**109.57**
T2	**60.71**	**160.43**	**110.57**
T3	**60.70**	**159.45**	**110.08**
T4	**60.71**	**159.77**	**110.25**
T5	**61.04**	**163.20**	**112.13**
P-Value	**1.806**	**2.165**	**1.315**
SEM	**0.999**	**0.6146**	**0.7083**

Different organic and inorganic sources had no significant effect on food consumption in different periods (P>0.05). But in general, feed consumption experiment period using chromium supplements tend to increase the number indicated. Average daily feed consumption in the first 21 days of breeding in the experimental groups, did not show significant differences (P>0.05) so that group of chromium yeast (61.04 g/d) has highest feed consumption in control group (60.68 g/d) have the lowest feed consumption. The effect of experiment treatments on average daily feed consumption in the last 21 days of breeding, did not show significant differences (P>0.05).

During this period, the highest and lowest feed consumption, respectively, for the

treatment of yeast chromium (163.20 g/d) and control group (158.45 g/d). The effect of experiment treatments on average daily feed consumption in the growing period, the difference is not significant. In the period of investigation, yeast chromium treatment (112.13 g/d) and the highest and control treatment (109.57 g/d) has the lowest average daily feed consumption.

2.3. Feed conversion ratio

The effect of experiment treatments on average feed conversion ratio of broiler chickens at different ages rearing period is given in Table 4. Feed conversion ratio in four periods of 0 to 10 days, 10 to 21 days, 21 to 42 days and 0 to 42 days was calculated. The feed conversion ratio by dividing the body weight of chicken was calculated for each period.

$$\text{Conversion Ratio} = \frac{\text{The total feed consumption in a specified time period}}{\text{Total weight of chickens at the beginning of the period - (weight loss in the same period + total weight of chickens at the end of the period)}}$$

Table 5: The effect of experiment treatments on feed conversion ratio (g/g) in a different period. Different letters in each column indicate significant differences at the level of 5%

	0-21 Day	21-42 Day	0-42 Day
T1	**1.39**	**1.83^{b}**	**1.68**
T2	**1.38**	**2.01^{a}**	**1.79**
T3	**1.36**	**1.88^{ab}**	**1.69**
T4	**1.42**	**1.84^{b}**	**1.70**
T5	**1.41**	**1.86^{b}**	**1.71**
P-Value	**0.9147**	**0.0662**	**0.1022**
SEM	**0.049**	**0.043**	**0.065**

Using chromium supplementation has no significant effect on growth and total the period of breeding (P>0.05). But in the end, chromium chloride (2.01) was significantly increased conversion ratio. In the first three weeks of the growing period between experimental groups there is not a significant difference in feed conversion (P>0.05). Lowest feed conversion ratio related to the chromium-methionine group (1.36) and the highest related to chromium picolinate group (1.42).

The effect of experiment treatments on average feed conversion ratio in the final three weeks of the growing period, indicated a significant increase in chromium chloride

(2.01) (0.05>P), low feed conversion ratio related to the control group (1.83) and the highest related to the chromium chloride (2.01). The effect of experiment treatments on average feed conversion ratio in the period of breeding did not show significant differences but the highest feed conversion ratio related to the chromium chloride (1.79) and the lowest related to control group (1.68).

CONCLUSIONS AND RECOMMENDATIONS

According to measurements by use of organic and inorganic chromium levels increased feed consumption in the total trial period that this increase was not statistically significant. The increase in body weight of chicks in the total period were tested however, this increase was not statistically significant. The results showed that the use of organic and inorganic chromium levels decreased feed conversion ratio in the total period of experiment but this reduction was not statistically significant. And chromium supplementation has a positive effect on broiler chicken performance (especially during growth) that the greatest impact, particularly in organic chromium, chromium yeast and chromium methionine was observed.

Improving weight gain, feed consumption and better ability metabolism of nutrients in groups that received supplementation of chromium showed importance of chromium exogenous resource. Stressors such as heat stress, leading to the release of chromium from tissues and dispose of them and therefore may exacerbate marginal deficiency of chromium and increase chromium needs. In such case, the use of chromium supplements can have beneficial effects. According to the results suggest that the better effects of organic and inorganic chromium supplementation sources in growth period, high levels of chromium, used in the growing season. And due to lower availability of mineral chromium suggested higher levels of it used.

REFERENCES

[Anandhi 2006] M. Anandhi, R. Mathivanan, K. Viswanathan and B. Mohan, Dietary Inclusion of Organic Chromium on Production and Carcass Characteristics of Broilers. International Journal of Poultry Science 5 (9): 880-884, 2006.

[Eren et al. 1999] M. Eren Erkek ve DiBi Broylerlerin BazY Kan Parametreleri Y.n.nden KarBYlaBtYrYlmasY ve Yemlere Krom Ulavesinin Bu Parametreler .zerine Etkisi. SelD uk .niv. SatJlYk Bilimleri Enst. Biyokimya (Vet.) Anabilim DalY, Doktora Tezi, 1999.

[Kim et al. 1996] Y.H. Kim, IN. K. Han, I.S. Shin, B.J. Chae and T.H. Kang. Effects of dietary excessive chromium picolinate on growth performance, nutrient utilizability and serum traits in broiler chicks. Asian Aust. J. Anim. Sci 9: 349-354, 1996.

[Lein et al. 1999] T. F. Lien, Y. M. Homg and K. H. Yang. Performance, serum characteristics, carcase traits and lipid metabolism of broilers as affected by supplement of chromium picolinate. Br. Poult. Sci 40: 357-363, 1999.

[Pechova, and Pavlata, 2007] A. Pechova, and L. Pavlata, Chromium as an essential nutrient: a review Veterinami Medicina52: 1-18, 2007.

[Pechova et al. 2002] A.Pechova, J. Illek, M. Sindelar and L. Pavlata. Effects of chromium supplementation on growth rate and metabolism in fattening bulls. Acta Veterinaria Brno 71: 535-541, 2002.

[Sahin et al. 2003] K. Sahin, N. Sahin and O. Kucuk. Effects of chromium and ascorbic acid supplementation on growth, carcass traits, serum metabolites, and antioxidant status of broiler chickens reared at a high ambient temperature (32oC). Nutr Res 23: 225- 238, 2003.

[Sahin et al. 2002] K. Sahin, N. Sahin, M. Onderci, F. Gursu and G. Cikim, Optimal dietary concentration of chromium for alleviating the effect of heat stress on growth, carcass qualities and some serum metabolites of broiler chickens. Biological Trace Element Research 89:53-64, 2002.

[Sahin et al. 2001] K. Sahin, O. Kucuk and N. Sahin, Effects of dietary chromium picolinate supplementation on performance, insulin and corticostrerone in laying hens under low ambient temperature. J. Anim. Physiol. Anim. Nutr 85: 142-147, 2001.

[Underwoodand Suttle 1999] E.J. Underwood, N.F. Suttle.Minerals in animal nutrition. CABI Publishing, 3rd edition, New York. pp.598, 1999.

[Uyanik 2000] E. Uyanik, A. Atasever, S. Ozdamar and F. Aydin, Effect of dietary chromium chloride supplementation on performance, some serum parameters and immune response in broilers. Biological Trace Element Res 90: 99-115, 2000.