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EFFECT OF DIETARY ARGININE SUPPLEMENTATION ON SOME HORMONES AND ITS RELATION TO PERFORMANCE OF LOCAL CHICKENS. 1- GROWING PERIOD.

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ABSTRACT

An experiment was conducted to study the influence dietary supplemental of Arg on productive performance and physiological traits in chickens during the growing period (one day-12 weeks of age). Four hundred and twenty unsexed–one day old chicks of Silver Montazah (SM) chicks were randomly distributed into four groups (each of 1o5 chicks) with three replicates (each of 35 chicks). The 1st group (T1) was fed the basal diet containing (1.14 % Arg) and served as control group. While the 2nd, 3rd and 4th groups were given the basal diet with 0.20, 0.25 and 0.30 % Arg, respectively. The obtained data revealed the following results: live body weight (LBW), body weight gain (BWG), Keel (KL) and shank lengths (SL) were enhanced with increased dietary Arg at 12 wks of age, likewise, feed consumption (FC) values were significantly (P≤0.05) decreased in chicks fed 0.30% Arg (T4) supplemental diet compared with the control group. Also, chicks fed diet supplemented with 0.20, 0.25 and 0.30% Arg (T2, T3 and T4) recorded better feed conversion ratio (FCR) than control group during the whole period. Adding Arg to the diet of chicks by 0.25 and 0.30% levels resulted in a significant increase in total erythrocytes count (RBC), hemoglobin concentration (Hb), total leucocytes count (WBC) and lymphocytes ratio (L %) and a significant decrease in heterophils (H %), monocytes (M %), eosinophils (E) and H/L ratio value at 12 wks of age as compared with T2 and control groups. The high level (0.30%) Arg (T4) significantly (P≤0.05) increased the nitric oxide (NO) and growth hormone (GH) and decreased significantly IGF-1 hormones than the basal diet (control group). The results of the present study indicated that arginine supplementation during the growing period caused promote the growth performance and had beneficial effects on some physiological responses of Silver Montazah chicks.

Keywords: Arginine, Productive Performance Nitric Oxide, GH and IGF-1

INTRODUCTION

Arginine (Arg) is considered an essential amino acid in birds, particularly in the starter phase of development after hatching. Birds are incapable of synthesizing Arg because the urea biochemical cycle is not functional. Birds have the highest requirement of Arg among the studied animals (Ball et al., 2007). This is explained by the lack of endogenous synthesis and the high protein deposition rate due to the fast growth and the antagonist metabolic interaction between lysine and arginine (Edmonds and Baker, 1987). (Khajali and Wideman, 2010 and Deng et al., 2005) found that affects important biological and physiological functions in poultry by

dimethylarginine, agmatine, glutamine, nitric oxide and protein as substrate for biosynthesis of many molecules. Arg is a protein constituent that is involved in the secretion of insulin by pancreas β cells (Bolea et al., 1997). Tayade et al. (2006) reported that the supplementation of 2% L-arginine in feeds was safe, and did not produce any detrimental effect when used in 21 to 42day old broiler chickens, as well as, L-Arg increases specific immune response against Infectious Bursal Disease (IBD) in chickens. Al-Daraji and Salih (2012a) found that Arg can be used as effective feed additive for improving productive performance of broiler chickens at 6 wks of age. Khajali et al. (2013) reported that Arg requirements for maximal body weight gain during the 21 days were estimated to be 15.3 g/kg of diet. Also, they observed that LBW, WG, NO and FCR at 21 days of age improved linearly ($P<0.05$) with Arg supplementation. Fernandes et al., (2009) found that increasing L-Arg level to over that required for broiler starter requirements was found to improve breast fillet weight, high breast and skeletal myofibers. Food has important role in supporting chickens for maximum growth and stimulation of the proliferation of satellite cells, their incorporation into muscle growth and myofibers (Uni and Ferket, 2004). Increasing dietary arginine to broiler chicken improved blood plasma parameters (Emadi et al., 2010). Alba-Roth et al. (1988) reported that Arg stimulates growth hormone (GH) secretion by suppressing endogenous somatostatin secretion that means it should set in motion a rapid and significant release of GH. GH is required for normal post hatching growth. Glucocorticoids which also rise at this time, may increase iodothyronine monodeiodinase (5, 9D-I),

Studies indicated that there is no direct dependence between the growth rate and the levels of growth hormone (GH) in poultry, and therefore it might be useful to study insulin-like growth factors (Beccavin et al. 2001), as indicator of growth hormone (Lei et al. 2005). The insulin-like growth factor gene (IGF1) is a candidate gene for skeletal characteristics, fat deposition, growth of adipose tissue, metabolism, body composition and growth in poultry. (Zhou et al. 2005). IGF1 belong to the family of polypeptide hormones; they are structural homologues of insulin and also have a similar function. This suggests that in the avian embryo the IGF-I level is of extrahepatic origin (McMurtry 1998). The IGF-I and GH content increases in blood after hatching. (Kikuchi et al. 1991).

Jobgen et al., (2006) reported that nitric oxide (NO) is synthesized from Arg by NO synthase in virtually all cell types. In mammals, NO regulates the metabolism of amino acids, glucose and fatty acids. As an oxidant, pathological levels of NO inhibit nearly all enzyme-catalyzed reactions through protein oxidation. However, nitric oxide stimulate glucose uptake as a physiological levels and signaling molecule, and also, fatty acid oxidation and glucose in adipose tissue, liver and heart inhibit the synthesis of fat, glucose and glycogen in tissues adipose and liver; and increase lipolysis in adipocytes. Therefore, this study was conducted to determine the effect of dietary supplementation with different levels of Arg on productive performance of Silver Montazah chicks through the influence on IGF-I, GH and NO.

MATERIALS AND METHODS

The present investigation was conducted at Inshas Poultry Research Station, Egypt.

Chicks and experimental design:-

Four hundred and twenty unsexed–one day old chicks of Silver Montazah (SM) chicks (Egyptian local strain) were randomly distributed into four groups (each of 1o5 chicks) with three replicates (each of 35 chicks), wing banded and individually weighed, with nearly similar average initial live body weight of all groups. The 1st group was fed the basal diet containing 1.14 % Arg, while 2nd, 3rd and 4th groups were fed the basal diet supplemented with 0.20, 0.25 and 0.30% Arg, respectively. Arginine was added in form of L-Arginine monohydrochloride. Assay (exc1) min. 98.0 %.C6H14 N4O2-Hcl Exp: 09/2017 Fw 210.7. Bestellen Sic Zum Nulltarif Germany. Chicks of each replicate were separately housed. All chicks were kept under the same managerial, hygienic and environmental conditions with light cycle regimen of 16h light: 8 h darkness throughout the experimental period (0-12 wks of age). Feed and water were provided *ad libitum*. The basal experimental diet was formulated to meet the nutrients requirements of chicks during growth period from (0-12 wks of age) according to feed composition tables for animal & poultry feedstuffs used in Egypt (2001). The composition and calculated analysis of the experimental basal diet are presented in (Table 1).

Table (1): Composition and calculated analysis of the experimental basal diets.

Ingredients	**Percentage (%)**
Yellow corn	59.84
Soya bean meal 44%	24.20
Wheat bran	8.20
Corn gluten 60%	4.00
Di calcium phosphate	1.53
Lime stone	1.52
Sodium chloride	0.37
*Premix	0.30
DL-Methionine	0.04
Total	100.00
** (%)Calculated analysis	
Crude protein %	19.0
Metabolizable energy (Kcal/kg)	2800
Crude fiber (C.F.) %	4.124
Ether extract %	3.052
Calcium %	0.995
Available Phosphorous %	0.447
Lysine %	0.949
Methionine %	0.403
Methionine & cysteine %	0.734

*** premix added to the 1 kg of diet including Vit.A 10000 I.U; vit. D3 2000 I.U; vit. E 15 mg; vit. K3 1 µg; vit B1 1mg; vit. B2 5mg; vit. B12 10 µg; vit B6 1.5mg; Niacin 30mg; Pantothenic acid 10mg; folic acid 1mg; Biotin 50 mg; choline 300 mg; zinc 50mg; copper 4mg; iodine 0.3 mg; iron 30mg; selenium 0.1mg; manganese 60mg; cobalt 0.1mg and carrier CaCo3 up to 1kg.** According to feed composition Tables for animal and poultry feedstuffs used in Egypt, (2001).**

Measurements:-

Productive performance:-

Chicks were individually weighed at the beginning of the trail then every four weeks. Feed consumption (FC) was measured and calculated as g/ bird/ day. Body weight gains (BWG) and feed conversion ratio (FCR) (g feed/ g gain) were calculated in 4 wks (4, 8 and 12 wks of age). Keel length (KL) and shank length (SL) values for each chick were estimated to centimeter (cm) at 12 weeks of age.

Blood sampling, analysis and hematology:-

At the end of the experimental period (12 wks of age) six chicks of each group were randomly chosen. Blood samples were collected from wing vein of each bird in two heparin zed test tubes. Blood of the first tube was used to evaluate the total erythrocytes count (RBC), hemoglobin concentration (Hb), packed cell volume (PCV), total leucocytes count (WBC), hetrophils (H%), lymphocyte (L), monocytes (M%), eosinophils (E%) and hetrophils to lymphocyte ratio (H/L). while the second one was centrifuged at 3000 rpm for 10 minutes. Plasma was obtained and frozen at -20°C until the chemical analysis for Plasma growth (GH), Insulin-like growth factor (IGF-I) hormones and nitric oxide were determined according to the manufacture recommendations of commercial kits.

Statistical analysis:-

The obtained data were statistically analyzed using the general linear model SAS (2001). Differences among means were detected by using Duncan's multiple range test (Duncan, 1955). The following model was used:

$$Yij = \mu + Ti + eij.$$

Where, Yij = observation for each dependent variable; μ = General mean;
Ti = Treatment effects (i = 1,2... and 4); eij = Random error.

RESULTS AND DISCUSSIONS

Productive performance traits:

The average values of LBW at 12 wks and BWG at 8 and 12 wks of age were generally increased linearly with increasing of Arg levels. (Table 2). Chicks received (0.20, 0.25 and 0.30% Arg) in their diets had recorded significantly ($P \leq 0.05$) higher BWG value by about 23.5, 28 and 28 % from 8 to 12 wks and 11, 13.3 and 15.3% from 0 to 12 wks of age respectively as compared with the control group. The present results show that the LBW was markedly improved in Arg supplemented groups throughout the experimental period from 0 to 12 wks of age. Similar results were obtained by Al-Daraji and Salih (2012a) who reported that adding Arg to the diet of broiler chickens at levels of 0.02, 0.04 and 0.06%, resulted in significant increase in live body weight, weight gain at 6 wks of age. Ruiz-Feria et al., (2001) and Emadi et al., (2010 and 2011) reported that BWG of broiler chicks was significantly increased as the dietary Arg concentrations increased from 0.52 to 2.77% during the period from 1 to 49 day of age. Also, (Khajali et al., 2013) observed that LBW and WG at 21 days of age were improved linearly ($P<0.05$) with increasing dietary Arg supplementation. Conversely, Rubin et

al. (2007) found that 1.83 % Arg concentration over the values recommended by the NRC, (1994) in broiler chick's diet, did not influence BWG. Similarly, Deng et al. (2005) reported that no statistical difference was observed in BWG in male Leghorn chicks from 1- to 28 day-old when Arg levels varying from 100 to 130% over the values recommended by the NRC (1994) were fed.

Table (2): Effect of dietary arginine supplementation on live body weight (g) and live body weight gain (g) of Silver Montazah chicks during different periods.

Item		T1	T2	T3	T4	MSE
Live body weight (g)	Age					
	day old	29.52	28.54	30.95	28.89	0.478
	4 wk	187.87	196.53	204.29	212.98	6.265
	8 wk	487.87	498.15	505.68	518.49	11.522
	12 wk	793.75^{b}	875.77^{a}	897.10^{a}	910.01^{a}	26.462
Live body weight gain (g)	0-4 wk	158.35	167.99	173.34	184.09	6.191
	4-8 wk	300.00	301.62	301.39	305.51	14.752
	8-12 wk	305.88^{b}	377.62^{a}	391.42^{a}	391.52^{a}	27.895
	0-12 wk	764.23^{b}	847.23^{a}	866.15^{a}	881.12^{a}	26.713

$^{a, b....}$ Means within each row have no similar letter(s) are significantly different (P ≤ 0.05)
T1:Control T2: 0.20% arginine
T3: 0.25% arginine T4: 0.30% arginine.

Data in Table (3) show that chicks supplemented Arg in their diets (T2, T3 and T4 groups) consumed significantly (P≤0.05) lesser feed than those fed non supplemented group (T1) at all experimental periods. Generally, chicks fed on T4 gave significantly (P≤0.05) the best FC value than control treatment. Feed consumption tended to decrease linearly with increased dietary Arg, The data of FCR are presented in Table 3. It could be observed that, chicks fed diet supplemented with 0.20, 0.25 and 0.30% Arg (T2, T3 and T4) had significantly (P≤0.05) better FCR than control group during the all periods studied and the whole period (total experimental period) except for period from 4 to 8 wks of age. However, the differences in accumulative FCR among experimental groups (T2, T3 and T4) were not significant during whole period from (0 to 12 wks of age).

Table (3): Effect of dietary arginine supplementation on feed intake (g) and feed conversion ratio of Silver Montazah chicks during different periods.

Item		T1	T2	T3	T4	MSE
Feed consumption (g)	0-4 wk	684.00^{a}	643.00^{ab}	611.00^{b}	586.00^{c}	23.475
	4-8 wk	1455.00^{a}	1439.00^{ab}	1412.00^{ab}	1356.00^{b}	19.431
	8-12 wk	2002.00^{a}	1960.00^{a}	1899.00^{ab}	1798.00^{b}	29.274
	0-12 wk	4098.00^{a}	4058.00^{a}	3924.00^{ab}	3795.00^{b}	70.019
Feed conversion ratio	0-4 wk	4.32^{a}	3.83^{b}	3.52^{bc}	3.18^{c}	0.204
	4-8 wk	4.85	4.77	4.68	4.44	0.246
	8-12 wk	6.55^{a}	5.19^{b}	4.85^{bc}	4.59^{c}	0.401
	0-12 wk	5.36^{a}	4.79^{b}	4.53^{b}	4.31^{b}	0.181

$^{a, b....}$ Means within each row have no similar letter(s) are significantly different (P ≤ 0.05)
T1:Control T2: 0.20% arginine
T3: 0.25% arginine T4: 0.30% arginine.

In the present study increasing the dietary Arg levels above the NRC (1994) recommended requirements significantly increased body weight, weight gain at 12 wks of age.

(Kwak et al., 1999) found that protein synthesis, stimulated secretion of growth, insulin hormones and glucagons consequently increase protein, ornithine and DNA synthesis and cell proliferation in response to additional dietary Arg. These findings were in accordance with Rubin et al. (2007) who reported that the highest Arg level numerically decreased feed intake ($P<0.11$), and this deserves attention in future studies. Such finding may also be interpreted as a result of amino acid imbalance, but broilers at this age are less sensitive to nutritional changes. Also, Carew et al., (1997) found that feed intake, was significantly lower in Arg feeding group (o.86%) than the control group of male broiler chicks up to 23 days of age. Studies showed that. Arg improves functions of digestive system in both mammals and birds when Arg decreases intestinal permeability due to its role in the production of nitric oxide and promotes the healing of the ulcers that occur in the digestive tract, Arginine also increases the jejunal activities for carbohydrate and protein digestion (Corzo and Kidd, (2003). However Emadi et al., (2010 and 2011) found that increase of dietary Arg significantly increased feed intake and significantly lowered FCR compared with control in broiler chicks. Gonzales-Esquerra and Leeson (2006) no significant differences in feed intake or in weight gain in 26- to 33-day-old broilers fed Arg levels of 0.94 or 1.54%. Also, Al-Daraji and Salih (2012a) reported that adding Arg to the diet of broiler chickens at levels of 0.02, 0.04 and 0.06%, resulted in significant increase in accumulative feed intake and the best results with respect to FCR as compared with control group (C) at 6 wks of age, who also reported that a possible explanation for this effect, apart from their roles in protein structure, might be the unique and additional roles of Arg in the urea cycle and methionine as a methyl donor, particularly in the synthesis of creatine. Murakami et al. (2012) observed that live weight and feed conversion at 21 days of age improved linearly ($P<0.05$) with Arg supplementation, whereas feed intake did not vary among the treatments. Khajali et al. (2013) found that Arg requirements for maximal optimal feed: gain during the 21 days was estimated to be 15.1 g/kg of diet. In the present study, it appears that these supplements of Arg have the ability to improve both FC and FCR traits, and these results may be attributed to changes in nutrient digestion or in the metabolic utilization which generally agrees with the results mentioned previously.

Keel (KL) and shank lengths (SL):

The data of KL and SL (Table 4) showed that SL was significantly ($P\leq0.05$) improved in all treated groups (T2, T3 and T4) compared with the control (T1), However, the longest shank was recorded for T4 and the shortest shank was recorded for chicks of the control group. Meanwhile, shank length of T2 and T3 was intermediate between T4 and T1 treatment groups at 12 wks of age. There was a significant ($P\leq0.05$) increase in keel length for chicks of T3 and T4 comparing to control (T1) at the same age. On the other hand, there was no significant difference between T2 and the control treatments.

Arginine has more benefits and vast effects when it is added as supplementary diet, for instance Arg increases the release of growth hormone and facilitates muscle growth (by inhibiting muscle loss). Also, it is required for the transport of the nitrogen used in muscle metabolism and improving muscle performance. It also improves glucose uptake into muscle cells (Stevens et al., 2000). Fernandes et al., (2009) stated that dietary supplementation with Arg had a positive effect on breast and breast fillet weight at 7 and 21 days and on myofiber diameter at 14 and 21 days. The authors added that, Arg was affected muscle growth in the starter phase positively. So, Arg at levels above the recommended ones for the starter phase may be necessary for improving muscle development in broilers. In contrast, Costa et al. (2001) reported that breast with skin and bone, and breast fillet were not influenced by supplementation of digestible Arg in 6 levels (from 1.00 to 1.400%).

Table (4): Effect of dietary arginine supplementation on shank and keel lengths of Silver Montazah chicks at the end of the experimental period.

Item	T1	T2	T3	T4	MSE
Shank Length (cm)	6.38 ^{c}	6.92 ^{b}	7.25 ^{ab}	7.60 ^{a}	0.156
Keel Length (cm)	9.34 ^{b}	9.87 ^{ab}	10.18 ^{a}	10.68 ^{a}	0.269

$^{a, b,...}$ **Means within each row have no similar letter(s) are significantly different (P ≤ 0.05)**
T1:Control T2: 0.20% arginine
T3: 0.25% arginine T4: 0.30% arginine.

Hematological parameters:

As shown in Table 5, the results of blood parameters showed that Arg treated chicks (T3 and T4) had significant higher total erythrocytes count (RBC), hemoglobin concentration (Hb), packed cell volume (PCV), total leucocytes count (WBC) and lymphocyte ratio (L %) as compared with control group. These values were generally increased linearly with increasing dietary Arg. On the other hand, means RBC, Hb, WBC and L % were significantly (P≤0.05) increased by the high level of Arg (T4) over than the other dietary treatments (T2, T3) and control group. While, no significant differences in PCV, WBC, heterophils (H %), L %, monocytes (M %) and H/L ratio were observed between T2 and T1 control. However, chicks in the T3 and T4 groups gave significantly (P≤0.05) the best H %, M %, eosinophils (E) and H/L ratio comparing with other treatments T2 and control at 12 wks of age. The percentages were generally decreased linearly with increasing of Arg.

Similar results were obtained by Al-Daraji and Salih (2012b) who indicated that adding Arg to the diet of broiler chickens (0.02, 0.04 and 0.06%,) resulted in a significant increase in RBC, PCV, Hb, WBC, and a significant decrease in H/L ratio as compared with control group. Erythropoietin (EPO) is a hematopoietic growth factor produced by kidney, acts directly on certain RBC progenitors and precursors in the bone marrow and controls the proliferation, differentiation and maturation of RBCs. In this respect, Westenfelder, (2002) reported that the expression of erythropoietin is markedly increased in kidneys during hypoxic state, a condition mediated by

the transcription factor Hypoxia Inducible Factor-1 (HIF-1). The ultimate effect is to increase erythropoiesis in an attempt to maintain oxygen delivery to vital organs. Emadi et al. (2011) reported that increasing dietary arginine modulates the systemic immune response against infectious bursal disease. Guo et al., (2015) demonstrated that Arg modulates immune functions in chickens. This may be that Arg activated nitric oxide (NO) secretion, which is consistent with the results obtained in the present study. However, Tayade et al. (2006) proved that the supplementation of 2% Arg in diets increased antibody counts and the protection against infectious bursal disease virus.

The stimulating effect of Arg to GH on erythropoiesis could be explained, at least partly, by anabolic action rather than a direct effect. The anabolic effect of GH induces an increase in metabolic activity and necessity for oxygen transport to peripheral tissue resulting in an increase of oxygen transportation and Hb levels (Jepson and Mcgarry, 1972). Kurtz et al. (1988) speculated that the increase of kidney mass during growth causes an increase in renal oxygen consumption and inconsequence, a relative renal deficiency of oxygen. In turn, an enhanced rate of EPO production would lead to stimulation of erythropoiesis and thus adapt RBC mass to body growth. Arginine also helps to prevent abnormal blood clotting by stimulating the production of plasmin and by increasing vasodilation and also inhibits the adhesion of monocytes to the endothelium, besides Arg reduces pulmonary blood pressure and improves blood circulation in pulmonary hypertension syndrome that known as ascites (Nakaki, 1990 and Nagaya, 2001).

Table (5): Effect of dietary arginine supplementation on heamatological parameters of Silver Montazah chicks at the end of the experimental period.

Item	T1	T2	T3	T4	MSE
RBCs x (10^6/mm^3)	2.27 ^{d}	2.82 ^{c}	3.19 ^{b}	3.63 ^{a}	0.055
Hb (g/dl)	9.26 ^{d}	9.82 ^{c}	10.32 ^{b}	11.17 ^{a}	0.060
PCV %	31.17 ^{c}	33.77 ^{bc}	35.90 ^{ab}	38.67 ^{a}	1.025
WBCs x (10^3/mm^3)	13.90 ^{c}	14.10 ^{c}	15.60 ^{b}	18.27 ^{a}	0.347
Differential leucocyte count (%)					
Heterophils (H) %	32.33 ^{a}	31.00 ^{a}	28.00 ^{b}	21.67 ^{c}	0.687
Lymphocytes (L) %	56.24 ^{c}	57.58 ^{c}	63.36 ^{b}	71.26 ^{a}	0.797
Monocytes%	4.62 ^{a}	4.16 ^{a}	3.15 ^{b}	2.70 ^{b}	0.180
Eosinophils%	4.66 ^{a}	4.06 ^{b}	3.32 ^{c}	2.89 ^{d}	0.124
H/ L ratio	0.58 ^{a}	0.54 ^{a}	0.44 ^{b}	0.31 ^{c}	0.014

$^{a, b,...}$ **Means within each row have no similar letter(s) are significantly different (P ≤ 0.05)**
T1:Control T2: 0.20% arginine
T3: 0.25% arginine T4: 0.30% arginine.

Nitric oxide (NO), IGF-I and GH hormones:

Results presented in Table 6 indicate that with respect to nitric oxide, the results displayed that group of (0.30% Arg /kg diet T4) was significantly (P≤0.05) higher plasma concentration of nitric oxide compared to control group. The average values of IGF-I at 12 wks of age as affected by using Arg in diets are presented in Table 5. It could be observed that the concentration of IGF-I was generally decreased linearly with increasing of Arg

levels. In addition, it was noticed that in spite of that there were significant differences among Arg treatment groups with respect to IGF-I. Also, there was clearly trend for this trait to be lower in Arg treatments (T2, T3and T4) as compared to control group (T1). On the other hand, the average values of GH concentration at 12 wks of age were generally increased linearly with increasing Arg level where chicks of T4 gave significantly (P≤0.05) the best GH value comparing to the other treatments. While, the worst values of GH were recorded for chicks fed the control diet T1. However, there were significant differences among Arg treatment groups, or between Arg treatment groups (T2, T3and T4) and control group (T1). Similarly, Khajali et al., (2011) found that supplementing the corn–canola meal diet with Arg (0.2 to 0.4%) increased the plasma NO level above that of corn–soybean meal group. Moreover, Arg is essential for the formation of nitric oxide (NO), a potent vasodilator that directly reduces pulmonary vascular resistance by causing vascular smooth muscle to relax and modulates or inhibits the production and release of vasoconstrictors such as serotonin and endothelin-1. Khajali et al. (2013) observed that LBW, BWG and FCR at 21 days of age were improved and NO was increased linearly with increasing Arg supplementation. Meanwhile, insulin-like growth factor is known to trigger numerous anabolic effects in the metabolism of skeletal muscles such as the proliferation and differentiation of satellite cells (Florini et al., 1996) and the aggregation of myofibrillar protein through its combined effects on the synthesis and degradation of proteins (Coleman et al., 1995 and Duclos, 2005). In contrast, Fayh et al., (2007) reported that L- Arg supplementation during seven days was ineffective to augment both GH and IGF-I release in individual male adults. Kanaley (2008) fount that most studies using oral Arg have Arg alone increased the resting growth hormone levels. Possible mechanisms for the improvement in these traits may be account for that Arg stimulate GH secretion and GH induces Insulin-like Growth Factor (IGF)-1 (Le Roith et al., 2001), which in turn counteracts apoptosis similarly to Erythropoietin (EPO) and fosters proliferation and differentiation of Burst- and Colony-Forming Units-Erythroid (BFU-E, CFU-E) and myeloid progenitor and peripheral blood cells (Deicher and Walter, 2005). Moreover, Guo et al., (2015) indicated that the increase of dietary Arg level from 9.0 to 13.5g /kg of diet correlated positively with NO production in broiler chicken.

Table (6): Effect of dietary arginine supplementation on nitric oxide and plasma IGF-1 and growth hormone (GH) of Silver Montazah chicks at the end of the experimental period.

Item	T1	T2	T3	T4	MSE
Nitric oxide (umol/ml)	6.15 ^{b}	7.03 ^{ab}	7.38 ^{ab}	10.44 ^{a}	1.119
IGF-1 (ng/ml)	22.56 ^{a}	21.44 ^{b}	19.20 ^{c}	18.36 ^{c}	0.333
GH (ng/ml)	1.500 ^{c}	1.580 ^{c}	1.710 ^{b}	1.907 ^{a}	0.038

$^{a, b,...}$ **Means within each row have no similar letter(s) are significantly different (P ≤ 0.05)**
T1:Control T2: 0.20% arginine
T3: 0.25% arginine T4: 0.30% arginine.

From the previous results it could be concluded that: adding Arg to the diet of Silver Montazah chicks resulted in significant improvement in live body

weight, body weight gain, feed consumption and feed conversion ratio, through its influence on blood concentration of growth hormone, insulin-like growth factors and nitric oxide. Therefore, it could be used as an efficient additive for improving productive performance of local chickens.

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تأثير اضافة الأرجنين فى العلف على بعض الهرمونات وعلاقة ذلك بأداء الدجاج المحلى.

١- فترة النمو.

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***قسم بحوث تربية الدواجن. ****قسم بحوث تغذية الدواجن**

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أجرى هذا البحث على عدد٤٢٠ كتكوت غير مجنس عمر يوم من كتاكيت المنتزة الفضى (سلالة محلية مصرية) وذلك لدراسة تأثيرأضافة مستويات مختلفة من الأرجنين فى العلف على الأداء الأنتاجى والفسيولوجى خلال فترة النمو من عمر يوم الى ١٢ أسبوع من العمر. قسمت هذه الكتاكيت عشوائيا الى ٤ مجاميع متساوية بكل مجموعة ١٠٥ كتكوت وكل مجموعة ٣ مكررات بكل مكررة ٣٥ كتكوت. غذيت المجموعة الأولى على عليقة أساسية (كنترول) تحتوى على (١٤و١ % أرجنين) بينما غذيت المجاميع الثانية والثالثة والرابعة على نفس العليقة مضافا إليها 20و٠ و٢٥و٠ و٣٠و٠ % أرجنين على التوالى. **وكانت أهم النتائج المتحصل عليها كما يلى:**

- أدى أضافة الأرجنين فى العلف الى زيادة كل من وزن الجسم الحى والزيادة الوزنية وطول عظام الساق والقص عند ١٢ أسبوع من العمر.
- سجلت المجموعة الرابعة المضاف اليها ٣٠و٠ % أرجنين فى العلف أقل غذاء مستهلك مقارنة مع المجموعة الكنترول بينما تحسنت المجاميع المضاف اليها الأرجنين فى العلف (الثانية والثالثة والرابعة) فى معدل تحويل الغذاء مقارنة مع المجموعة الكنترول.
- سجلت المجاميع الثالثة والرابعة أعلى قيم معنوية فى عدد كل من كرات الدم الحمراء والبيضاء، تركيز الهيموجلوبين فى الدم والنسبة المئوية لليمفوسايت ، وأقل قيم معنوية فى النسب المئوية لكلا من الهيتيروفيل، المونوسايت الإسينوفيل وكذلك نسبة الهيتيروفيل إلى الليمفوسايت عند ١٢ أسبوع من العمر مقارنة مع الجموعة الثانية والمجموعة الأولى (الكنترول).
- سجلت المجموعة الرابعة تحسن معنوى فى مستوى أكسيد النتريك وهرمون النمو ونقص فى عامل النمو المشابة للأنسولين عندما قورنت مع المجموعة الأولى (الكنترول).

التوصية: توضح النتائج أن إضافة الأرجنين الى علف الكتاكيت خلال فترة النمو (من عمر يوم الى ١٢ أسبوع من العمر) يؤدى إلى تحسين الأداء الأنتاجى ويظهر تأثيرا أيجابيا على بعض الإستجابات الفسيولوجية فى كتاكيت المنتزة الفضى وبذلك توصى الدراسة بإضافته للعلائق بنسبة ٣٠و٠ % .