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PRODUCTIVE AND PHYSIOLOGICAL PERFORMANCE OF BROILER CHICKS AS AFFECTED BY DIETARY L-ARGININE SUPPLEMENTATION UNDER HOT CLIMATE CONDITIONS

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ABSTRACT : The current study was conducted to investigate the influence of dietary Arginine levels supplementation on broiler performance, some physiological parameters under summer conditions. One hundred and twenty, one day old unsexed of Arbor Acres broiler chicks, were randomly divided into 4 equal groups in equal 3 replicates of 10 chicks each. The first group was fed control (base diet), the 2nd ; 3rd and 4th groups fed the control diet supplemented with 0.1%, 0.3%, and 0.5% Arginine, respectively. All chicks were maintained under the same management from 1 to 38 days of age. The ambient temperature during this period fluctuated between (30-35 ^{o}C). The results were as follows: Compared to chicks given either a control diet or diets supplemented with 0.1 and 0.3% L-Arginine, chicks fed diets containing 0.5% Arginine had significantly the highest final body weight and weight gain values. The two groups received either 0.3 or 0.5 L-Arginine in their diets had recorded the best FCR ratio and the lowest amounts of feed intake at the end of experimental period. An increase in dietary arginine levels dramatically decreased TL, TC, TG, and LDL during the grower and finisher phases. As the level of Arginine supplementation rose, there was a significant rise in TP, Al, and globin, respectively. No difference in carcass traits was seen among the examined arginine levels. In general, it can be concluded that adding L-Arginine in broilers diet was useful in increasing FCR and lowering FI, blood cholesterol and abdominal fat and dietary added 0.5 L-Arginine/kg diet was more efficient in improving the performance of Arbor Acres broiler chicks under hot climate conditions.

Keywords: Broiler, Arginine levels, growth performance, physiological traits, hot climate

INTRODUCTION

Arginine (Arg) is an essential amino acid (Jahanian, 2009) for acquiring birds' best rate of growth and nitrogen balance, Due to a lack of the majority of urea cycle enzymes, chickens are unable to synthesize the amino acid arginine, which explains why it is so crucial to their diet. L-Arg supplementation is essential in Arg-deficient diets since it improves broiler development, intestinal integrity, and morphology as well as total body size and lean deposition without decreasing fat accretion (Castro et al., 2019; 2020)

Heat stress has been recognized as one of the greatest challenges in chicken production, particularly in tropical and subtropical regions, as a result of climate change (Smith and Gregory, 2013). Compared to hens subjected to normal environments (25°C), heat-stressed chicks produce more reactive oxygen species and have greater levels of lipid peroxidation .

In addition, oxidative stress causes lipid peroxidation to increase and superoxide dismutase, glutathione peroxidase, and catalase enzyme activity to decrease in the chicken liver. Proteins, creatine, nitric oxide, ornithine, polyamine, s-glutamate, proline, glutamine, agmatine, and dimethylarginine may all be biosynthesized using the precursor Arg. As a result, it serves a variety of physiological purposes in poultry (Khajali et al., 2014). According to experimental studies, arg supplementation reduced ascites mortality, decreased pulmonary hypertension syndrome, and enhanced innate, humoral, and cellular immune responses in broiler chickens (Tayade et al., 2006; Munir et al., 2009). It also released oxidative stress and improved antioxidant capacity. Corzo et al. (2003) and Fouad et al. (2013) conducted studies on hens and concluded that dietary Arg supplementation is effective in lowering body fat deposition. By inhibiting the activities of glucose-6-phosphate dehydrogenase, malate dehydrogenase, and fatty acid synthase, arg supplementation at a dose of 1.00% lowered body fat accumulation in ducks (Wu et al., 2011). Therefore, the objective of this research was to investigate the effect of arginine dietary supplementation on broiler performance, some physiological parameters, and immune response under summer conditions.

MATERIALS AND METHODS

The trials were carried out in the research farm belonging to the Animal Production Research Institute (APRI), Agricultural Research Center (ARC), located in the north of Egypt. The Institute's ethical rules for animal research were followed and the study plan was approved by the Institute's Research Committee.

Experimental design and management

One hundred and twenty, unsexed Arbor Acres one day old broiler chicks, were randomly divided into 4 equal groups in equal 3 replicates; each group contained 30 chicks which were divided into three replicates of 10 chicks. The average initial body weight of all replicates were almost similar. The first group was fed the control (T1,basal diet) whereas, the 2nd; 3rd, and 4th groups fed control diet supplemented with 0.1%(T2), 0.3%(T3), and 0.5%(T4) L-Arginine. Composition, and calculated analysis of the basal diet are shown in table (1). All chicks were maintained under the same management conditions. The birds were housed in cages and exposed to continuous light . the ambient temperature throughout this period fluctuated between (30 – 35^{o}C) feed and water were available ad lib during the whole experimental period (1 – 38 days).

Measurements:

Growth performance and carcass characteristics:

Performance parameters, including body weight (BW), and feed intake (FI) were recorded. Body weight gain (BWG), and feed conversion ratio (FCR) as g feed/g gain at 10, 24, and 38 days of age were calculated for the starter period (1–10 days), grower (11-24 days), and finisher (25–38 days) of age. At the end of the trial , three birds were taken randomly from each treatment (one per each replicate), birds were weighed individually, and slaughtered. Viscera were removed immediately; The weights of carcass, abdominal fat, liver, heart and gizzard, as well as lymphoid organs (spleen, bursa of Fabricius, and thymus) , and were obtained using a digital scale. Carcass yield and relative weights of internal and lymphoid organs were calculated as the percentages of live body weight(LBW).

Blood biochemical parameters :

At 24 and 38 days of age 9 chicks from each group (three birds per each replicate) were selected randomly for blood sampling. three milliliters of blood samples were collected from the brachial vein and centrifuged at 3000 rpm for 10 min, Serum samples were stored at −20°C until chemical analysis. Serum concentrations of total lipids(TL), cholesterol(TC), triglyceride(TG), high-(HDL) and low-(LDL) density lipoproteins, were measured using diagnostic kits. Serum total protein (TP), Albumin(Alb) and creatinine were determined colormetrically using available commercial kits.

Serum globulin (Glb) was calculated by the difference between TP and Alb and calculated Alb/Glb ratio.

Statistical analysis:

Data of experimental treatments were analyzed by using a one-way analysis of SPSS program (2016). Variables showed significant differences were compared to each other's using Duncan's Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

Various dietary arginine levels had a significant an impact on the body weight (BW) and body gain (BWG) of chicks (Table 2). Evidently, at ages 10, 24, and 38 days, chicks fed diet enriched with Arg. level 0.5% had significantly ($P\leq0.05$) higher body weight values than those fed either a control diet or 0.1 and 0.3% L-Arg. During the starter (1–10 day), grower , (11–24 day) and finisher (25–38 day), as well as across the full period (1–38 day), It is evident from the results that body weight(BW) and bodyweight gain(BWG) significantly ($P\leq0.05$) increased with the addition of Arginine at all levels compared to the control. The highest increase was observed when using a high level of Arginine (0.5%).As regard to the overall mean of feed intake, Table (3) showed that the amounts of feed consumed (FI) by all Arg dietary treatments were significantly ($P\leq0.05$) lower than control group, either through grower, finisher phases (11-24 d and 25-38 d). or during the whole experimental period(1-38 d). However , the least amounts of feed intake were recorded for birds of T3 which received 0.3% Arg in their diet. The results from Table (3) clear that dietary inclusion of Arg in broiler diets significantly ($P\leq0.05$) improved FCR comparing with control(un supplemented treatment. However , birds given 0.5%in the diet had significantly ($P\leq0.05$) the best FCR at finisher and at full experimental period (1-38 d). and However, According to Labadan, et al. (2001), the arginine requires for body weight gain were 1.24% higher from 0 to 3 weeks of age than the NRC (1994). On the other hand, According to (Jahanian, 2009) and Fernandes et al. (2009), dietary Arg supplementation had no effect on the average live body weight of chicks at 42 days. In comparison to broiler chicks fed a basal diet, adding L-Arg to the diet at a rate of 2 g/kg did not affect the broiler chicks' body weight, feed intake, or feed conversion ratio (FCR). These results are agreed with . Emadi et al. (2011) found that chicks fed diets supplemented with 2.5% L-Arg over their needs had better BWG, FI, and FCR and suggested that these variations may have resulted from the length of the period and/or supplementation doses, Jahanian and Khalifeh (2017) who reported that adding Arg to the diet increased FI throughout the growing period. Likewise, Xu et al.(2018) reported that dietary supplementation of Arg increased body weight gain in broiler chickens. Feeding arginine above the recommended specifications improves the growth performance of broilers, lower FCR and improves BW. The improvement in growth performance corroborates the advantages of supplementing arginine in broiler nutrition. It can be hypothesized that the performance enhancement found in this study is associated with the increased availability of arginine, betaine, histidine, and creatine in plasma and the liver, as well as to the ability of extra dietary arginine to potentially ameliorate intestinal conditions and microbiota of supplemented birds (Brugaletta et al.2023).

On the other hand, D'Amato and Humphrey (2010) and Wu et al. (2011). A 3-week feeding trial also revealed that the addition of L-Arg had no appreciable impact on FI and FC. In addition, Fouad et al. (2013) showed that adding L-Arg to the diet had no significant impact on the growth performance of broiler chicks (BWG, FI, and FCR).

The results of carcass, selected body organs and abdominal fat as percentage of live body weight are presented in Table (4). It was observed that adding Arg to broiler diets had no significant effect on carcass, abdominal fat, liver, heart, empty gizzard. However, abdominal fat was numerically, decreased with increasing dietary Arg level (0.3% and 0.5%). These findings concur with those of Youssef et al. (2016), who discovered that alterations in Arg level had no appreciable impact on the percentage of organ weight of broilers under heat stress. However, Esser et al. (2017) observed that adding Arg to the feed of broiler increased carcass weight and decreased belly fat deposition by inhibiting the activities of fatty acid synthase, malate dehydrogenase, and glucose-6-phosphate dehydrogenase. also, dietary Arg supplementation decreased body fat formation in meat-type ducks (Wu et al., 2011).Therefore, dietary L-Arg supplementation decreases fat storage via regulating de novo lipogenesis, even if theoretically it might also do so by altering the expression of genes involved in lipogenesis and/or increasing the expression of genes involved in lipolysis.

Immune organs relative weight, as shown in Table (5), did not change significantly with dietary Arg levels. These results are consistent with the findings of Dominguez et al. (2015) and Tan et al. (2015a) who found that commercial broilers fed dietary Arg did not have an increase in immune organ weights. However, Jahanian,(2009), and Ruiz-Feria, and Abdukalykova (2009) demonstrated that broilers grown in a typical environment benefit from the addition of arginine to balanced diets (formulated based on NRC, 1994 recommendations). This may be considering the thymus is more susceptible to various Arg concentrations than the bursa of Fabricius, and an Arg effect on immunity may primarily be through a thymic-dependent mechanism of the immune response (Tayade et al., 2006). reported that increasing dietary Arg levels elevated interleukin, according to the outcomes of in vivo tests. Additionally, the rise in the number of circulating peripheral blood mononuclear cells and the production of cytokines was indicative of the ameliorating effects of Arg supplementation on immunosuppression (Tan et al., 2015b). As a consequence, high amounts of Arg supplementation may potentially inhibit broiler chickens' innate immunity while enhancing their antioxidant activity (Hu et al., 2016). Effect of different dietary Arginine levels on lipid profile of broiler chicks are presented in Table (6). It could be observed that during grower and finisher periods, There are a significant**(P≤0.01)** reduction in blood TL, TC, TG and LDL with increasing dietary Arg level. These findings are in line with those of Emadi et al. (2011) and Fouad et al. (2013) who showed that supplementing broiler chicks with L-Arg decreased the blood levels of TC and LDL. Whereas, the present results induce significant **(P≤0.01)** favorable increase in HDL value which agree with Jahanian and Khalifeh (2017). On the other hand, The concentration of HDL was significantly increased by the dietary changes, which is in accordance with Fouad et al. (2013). In chickens, hepatic hydroxyl-3-methylglutaryl-CoA reductase (HMGR) gene expression regulates both the blood cholesterol level and the muscle's TC content (Cui et al., 2012). The potential reason for the decrease in lipid levels during the finisher period compared to the grower period could be attributed to the influence chick's sex. Regarding blood TP, Al and Glob concentrations, Table (7) shows that all Arg dietary treatments were significantly (P≤0.01) higher than control group there was an increase in TP, Al and Glob as Arg supplementation levels increased at two studied periods. A valuable tool in stress research is Alb/Glb ratio, whereas, stress is known to decrease total serum protein, albumin and globulin (El-Damrawy, 2013). According to Eits et al. (2002), broiler males' protein deposition rate increased with higher consumption of amino acids. creatinine concentration was decreased significantly**(P≤0.01)** by adding Arg at 24 and 38 days of age comparing to control group (Table 7). The conversion of creatine to creatinine occurs without the involvement of enzymes and is eliminated through urine without being reabsorbed.

This suggests that the levels of creatinine excretion could be influenced by the levels of muscle creatine or creatine synthesis, and therefore could reflect the levels of their dietary precursors. In line with this results, Hasegawa et al. (2017) found that creatinine excretion increased dose-dependently with increasing dietary arginine intake, indicating the importance of studying the dose-response relationship between creatinine excretion and levels of dietary protein and other amino acids.

Additionally, Chamruspollert et al. (2002a) suggested that muscle creatine levels can serve as a criterion for assessing the requirement of arginine. According to Gonzalez-Esquerra and Leeson (2006), heat-stressed broilers had low levels of creatine production as evidenced by the fact that the levels of creatine and creatinine were lowered in the excreta but did not rise in the muscle when broilers were subjected to heat stress. Nitric oxide (NO) production may use Arg when the birds are exposed to high environmental temperatures (Förstermann et al., (1991). According to Dimmeler and Zeiher (1999), nitric oxide is a key signalling molecule that promotes vasodilation and lowers vascular resistance. Additionally, it is crucial for the transfer of glucose into the muscle during muscular contraction (Roberts et al., 1999). Because of this, broiler chickens housed in high-temperature environments may require more Arg for NO production, and in these circumstances, Arg can be a significant metabolic facilitator (Roberts et al., 1999 and Ruiz-Feria et al., 2001).

The results of the present study suggest that adding L-Arg at level of 0.5% to diet was efficient in increasing BW,BWG, lowering FI and improving FCR in Arbor Acers broiler chicks. Increased serum total protein, Alb , Glob and decreasing serum Creatinine during two studied periods.

CONCLUSION

Generally, it can be concluded that adding arginine to the feed of broiler chicks during hot climate conditions led to improvement in production performance as well as physiological performance, with the best results achieved using 0. 5% arginine level.

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

Ingredient	Starter (1-10 Days)				Grower (11-24 Days)				Finisher (25-38 Days)			
	T1	**T2**	**T3**	**T4**	**T1**	**T2**	**T3**	**T4**	**T1**	**T2**	**T3**	**T4**
Yellow corn, ground	52.00	51.80	51.4	51.16	56.37	56.20	56.0	55.60	61.74	61.64	61.30	60.90
Soybean meal (44%CP)	34.00	34.00	34.00	34.0	27.04	27.04	27.09	27.14	24.64	24.64	24.64	24.64
Corn gluten meal (60%CP)	6.00	6.00	6.00	6.00	8.50	8.50	8.50	8.50	5.5	5.5	5.50	5.50
Di-cal. Phos.	1.84	1.84	1.84	1.84	1.97	1.97	1.97	1.97	1.62	1.62	1.62	1.62
Limestone	1.86	1.86	1.86	1.86	1.29	1.29	1.29	1.29	1.11	1.11	1.11	1.11
Nacl	0.24	0.24	0.24	0.24	0.49	0.49	0.39	0.39	0.33	0.33	0.33	0.33
Soybean oil	3.08	3.18	3.38	3.42	3.16	3.23	3.28	3.43	4.41	4.41	4.55	4.75
Premix*	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
DL-Methionine	0.26	0.26	0.26	0.26	0.33	0.33	0.33	0.33	0.18	0.18	0.18	0.18
L-Lysine	0.32	0.32	0.32	0.32	0.55	0.55	0.55	0.55	0.17	0.17	0.17	0.17
Argenine	-	0.1	0.3	0.5	-	0.1	0.3	0.5	-	0.1	0.3	0.5
Total	100	100	100	100	100	100	100	100	100	100	100	100
Analysis***												
ME, kcal/kg	3000	3002	3005	3000	3101	3101	3100	3100	3202	3200	3200	3202
Crude protein%	23.13	23.12	23.08	23.06	22.21	22.20	22.20	22.20	19.26	19.26	19.23	19.20
Etherex	5.69	5.79	5.97	6.00	5.89	5.95	6.00	6.13	7.24	7.24	7.36	7.55
Crude fiber%	3.79	3.79	3.78	3.77	3.43	3.43	3.43	3.43	3.32	3.32	3.31	3.30
Calcium%	1.20	1.20	1.20	1.20	1.01	1.01	1.01	1.01	0.85	0.85	0.85	0.85
Available P%	0.498	0.497	0.497	0.497	0.51	0.51	0.51	0.51	0.43	0.43	0.43	0.43
Lysine%	1.43	1.43	1.43	1.43	1.44	1.44	1.44	1.44	1.06	1.06	1.06	1.06
Methionine%	0.68	0.68	0.67	0.67	0.75	0.75	0.75	0.75	0.55	0.55	0.55	0.55
Meth. + Cyst. (%)	1.05	1.05	1.05	1.05	1.12	1.12	1.12	1.12	0.87	0.87	0.87	0.87
Arginine	1.68	1.78	1.97	2.17	1.51	1.64	1.84	2.04	1.47	1.57	1.77	1.96
Sodium	0.10	0.10	0.10	0.10	0.20	0.20	0.16	0.16	0.14	0.14	0.14	0.14

*The premix (Vit. & Min.) was added at a rate of 3 kg per ton of diet and supplied the following per kg of diet (as mg or I.U. per kg of diet): Vit. A 12000 I.U., Vit. D3 2000 I.U., Vit. E 40 mg, Vit. K3 4 mg, Vit. B1 3 mg, Vit. B2 6 mg, Vit. B6 4 mg, Vit. B12 0.03 mg, Niacin 30 mg, Biotin 0.08 mg, Pantothenic acid 12 mg, Folic acid 1.5 mg, chloride 700 mg, Mn 80 mg, Cu 10 mg, Se 0.2 mg, I 0.4 mg, Fe 40 mg, Zn 70 mg and Co 0.25mg.**According to Feed Composition Tables for animal & poultry feedstuffs used in Egypt (2001). T1:control, T2, T3and T4 supplemented with L-Arg 0.1%, 0.3%,0.5%

Table (2): Effect of dietary Arginine (Arg) levels on live body weight and body weight gain of Broiler chicks.

Treats / Treatments	Live body weight (g)				Body weight gain (g)			
	1day	**10day**	**24day**	**38day**	**1-10day**	**11-24day**	**25-38day**	**1-38day**
T1	49.32	242.18 ^{d}	831.71 ^{c}	1658.40 ^{c}	192.85^{d}	589.54 ^{c}	826.73 ^{c}	1609.10 ^{c}
T2	49.65	247.95 ^{c}	845.61 ^{c}	1677.00 ^{c}	198.29 ^{c}	597.66 ^{bc}	831.38 ^{c}	1627.30 ^{c}
T3	49.86	252.81 ^{b}	861.34 ^{b}	1735.50 ^{b}	203.00 ^{b}	608.54 ^{ab}	874.14^{b}	1685.60 ^{b}
T4	49.38	262.32 ^{a}	882.48 ^{a}	1808.80 ^{a}	212.94 ^{a}	620.16 ^{a}	926.34 ^{a}	1759.40 ^{a}
SEM	0.14	1.18	3.38	8.56	1.16	2.77	6.90	8.55
Probability	NS	*	*	*	*	*	*	*

a,b,….. Means within the same column with different superscripts are significantly differ ($P \leq 0.05$).NS: not significant.
T1:control, T2, T3and T4 supplemented with L-Arg 0.1%, 0.3%,0.5%

Table (3): Effect of dietary Arginine levels on Feed intake and Feed conversion ratio of Broiler chicks.

Treats / Treatments	FI (g / bird)				FCR (g feed / g gain)			
	1-10day	**11-24day**	**25-38day**	**1-38day**	**1-10day**	**11-24day**	**25-38day**	**1-38day**
T1	282.91 ^{a}	930.68 ^{a}	1590.50 ^{a}	2804.10 ^{a}	1.47 ^{a}	1.58 ^{a}	1.92 ^{a}	1.75 ^{a}
T2	283.36 ^{a}	915.95 ^{a}	1507.60 ^{b}	2706.90 ^{b}	1.43 ^{a}	1.52 ^{a}	1.82 ^{b}	1.67 ^{b}
T3	261.50 ^{b}	805.61 ^{b}	1511.00 ^{b}	2578.10 ^{c}	1.28 ^{c}	1.32 ^{b}	1.73 ^{c}	1.53 ^{c}
T4	282.95 ^{a}	907.50 ^{a}	1484.10 ^{c}	2674.60 ^{b}	1.33 ^{b}	1.49 ^{a}	1.61 ^{d}	1.52 ^{c}
SEM	1.59	9.24	5.13	12.13	0.01	0.02	0.02	0.02
Probability	*	*	*	*	*	*	*	*

A,b,… Means within the same column with different superscripts are significantly differ ($P \leq 0.05$).
T1:control, T2, T3and T4 supplemented with L-Arg 0.1%, 0.3%,0.5%, FI: Feed intake, FCR: Feed conversion ratio.

Table (4): Effect of dietary Arginine levels on relative weight of carcass and some internal organs of broiler chicks.

Trait / Treatment	Carcass%	Abdominal Fat%	Liver%	Heart%	Gizzard%
T1	0.68	0.98	2.77	0.57	2.35
T2	0.65	1.05	2.93	0.60	2.70
T3	0.67	0.86	2.85	0.55	2.38
T4	0.67	0.81	2.80	0.53	2.29
SEM	0.01	0.07	0.07	0.01	0.08
Probability	NS	NS	NS	NS	NS

A,b,..Means within the same column with different superscripts are significantly differ ($P \leq 0.05$). NS: not significant. T1:control, T2, T3and T4 supplemented with L-Arg 0.1%, 0.3%,0.5%

Table (5): Effect of dietary Arginine levels on some lymphoid organs relative weights

Trait **Treatment**	**Spleen%**	**Bursa%**	**Thymus%**
T1	0.24	0.08	0.16
T2	0.18	0.11	0.32
T3	0.20	0.08	0.32
T4	0.22	0.13	0.34
SEM	0.02	0.01	0.03
Probability	NS	NS	NS

a,b,.. Means within the same column with different superscripts are significantly differ ($P \leq 0.05$) NS: not significant.
T1:control, T2, T3and T4 supplemented with L-Arg 0.1%, 0.3%,0.5%.

Table (6): Effect of dietary Arginine levels on blood lipid profile of broiler chicks.

Trait **Treatment**	**TL**	**TC**	**TG**	**HDL**	**LDL**
During grower period					
T1	731.31^{a}	228.10^{a}	129.95^{a}	51.91^{b}	56.54^{a}
T2	703.03^{b}	212.38^{b}	119.32^{b}	62.27^{a}	46.91^{a}
T3	673.74^{c}	198.33^{c}	109.19^{c}	63.94^{a}	41.87^{ab}
T4	646.46^{d}	194.52^{c}	99.24^{d}	64.64^{a}	29.00^{b}
SEM	10.04	4.34	3.56	1.94	3.54
Probability	**	*	**	**	**
During finisher period At 38 days of age					
T1	606.06^{a}	178.33^{a}	94.18^{a}	50.00^{b}	60.00^{ab}
T2	572.73^{b}	169.05^{b}	92.83^{ab}	57.60^{ab}	62.91^{a}
T3	525.25^{c}	162.14^{ab}	85.23^{bc}	75.09^{a}	53.01^{b}
T4	497.98^{d}	155.48^{b}	83.54^{c}	74.49^{a}	60.66^{ab}
SEM	12.99	2.73	1.78	3.95	1.50
Probability	**	**	**	**	**

a–d Means within the same column within each age with different superscripts are significantly differ ($P \leq 0.01$).
T1:control without any addition, T2, T3and T4 supplemented with L-Arg 0.1%, 0.3%,0.5%
TL: Total lipids ; TC :Total Cholesterol , TG: Triglycerides:, HDL: high-density lipoproteins; LDL: low-density lipoproteins.

Table (7): Effect of dietary Arginine levels on blood biochemical parameters of broiler chicks.

Trait Treatment	TP	Alb	Glb	Alb/Glb ratio	Creat
During grower period					
T1	4.93^{d}	2.54^{c}	2.40^{c}	1.06	1.23^{a}
T2	5.28^{c}	2.78^{b}	2.50^{b}	1.11	1.21^{ab}
T3	5.59^{b}	2.91^{ab}	2.65^{ab}	1.11	1.14^{ab}
T4	5.90^{a}	3.07^{a}	2.83^{a}	1.08	1.05^{b}
SEM	0.11	0.06	0.06	0.03	0.03
Probability	**	**	**	NS	**
During finisher period					
T1	6.14^{c}	3.17^{c}	2.97^{b}	1.07	1.03^{a}
T2	6.37^{b}	3.30^{b}	3.07^{ab}	1.07	0.95^{a}
T3	6.57^{a}	3.35^{ab}	3.22^{a}	1.04	0.83^{b}
T4	6.60^{a}	3.42^{a}	3.18^{a}	1.07	0.78^{b}
SEM	0.06	0.03	0.03	0.01	0.03
Probability	**	**	**	NS	**

a–b Means within the same column within each age with different superscripts are significantly differ ($P \leq 0.01$) NS: not significant.
T1:control without any addition, T2, T3and T4 supplemented with L-Arg 0.1%, 0.3%,0.5%
TP: total protein, Alb: Albumen, Glb: Globulin and Creat: Creatinine.

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الملخص العربي

تأثير إضافة مستويات من الأرجينين فى العليقة على الأداء الإنتاجي و الفسيولوجي لدجاج اللحم تحت ظروف الجو الحار

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مركز البحوث الزراعية.-معهد بحوث الإنتاج الحيواني – قسم بحوث تربية دواجن ، قسم بحوث تغذية الدواجن –– الدقي

أجري هذا البحث بهدف دراسة تأثير إضافة مستويات من الأرجينين فى العليقة على الاداء الإنتاجي والفسيولوجي لدجاج اللحم تحت ظروف درجات الحرارة المرتفعة . تم أستُخدمَ عدد ١٢٠ كتكوت أربوايكرز عمر يوم بدون تجنيس وقسمت عشوائيا إلي ٤ مجموعات متساوية ثم قسمت كل مجموعة إلي ثلاث مكررات (يحتوي كل مكرر علي ١٠ كتاكيت) وتم تغذية المجموعات كالاتي:

المجموعة الأولي (كنترول) غذيت علي عليقة أساسية بدون اى اضافة ، المجموعات الثانية و الثالثة و الرابعة غذيت علي عليقة أساسية (الكنترول) مضاف إليها الأرجينين بمستويات 1و % ،٣و% ، ٥و % علي التوالى .

غذيت الكتاكيت علي علائق تغطي إحتياجاتها خلال فترة البادي ١-١٠ يوم و النامي ١١-٢٤ يوم و الناهي ٢٥-٣٨ يوم. وضعت كل الكتاكيت تحت نفس ظروف الرعاية من عمر يوم حتى عمر٣٨ يوم حيث تراوحت درجة الحرارة من ٣٠-٣٥ °م خلال فترة التجربة. تم تسجيل الوزن الحي و معدل الزيادة في النمو و معدل الاستهلاك الغذائي و معدل التحويل الغذائي و بعض قياسات الذبيحة و الدم خلال فترات التجربة.

و فيما يلي أهم النتائج التي تم الحصول عليها:

اضافة الأرجينين بمستويات مختلفة لعلائق كتاكيت التسمين ادى الى زيادة معنوية في وزن الجسم و معدل الزيادة في النمو بالمقارنة بمجموعة الكنترول و قد تحققت افضل النتائج بإضافة نسبة ٥ و % ارجنين للعليقة خلال المراحل العمرية المختلفة للتجربة.

و المجموعتين المضاف إليهم ٣و % و 5و % أرجينين سجلت معنويا أفضل كفاءه تحويلية للغذاء عن باقي المجموعات ولم توجد فروق معنوية بين مجموعات الأرجينين فى كل من صفات الذبيحة والوزن النسبي للأعضاء المناعية. حدث انخفاض معنوى في كل من الدهون الكلية و الكوليسترول الكلى و الجلسريدات الثلاثية و ال LDL , و الكرياتينين بينما اتفع تركيز كلا من HDL و البروتينات الكلية و الالبيومين و الجلوبيولين فى دم الكتاكيت التى تناولت علائق تحتوى على الارجنين مقارنة بتلك التى تناولت عليقة الكنترول خلال فترات التجربة.

عامة يمكن استنتاج ان اضافة الارجنين لعلائق كتاكيت التسمين ادى الى تحسن الاداء الانتاجى (وزن الجسم و الكفاءة التحويلية و انخفاض فى استهلاك العليقة) و كذلك الاداء الفسيولوجى وقد تحققت افضل النتائج باستخدام مستوى 5و % أرجينين.