HATCHABILITY OF EGGS FROM HENS FED DIETS SUPPLEMENTED WITH GRADED LEVELS OF CHROMIUM PICOLINATE WITH OR WITHOUT VITAMIN C

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ABSTRACT
A total of 216 point of lay Noiler pullets were purchased from a reputable farm. The birds were assigned to 8 treatments in a completely randomized design (CRD) using 2 x 4 factorial arrangement (2 levels of vitamin C and 4 levels of CrPic). A basal diet was formulated, divided into eight equal portions and diet 1 to 4 were supplemented with 0.00, 0.40, 0.80 and 1.20mg/kg CrPic. Diets 5 to 8 were supplemented with 200mg/kg vitamin C; 0.40mg/kg CrPic+200mg vitamin C; 0.80mg/kg CrPic+200mg vitamin C, 1.20mg/kg CrPic+200mg Vitamin C, respectively. The feeding trial lasted for 16 weeks and hatchability of eggs set from hens were investigated. Data collected was subjected to analysis of variance from General Linear Model procedures for completely randomised design with a 2 × 4 (2 levels of vitamin C and 4 levels of Chromium picolinate) factorial arrangement. Generally, level of CrPic at 0.8mgkg recorded higher (P>0.05) number of fertile eggs, number of egg hatched, fertility of total egg set, hatchability of egg set and hatchability of fertile egg when compared to others. The interaction between CrPic and Vitamin C was also not significant (P > 0.05) for all the parameters considered. The study revealed that the percentage fertility and hatchability of eggs of hens set increased by CrPic treatments with or without Vitamin C, mostly at 0.8mg/kg diet compared to control diet.
Keywords: Hatchability, Fertile eggs, Hens, Chromium picolinate, Vitamin C

INTRODUCTION

Supplementation of poultry diet with chromium has been shown to positively affect egg production and performance in laying birds (Sahin *et al*., 2001; Sahin *et al*., 2002). The beneficial effects of chromium could be more efficiently noticed in conditions of dietary, environmental and hormonal stresses. Chromium supplementation in laying Japanese quails reared under heat stress was found to improve feed efficiency (Sahin *et al*., 2002). Studies by Uyanik *et al*. (2002) have shown improved efficiency of feed utilization by laying hens with supplementation of chromium as chromium chloride. Research findings (Sahin *et al*., 2001) have shown improved egg quality traits such as specific gravity, eggshell thickness, eggshell weight and Haugh unit, with chromium supplementation in the diets of laying hens reared under low ambient temperatures. In a similar vein, Sahin *et al*. (2002) observed improved egg quality traits in laying Japanese quails exposed to heat stress. However, Lien *et al*. (1996) reported that shell thickness was not affected by chromium picolinate supplementation under thermally neutral conditions. Other studies (Southern and Page, 1994) observed that chromium supplementation did not affect significantly egg quality traits such as Haugh units and specific gravity, this could suggest that marked beneficial effects of chromium on egg quality is observed only under conditions of stress. Chromium supplementation markedly decreased blood cholesterol concentrations in Japanese quail under thermo neutral zones (Sahin *et al*., 2001). This study therefore aimed at the effect of Chromium picolinate with or without Vitamin C on the hatchability of egg set from hens.

MATERIALS AND METHODS

This study was conducted at the Poultry Unit of The Teaching and Research Farm, Federal University of Technology, Akure. The research was conducted during the peak of the dry season in the study area (i.e. between January and February 2020). Two hundred and sixteen Noiler point-of-lay (POL) chicken at 18 weeks were purchased from a reputable farm. They were randomly assigned to eight experimental diets with 3 replicates per treatment having 9 birds each. The proximate composition of the standard diet was investigated according to (AOAC, 1995). A basal diet was formulated (Table 1), divided into eight equal portions in which treatment 1 to 4 were supplemented with different concentrations of CrPic supplemented ranging from 0.00, 0.4, 0.8 and 1.20mg/kg, respectively. While treatments 5 to 8 diets contained 200mg of vitamin C (T5: 200mg Vit C, T6: 0.4mg/kg+200mg Vit C, T7: 0.8mg/kg+200mg Vit C, T8: 1.2mg/kg+200mg Vit C) which lasted for 16 weeks. Data collected were subjected to a 2 × 4 factorial arrangement (2 levels of vitamin C and 4 levels of Chromium picolinate) using SAS (version 9.2). The laying birds were artificially inseminated from 50% laying performance using intact cocks that have been trained for semen collection using the five minutes abdominal sexual massage (5ASM). After inseminating the layers, eggs for hatching were collected twice a day (08:00 - 11:00 and 14:00 - 17:00) and marked according to the treatment. All eggs collected from each bird for seven (7) days were incubated to assess the egg fertility. On day 21, hatchability parameters were recorded according to the respective treatments. The day-old chicks that were hatched, were vaccinated and transferred to the brooding pens.

For the experiment the performance record based on hatchability, fertility and percentage hatched were calculated as:

Percentage Fertility=$Total\ number\ of\ fertile\ eggs \times 100\ Total\ number\ of\ egg\ set$

$Percentage$ Hatchability=$Total\ number\ of\ chicks\ hatched\ \times 100 Total\ number\ of\ fertile\ eggs$

$Percentage$ Hatched=$Total\ number\ of\ chicks\ hatched\ \times 100\ Total\ number\ of\ egg\ set$

AK Scientific, Union City, CA, USA., manufactured the chromium picolinate powder (purity level=98%) and Avondale Laboratories (Supplies and Services) Limited, Banbury, England manufactured L-ascorbic acid powder (purity level = 100% pure (USP/FCC grade).

Table 1: Composition of the Hens' Basal Experimental Diets

Ingredients	Quantity (kg)
Maize	55.00
Soya Bean Meal	15.00
Ground Nut Cake	7.00
Fish Meal	0.50
Palm Kernel Meal	5.67
Wheat Offal	5.48
Limestone	8.50
Dicalcium Phosphate	2.00
Lysine	0.15
Methionine	0.15
Common s**alt**	0.30
Layer Premix*	0.25
TOTAL	**100**
Calculated nutrient values	
Crude protein (%)	16.85
ME (kcal/kg)	2687.36
Ca (%)	3.79
Crude fibre (%)	1.95
Lysine (%)	0.89
Methionine (%)	0.50
Phosphorus (%)	0.47

- **ME: Metabolizable Energy * Ca- Calcium**

RESULTS AND DISCUSSION

Shown in Table 2 is the hatchability of eggs set from hens fed varied levels of CrPic with or without vitamin C which were set in the hatchery. Same numbers of eggs were set for all the treatments and data were obtained for number of fertile eggs, number of infertile eggs, number of eggs hatched, fertility of total egg set, hatchability of egg set and hatchability of fertile egg. The table showed that there was no significant difference (P>0.05) in the parameters of hen fed different levels of CrPic. Vitamin C supplementation did not show any significant influence (P>0.05) on the hatchability of the egg set from the hens, but recorded higher value except for the number of infertile eggs compared to parameters without vitamin C. Generally, level of CrPic at 0.8mgkg recorded higher (P>0.05) number of fertile egg (50.00), number of eggs hatched (45.83), fertility of total egg set (83.33%), hatchability of egg set (76.39%) and hatchability of fertile egg (91.69%) value when compared to others. The interaction between CrPic and Vitamin C was also not significant (P > 0.05) for all the parameters considered.

Table 2: Hatchability of eggs from hens fed graded levels of CrPic with or without vitamin C

Level of CrPic (mg)	Vitamin c (mg)	Number of egg set	NFG	Number of infertile egg	Number of egg hatched	Fertility of total egg set (%)	Hatchability of egg set (%)	Hatchability of fertile egg (%)
ChroPic								
0		60.00±0.00	47.50±0.96	12.50±0.96	42.50±1.73	79.17±1.60	70.56±2.14	89.07±1.43
0.4		60.00±0.00	48.33±1.89	11.67±1.89	44.17±1.97	80.56±3.15	73.61±3.29	91.28±0.80
0.8		60.00±0.00	50.00±1.46	10.00±1.46	45.83±1.33	83.33±2.43	76.39±2.21	91.69±0.99
1.2		60.00±0.00	48.33±1.58	11.67±1.58	42.33±2.03	80.55±2.64	70.56±3.38	87.61±3.04
Vitamin C								
	0	60.00±0.00	47.50±0.94	12.50±0.94	42.67±1.10	79.17±1.57	70.97±1.58	89.67±1.04
	200	60.00±0.00	49.58±1.07	10.42±1.07	44.75±1.37	82.64±1.78	74.58±2.28	90.15±1.53
CrPicxVit c								
0	0	60.00±0.00	46.67±1.33	13.33±1.33	42.00±3.21	77.78±2.22	69.44±3.09	89.20±1.54
0.4	0	60.00±0.00	48.00±2.52	12.00±2.52	43.67±2.85	80.00±4.19	72.78±4.75	90.84±1.24
0.8	0	60.00±0.00	48.67±1.76	11.33±1.76	44.33±1.86	81.11±2.94	73.89±3.09	91.06±0.79
1.2	0	60.00±0.00	46.67±2.6	13.33±2.60	40.67±0.67	77.78±4.34	67.78±1.11	87.57±3.92
0	200	60.00±0.00	48.33±1.45	11.67±1.45	43.00±2.08	80.56±2.42	71.67±3.47	88.93±2.81
0.4	200	60.00±0.00	48.67±3.38	11.33±3.38	44.67±3.33	81.11±5.64	74.44±5.56	91.72±1.20
0.8	200	60.00±0.00	51.33±2.40	8.67±2.40	47.33±1.76	85.55±4.01	78.89±2.94	92.32±1.96
1.2	200	60.00±0.00	50.00±1.73	10.00±1.73	44.00±4.16	83.33±2.89	73.33±6.94	87.64±5.57
Statistical significance								
Level of CrPic (mg)		.	0.73	0.73	0.544	0.73	0.471	0.453
Vitamin C (mg)		.	0.208	0.208	0.291	0.208	0.244	0.812
CrPic level*Vitamin C		.	0.938	0.938	0.954	0.938	0.955	0.992

Means within the same column with different superscripts (a, b, c) are significantly different (P≤0.05) Number of fertile egg-NFG Number of infertile egg

Fertility percentages were not significantly influenced by the concentrations of dietary CrPic with or without vitamin C supplementation, but 0.4 and 0.8 mg/kg CrPic+200 mg/kg vitamin C and 0.4 and 0.8 mg/kg CrPic diets had higher numerical values compared to the control. This result was inconsonance with the findings of Contreras and Barajas (2001) indicating that supplementation of 400 g of Cr through Cr methionine improved fertility in Japanese quail. Attia *et al*. (2015) reported increased hatchability percentage comparable to the control of the birds fed graded levels of diets containing CrPic and vitamin C, the improvement in hatchability percentages was attributed to the improvement in egg shell quality (Abdel-Mageed and Hassan 2012), since the poor hatchability in hot climate may be partially due to thin shell eggs (Daghir 1995). Likewise, Hanafy (2011) reported that fertility and hatchability percentages significantly increased with the increased dietary organic Cr levels from 250 to 1500 ppb Cr. These Results agree with those reported by Anderson (1994) who reported that Cr is thought to be essential for activating certain enzymes and for stabilizing proteins and nucleic acids which lead to increase fertility and hatchability percentages. However, Abd El-Samee *et al*. (2012) reported that supplementing diets with 600 or 1200μg Cr-yeast/ kg diet had no effects on fertility and hatchability percentages in quail.

CONCLUSION

In Conclusion, the study revealed that the percentage fertility and hatchability of eggs of hens set increased by CrPic treatments with or without Vitamin C, mostly at 0.8mg/kg diet compared to control diet.

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