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EFFECT OF CHROMIUM PICOLNATE SUPPLEMENT ON GROWTH PERFORMANCE, CARCASS TRAITS, BLOOD PRAMETERS AND PICTURE OF GROWING KIDS UNDER SUMMER CONDITION

Khalil, B.A.
Dept. of Anim. Prod. Fac. of Agri., Zagazig University

ABSTRACT

The present work was performed to study the effect of chromium piclonate supplement on performance of growing kids during hot summer season (33.6 ºC and 74.2% RH). A total number of twenty weaned commercial kids randomly divided into four treatment groups each of 5 animals. Groups were nearly similar in initial body weight. Kids of first group fed the basal diet and kept as control (G1), while kids of G2, G3 and G4 fed diets supplemented with 50, 100 and 150 mg chromium piclonate/kg diet, respectively. The final live body weight and daily body gain increased significantly ($P < 0.05$ to 0.01) during all the experimental periods for Kids fed diets supplemented with chromium piclonate. However, the supplementation of 150 mg chromium piclonate/kg diet had to be the best significant performance. The daily feed intake, feed conversion, water ⁄ feed intake ratio, water ⁄ daily gain ratio increased significantly ($P < 0.05$ to 0.01) during the experimental period for kids fed diets supplemented with chromium piclonate. Water intake, rectum temperature and respiration rate not significantly affected by previous treatments. The best margin obtained for group fed the diet supplemented with 150 mg chromium piclonate/kg diet. All carcass traits improved but insignificantly due to dietary chromium piclonate supplementation. Serum total proteins and ALT increased significantly ($P < 0.05$), while cholesterol and triglycerides levels decreased significantly ($P<0.05$) in kids treated with chromium piclonate compared with control group. Serum albumin, globulin, urea-N, creatinine, AST, WBCs, RBCs MCV, MCH and Hb levels insignificantly affected by chromium piclonate supplementation to the kids' diets. Finally, it could conclude that supplementation of 150 mg chromium piclonate/kg diet to the kids is helpful in improving production performance, under summer condition.

Key words: kids, growth performance, chromium piclonate, carcass traits.

INTRODUCTION

In tropical and sub- tropical countries, climatic heat is the major constraint on animal productivity. Production and reproduction are impaired because of the drastic changes in biological functions caused by heat stress (Kamal et al., 1989 and Marai et al., 2006). Live body weight and gain decreased by exposure to heat stress. Feed additives, which achieved most animal cells, has numerous biochemical functions. This metabolic factor is essential for growth and counteracting infections caused by pathogenic bacteria and viruses. Verde and Piquer (1986) noted that plasma minerals concentration significantly reduced in animals exposed to stress. In other species, supplementary Ascorbic Acid has shown beneficial in reducing the effects of stress. This means that the metabolic need for Ascorbic Acid increase at certain conditions. Therefore, the growth –promoting effect of Ascorbic Acid may be associated with alleviation of retard in hormones function, (Coates, 1984).

Abdel – Hamid (1994) found that body weight, gain, feed intake and feed conversion were improved significantly ($P<0.01$to 0.05), during the summer period, for growing rabbits fed diets supplemented with Ascorbic Acid. Afify and Makled (1995) also found that growth performance and blood components were significantly affected ($P<0.05$) by Ascorbic Acid

supplementation to rabbits till 6 months of age. Abdel - Hamid and El- Adawy (1999) reported that Ascorbic Acid supplementation to rabbit diets improved significantly ($P<0.01$) growth performance and, economical efficiency as compared with control.

Chromium is one of the most important trace elements. Its 1evel must be constant in the blood. It is responsible of maintenance of the blood glucose level, (Underwood, 1977). It plays a role in the glucose tolerance, where it facilitates the attachment of insulin to its receptors, so potentiates the action of insulin (Anderson, 1987). Johnson (1986), Moonsie –Shgeer and Mowat, (1993) reported that, chromium may improve the immune response of stressed animals. Kegley et al.(1997) recorded that, supplemental organic chromium has markedly improved the growth rate and immune response of stressed feeder calves. Also Johnson (1986) and Moonsie - Shageer and Mowat (1993) reported that, chromium improved the immune response of stressed` animals .Chromium piclonate decreased the total cholesterol, LDL cholesterol, (Press et al, 1990) and reduced body fat while the lean mass was increased (McCarty 1991),

The present study conducted to study effects of chromium piclonate (CP) supplementation to growing kids, under heat stress of summer.

MATERIALS AND METHODS

The present work was performed in private farm to study the effect of CP supplementation on the performance of growing kids during hot summer season (33.6 C^o and 74.2% RH). Twenty weaned kids were randomly distributed into four treatment groups each of 6 kids. Groups nearly of similar initial body weight. Kids of the first group fed the basal diet according to **NRC (1981)** and served as control (0.0 supplementation), while groups G2, G3 and G4 were fed the basal diets supplemented with 50,100 and 150 mg chromium piclonate/kg diet, respectively. Animals were individually weighed for two successive days at the beginning of the experiment and then at 15 days intervals up to the end of experiment. The daily feed and water consumption recorded and the feed efficiency was estimated.

Kids housed in semi- open sheds. Rectal temperature and respiration rate measured three times at 8:00, 12:00 and 16:00 h. for one day every week, during the experimental period. Rectal temperature measured by inserting YSI Electronic Thermometer Model 46. Respiration rate (RR) counted by the consistent flank movements per one minute. All measurements taken within a range of time that did not exceed 2-3 minutes for each animal.

At the end of experimental period, blood samples collected from the marginal ear vein after shaving and cleaning with alcohol in less than 2 minutes into dry clean centrifuge tubes for hematological and biochemical analysis. Blood samples separated by centrifuging at 3000 rpm for 20 minutes. Samples kept in a deep freezer at -20 ^oC until analysis. Total proteins (Weichselbaum, 1946), albumin (Douman, 1971), urea (Fawcett and Scott, 1960), creatinine (Brod and Sirota, 1948), cholesterol (Watson, 1961), triglycerides (Eggstein and Kuhlmann, 1974) concentrations and AST and ALT enzyme activities (Reitman and Frankel, 1957) were estimated. Globulin values obtained by subtracting the values of albumin from the corresponding values of total proteins. Five kids in each group e slaughtered for studying carcass traits. Before slaughtering, the kids were fasted for 12 hours. The dressing percentage calculated as hot carcass weight, liver, heart and kidneys relative to slaughter body weight. The obtained data statistically analyzed by using complete randomize design according to Snedecor and Cochran (1982) using the following model:

$Xij = \mu + Ti + eij$

where, μ = general mean, Ti= fixed effect of the treatments(1,…..,4),

and eij = random error . The differences between experimental groups were separated by Duncan s multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

Growth performance:

Data summarized in Table 2 revealed that the growth performance of the growing kids in terms of final live body weight and daily body gain increased significantly (P < 0.05 to 0.01) during all the experimental periods for Kids fed diets supplemented with CP. However, the supplementation of CP at 150 mg/kg diet showed the best performance. The previous results agree with those of **Abdel – Hamid and El – Adawy (1999)** who found that the addition of Ascorbic Acid increased significantly (P<0.01) final body weight and daily weight gain by 3.04 and 9.41 %, respectively, than control group. In addition, other authors obtained similar results such as **Abdel-Monem (2000)** in rabbits, **Shahin and Kucuk (2001)** in Japanese quails. **Sahina et al., (2016) and Maziar Mohiti Asli et al., (2007)** found the same trend on laying hens. The supplementation of calve diets with CP significantly (P<0.05) increased final body weight and daily weight gain than control group. The same by ***El-Masry et al. (2001)***, ***Gaber and Abdel-Monem (2003)*** on rabbits and ***Tahan et al., (2005)*** on lactating cows. The increase in growth rate and final body weight with Cr supplement might resulted from increasing nitrogen retention ***(Kornegay et al., 1997),*** incorporation and utilization of amino acids and nuclear protein synthesis ***(Weser and Koolman, 1969)*** and RNA synthesis ***(Okada et al., 1981).*** On the other hand, ***Borel et al., (1984)*** reported positive increases in growth performance by using Cr, which likely attributed to the apparent effect of Cr on distribution of energy between adipose and lean tissues. Moreover the improve of immunity ***(Mowat et al., 1993)*** and elevation in growth hormone level ***(Page et al., 1993)*** may played a role in improvement of growth rate and body gain.

The results obtained for growing Kids showed that daily feed intake, feed conversion, water ⁄ feed intake ratio, water⁄daily gain ratio increased significantly (P < 0.05 to 0.01) during the experimental period for Kids fed diets supplemented with CP **(**Table 2**)**. The beneficial effects of growth, feed intake and feed conversion accompanied CP supplementation may be due to that CP helps to improve the cell function. It also, protects the immune system and has an important role on bone formation during growth (Pion et al., 2004 and Maziar Mohiti Asli et al., 2007).

The results showed that water intake, rectal temperature and respiration rate not significantly affected by previous treatments. The best margin obtained in group fed diets supplemented with CP. All carcass traits increased but insignificantly due to CP supplement, (Table 2). Similar results obtained by ***Gaber and Abdel-Monem (2003)*** who found that rectal temperature and respiration rate were not significantly affected by the presence of CP in the rabbit diet.

Carcass traits:

All carcass traits studied (Dressing %, Liver weight%, Head weight % and the eye muscle weight%) were increased due to CP supplement to the kids diet, Table (3). Similar results were obtained by **Abdel-Monem (2000)** who found that feeding growing rabbits on diets containing CP increased the carcass and non-carcass weights.

Some blood parameters and constituents

The results of blood serum for growing kids showed that total proteins and ALT increased significantly (P < 0.05), while cholesterol and triglycerides decreased significantly (P<0.05 to 0.01) in kids treated with CP compared with kids of the control group under summer conditions (Table 4).

Serum albumin, globulin, urea-N, creatinine, AST, WBCs, RBCs MCV, MCH and Hb contents insignificantly affected by CP to the kids diets (Table 4). Such results seem to be like that obtained by ***Campbell et al. (1997),*** who found that hematocrite, Hb%, RBCs count, mean corpuscular volume (MCV) and mean corpuscular hemoglobin (MCH) were within the normal clinical ranges, but the blood platelets was increased significantly (P<0.05) by using CP supplementation. ***Chang and Mowat (1992)***, *stated* that serum globulin in calves were increased with CP supplementation, which improve the immune status of the animal. Our results are similar with those obtained by ***Lee and Reasner***

(1994) and El-Gharably (2000), who recorded that CP supplementation associate with lower serum triglycerides. We are on the same ground also with ***Boyd et al. (1998)*** who reported that CP supplement decrease the total cholesterol, LDL.

Table (1): Ingredients of kids' diets chemical composition, % and feeding Values.

Ingredients, %		**Chemical composition %**	
Corn	83	Dry Matter	90.38
Soya bean meal	15	Crude Protein	16.15
Calcium carbonate	1.4	Ether Extract	1.92
Sodium chloride	0.5	NFE	2.28
Minerals and vitamins	0.1	Ash	76.1
Feed Value			
TDN	55.5		
SV	34.3		
DCP	11.94		

Reviewing the above-mentioned findings, it could conclude that supplementation with 150 mg CP / kg to the kid diets could successfully improve productivity under summer conditions

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Table (2):- Effect of chromium piclonate supplementation on growth performance, some physiological parameters and profit analysis of growing commercial kids, under summer conditions (x'± SE).

Items	Control	chromium piclonate			Sig.
		50 mg/kg diet	100 mg/kg diet	150 mg/kg diet	
Body weight					
At age 120 days	10.4±1.4	11.1±1.0	11.0±12	10.9±1. 3	N.S
At age 210 days	20.2±2.3 ^{b}	21.5±3.3 ^{ab}	22.6±2.8 ^{a}	23.9±3. 5 ^{a}	*
At age 270 days	27.7±6.0 ^{c}	31.9±5.6 ^{b}	33.5±3.9 ^{ab}	35.3±4. 2 ^{a}	**
Daily gain (kg)					
120 – 210 days	10.2±2.9 ^{c}	10.4±3.4 ^{cb}	11.6±4.0 ^{b}	13.0±3.2 ^{a}	**
210 -270 days	7.5± 3.5^{b}	10.4±2.7 ^{a}	10.9±2.6 ^{a}	11.4±3.9 ^{a}	**
120 – 270 days	17.3. ±2.9 ^{b}	20.8±2.8 ^{ab}	22.5±3.8 ^{a}	24.4±3.4 ^{a}	**
Feed intake (kg)	590.5±39.1 ^{b}	561.0±31.2 ^{a}	559.8±35.4 ^{a}	592.4±41.4 ^{a}	**
Feed conversion	5.1±0.6 ^{a}	4.1±0.7 ^{ab}	3.8±0.7 ^{b}	3.7±0.9 ^{b}	*
Water intake(ml)	1009.9±57.4	1018.6±49.0	1027.8±55.2	1039.1±39.4	N .S
Water/Feed intake ratio	2.3±0.08^{a}	1.9±0.05 ^{b}	1.8±0.06 ^{b}	1.9±0.09 ^{b}	*
Water/daily gain ratio	10.0±0.5^{a}	8.2±0.9 ^{b}	7.4±0.9 ^{b}	8.2±.0.9 ^{b}	*
Physiological parameters					
Rectum temp.	39.8±0.07	39.7±0.09	39.5±0.07	39.8±0.09	N.S
Respiration rate	99±10.3	95.8±11.3	99±12.9	100±10.1	N.S
Profit analysis					
Feed cost	442.8	514.8	531.6	549.6	
Return	726.6	873.6	945	1024.8	
Margin	283.8	358.8	413.4	475.2	

Price : Experimental diet = 3.0 LE per kg diet , kids live body weight = 30.0LE per kg , .Margin per head == Return from body gain – feed cost . Other head costs assumed constant.

N S = not significant, * (P< 0.05) and **(P< 0.01) . Means a, b and c in the same row bearing different letters , differ significantly (P< 0.05).

Table (3) :- Effect of chromium piclonate supplementation on carcass traits of growing kids under summer conditions .

	Control	chromium piclonate		
		150 mg/kg diet	150 mg/kg diet	150 mg/kg diet
Carcass traits				
Dressing %	50.4	52.9	53.6	57.1
Liver weight%	1.7	1.9	2.0	2.2
Head weight %	8.2	8.0	8.3	7.9
Eye muscle weight	1.8	2.1	2.4	2.5

Table (4) :- Effect of chromium piclonate supplementation on blood chemicals and blood picture of growing kids, under summer condition (x'± SE).

	Control	Chromium piclonate			Sig.
		150 mg/kg diet	150 mg/kg diet	150 mg/kg diet	
Total protein (g/dl)	7.5±0.6 ^{b}	7.9±0.5^{ab}	8.2 ±0.7^{a}	7.8 ±0.4^{b}	*
Albumin (g/dl)	4.1±0.4	3.8±0.4	4.2±0.3	4.4±0.3	N.S
Globulins(g/dl)	3.4±0.3	4.1±0.3	4.0±0.4	3.4±0.3	N.S
Urea (mg /dl)	31.2±1.6	29.1±1.3	31.9±1.5	33.1±1.5	N.S
Creatinine (mg /dl)	1.4±0.05	1.6±0.02	1.4±0.03	1.7±0.7	N.S
T. Cholesterol (mg /dl)	88.0±9.1 ^{a}	81.3±11.2^{b}	86.5±6.9 ^{a}	79.0±10.1 ^{a}	*
Triglycerides (mg /dl)	93.2±10.1 ^{a}	81.9±6.7 ^{b}	80.1±14.2 ^{a}	80.0±11. 4 ^{a}	**
AST (U/L)	35.9±2.9	33.0±1.4	34.1±3.9	36.3±3.5	N.S
ALT(U/L)	20.7 ±1.9	21.3±1.3	20.1±1.5	19.7 ±1.8	NS
Blood picture					
RBcs count	6.5±0.3	5.9±0.2	6.0±0.4	5.9±0.2	N.S
WBcs	7.0±1.5	7.1±1.4	6.9±1.2	7.3±1.3	N.S
HB %	8.7±0.6	9.1±0.7	8.9±0.5	8.5±0.4	N.S
MCV %	59.6±2.5	57.9±3.8	61.2±2.9	60.7±4.1	N.S
MCH %	20.9±1.9	19.5±2.4	19.8±3.8	21.1±1.3	N.S

N S = not significant, * (P< 0.05) and **(P< 0.01) . Means in the same row bearing different letters, differ significantly (P< 0.05).

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تأثير إضافة بيكلونات الكروميوم علي أداء النمو وصفات الذبيحة وبعض الصفات الفسيولوجية و مكونات الدم في الجداء النامية تحت ظروف الصيف

بكري عبد الغني خليل

صممت هذه التجربة لدراسة تأثير إضافة بيكلونات الكروميوم علي أداء الجداء النامية تحت ظروف موسم الصيف الحار (حيث كانت درجة الحرارة 33.6 و معدل الرطوبة النسبية 74.2 %). حيث أجريت هذه الدراسة علي عدد 20 جدي بلدى مفطوم عند عمر اربع شـــهور حيث وزعت الجداء عشـــوائيا علي اربع مجاميع تجريبية (5حملان في كل مجموعة). المجموعة الأولي اعتبرت مجموعة كنترول بينما المجموعة الثانية والثالثة والرابعة تم تغذيتهم علي عليقة الكنترول مضـافا لها بيكلونات الكروميوم بمستوي 50و 100 و 150 مجم/ كجم عليقة علي التوالي لدراسة أداء النمو وبعض الصفات الفسيولوجية ومكونات الدم وصفات الذبيحة.

وقد أظهرت النتائج أن وزن الجســم النهائي ومعدل الزيادة اليومية في وزن الجســم وكذلك الغذاء المأكول وكفاءة تحويل الغذاء قد زادوا معنويا (علي مســـتوي 0.01 و 0.05) طوال فترات التجربة علي الجداء التي تغذت علي عليقة بها بيكلونات الكروميوم وقد كان مستوي 150 مجم / كجم عليقة الامثل.

كما أظهرت النتائج أن درجة حرارة الجسم ومعدل التنفس لم يتأثرا معنويا بوجود بيكلونات الكروميوم في غذاء الجداء

وقد وجد أن أفضـل عائد نهائي كان للمجموعة التي تم تغذيتها علي عليقة مضـافا اليها بيكلونات الكروميوم بمعدل 150 مجم. كما وجد ان جميع صـفات الذبيحة تحسـنت بدرجة غير معنوية في المجاميع التي تغذت علي عليقة بها بيكلونات الكروميوم عند مقارنتها بمجموعة الكنترول تحت ظروف الصيف.

بروتين الدم الكلي ALT, ارتفعا معنويا بينما وجد أن الكوليسترول والدهون الثلاثية قد انخفضا معنويا علي مستوي (0.05) . في حين ان الالبيومين والجلوبيولين واليوريا و AST, والكرياتيينين لم يتأثروا معنويا في الجداء التي تغذت علي عليقة بها بيكلونات الكروميوم عند مقارنتها بمجموعة الكنترول تحت ظروف الصيف.

كما أن العدد الكلي لكل من كرات الدم البيضـاء وكرات الدم الحمراء والهيموجلوبين ونسـبة حجم الكرات و وحجم الخلايا المقسـمة والهيما توكرت لم يتأثروا معنويا بإضافة بيكلونات الكروميوم في غذاء الجداء

التوصـية: من الواضـح أن إضـافة بيكلونات الكروميوم بمسـتوي 150 مجم / كجم عليقة عليقة ضـروري لتحسـين انتاجية الجداء تحت ظروف الصيف الحار.