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ROLE OF L-CARNITINE IN IMPROVING SOME NUTRITIONAL AND PHYSIOLOGICAL PARAMETERS IN AGED GIMMIZAH COCKS.

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ABSTRACT

This study was conducted to investigate the effects of different dietary levels of L-carnitine on body weight, feed intake, metabolizable energy (ME), semen characteristics and some blood biochemical's of Gimmizah cocks. Forty eight cocks of 60 weeks old were randomly chosen from a large flock with insignificant differences in body weight and divided into 6 groups (8 birds in each) according to L-carnitine supplementation level (0.0, 25, 50, 75, 100, and 125 mg L-carnitine/kg of diet). Birds were housed in individual wire cages during the whole experimental period from 60 to 68 weeks of age.

The results indicated that body weight, body weight change and feed intake were not significantly affected by dietary L-carnitine supplementation. However, the efficiency of ME utilization was improved in response to dietary L-carnitine supplementation compared with the control. Ejaculate volume, testes absolute and relative weights, sperm motility, livability, normality percentage, and sperm concentration, were significantly increased by increasing supplemental L-carnitine level. Also, blood plasma concentrations of total protein, albumin, albumin/ globulin ratio and glucose were significantly ($P \leq 0.05$) increased by feeding the L-carnitine-supplemented diets; however, globulin was not affected. Cholesterol and total lipids concentrations were significantly ($P \leq 0.05$) decreased by dietary L-carnitine supplementation.

It could be concluded that the addition of L-carnitine in cock diets proved to be effective in improving the utilization of dietary ME and semen characteristics of aged Gimmizah cocks..

Keywords: cocks, L-carnitine, semen characteristics, metabolizable energy.

INTRODUCTION

Carnitine has antioxidant properties that protect sperm membranes against toxic reactive oxygen species and reduce the availability of lipids for peroxidation by transporting fatty acids into the mitochondria for β- oxidation to generate adenosine triphoshate energy (Neuman *et al.,* 2002). This transport of fatty acids into the mitochondria for catabolism reduces the amount of lipid available for peroxidation (Kalaiselvi and Panncerselvam 1998). In instances of carnitine insufficiency, movement of long -chain fatty acids into mitochondria and their subsequent oxidation could be impaired. Dietary L-carnitine supplementation could be used to augment carnitine supply for use in metabolism, thereby facilitating fatty acid oxidation and reducing the amount of long-chain fatty acids available for storage in adipose tissues and thus reducing the obesity in chickens. Feeding mature White Leghorn cocks on diet supplemented with L-carnitine (500 mg/kg diet)did not affect feed consumption, body weight, testes weight, semen volume, sperm viability, and percent of dead sperm, while sperm concentration was significantly increased in birds fed the supplemented diet as compared to the

control (Neuman *et al*., 2002). L-carnitine can prevent the obesity when broilers were fed L-carnitine diet for 6 weeks (Lien and Horng, 2001). Similar trends were reported on Gimmizah laying hens by Nofal *et al*.(2006). On contrary, Arslan *et al*.,(2003) observed that oral administration of L-carnitine at a level of 200 mg/ liter of drinking water did not affect concentration of serum cholesterol, total lipids and total protein of ducks.

The objective of the present study was to evaluate the effects of dietary supplementation of L-carnitine on the utilization of metabolizable energy, some physical semen characteristics, some blood parameters and metabolizable energy of aged Gimmizah cocks.

MATERIALS AND METHODS

The present study was carried out at Gimmizah Research Station, Animal Production Research Institute, Agricultural Research Center, Ministry of Agriculture. Forty eight, 60-wk-old Gimmizah cocks were randomly chosen from a large flock reared on floor. Birds were placed in approximately similar weight groups and kept in individual wire cages. During the experimental period, feed and water were provided *ad-libitum* and cocks were exposed to 16-hr light daily. L-carnitine was supplemented at levels of 0.0, 25, 50, 75, 100, and 125 mg/kg diet. Ingredients and chemical composition of the basal diets fed to cocks during the experimental period are presented in Table (1). Diets were formulated according to NRC (1994). Birds were divided into 6 groups (eight per group). The experimental period lasted eight weeks (from 60 to 68 weeks of age). Feed intake and body weight changes in cocks during the experimental period were recorded.

Table (1): Ingredients and chemical analysis of the basal diet fed to cocks during the experimental period.

Ingredient	**%**
Yellow corn	65.40
Soya bean meal	22.00
Wheat bran	8.00
Di- ca – P.	1.39
Lime stone	2.44
Salt Nacl	0.30
Vit + Minerals *	0.30
DL- Methionine	0.17
Total	100
Calculated analysis **	
Crude protein (%)	16.68
ME (Kcal)	2778.76
Crude fiber (%)	3.37
Ca (%)	1.8
Total P (%)	0.62
Lysine (%)	0.82
Methionine (%)	0.45

- **Each 2.5kg. of vit & Min . Mixture contain : vit A 12000.000 IU, vit D3 2000.000 IU , vit E 10.000 mg , vit K3 2000 mg , vit B1 1000 mg , vit B2 4000 mg , vit B6 1500 mg , vit B12 10 mg , Niacin 50.000 mg , Pantothenic acid 10.000 mg , Choline chloride 500.000 mg , Cupper 10.000 , Iodine 1.000 mg , Iron 30.000 mg , Manganese 55.000 mg , Zinc 55.000 mg and Selenium 100 mg .**

**** NRC., (1994).**

When the cocks were 64 weeks of age, a digestibility trial was conducted to determine the metabolizable energy of the experimental diets supplemented with different levels of L-carnitine. Total number of 18 Gimmizah cocks were assigned individually into digestion cages (three cocks/treatment) and fed their respective experimental diets as previously described. During the test period, daily feed intake and excreta voided were quantitatively determined for each cock. Concurrently, the control group was fasted for 48 h in which the excreta were quantitatively collected to determine the metabolic fecal and endogenous nitrogen losses. The excreta were dried in an oven at 60^{o} for 24 hr, and then ground and stored for gross energy and nitrogen determination. Apparent and true metabolizable energy (AME and TME) values were calculated according to NRC (1994).

At the end of the experimental period, semen was collected from all cocks in each group by using the massage technique. Several physical characteristics of semen were determined, including ejaculate volume, mass motility, sperm cell concentration and sperm livability. The mass motility of spermatozoa was expressed as the percentage of motile spermatozoa with moderate to rapid progressive movement. Sperm concentration was determined using a hemocytometer after dilution of the semen (1:200) with a weak eosin solution (Brillard and McDanial, 1985). Sperm livability was examined microscopically (500X) in smears stained with nigrosin and eosin. The proportions of live (unstained sperm) and dead (stained sperm) spermatozoa in a sample were assessed on the basis of 200 spermatozoa, for 2 microscopic fields, then average percentage of dead sperm was calculated.

In addition, blood samples were individually withdrawn from the wing veins of 68-wk-old cocks in each group by using a heparinized syringe. The blood samples were centrifuged immediately after collection and the plasma samples were separated and stored at approximately -20˚C till chemical analysis. Quantitive determination of plasma concentrations of total protein, albumin, glucose, cholesterol and total lipids were carried out colorimetrically by using commercial kits. At the end of experimental period all cocks from each treatment were slaughtered and testes were separated and weighed.

Statistical analysis:

The data were analyzed according to one way analysis of variance by using SPSS (1997) computer program. Percentages were transformed to arcsine before being analyzed to approximate normal distribution. Multiple range test was used to determine significant differences among means (Duncan, 1955**)**.

RESULTS AND DISCUSSION

Changes in Body weight of Cocks:

Data in Table 2 indicated that each of final body weight (FBW), body weight changes were not significantly affected by dietary supplementation with L-carnitine of Gimmizah cocks. These findings are in close agreement with those revealed by Barker and Sell (1994), who reported that L-carnitine

did not have any affect on body weight at 45 days of age in Arbor Acres broiler chickens.

Table (2): Means and standard error of live body weight, weight change and feed intake of Gimmizah aged cocks during the experimental period as affected by treatment groups.

Treatments	IBW (kg)	FBW (kg)	Weight change (gm)	Feed intake (gm)
L-carnitine 0.0 mg/ kg	2.28±0.056	2.38±0.056	108.0±66.25	123.75±1.61
25.0 mg / kg	2.29±0.046	2.37±0.060	85.0±10.30	122.50±3.22
50.0 mg / kg	2.26±0.052	2.36±0.083	95.0±73.77	120.63±1.80
75.0 mg / kg	2.28±0.064	2.37±0.053	90.0±29.72	120.94±1.56
100.0 mg / kg	2.27±0.049	2.35±0.046	75.0±75.00	120.63±1.87
125.0 mg / kg	2.27±0.063	2.36±0.063	93.0±69.93	120.63±1.19
Overall mean	2.27±0.020	2.36±0.020	91.0± 26.39	121.51±0.76
Significance	NS	NS	NS	NS

NS= not significant; IBW = Initial body weight in kilogram; FBW = Finial body weight in kilogram.

Also L-carnitine had no significant effect on growth performance of broiler chickens (Buyse *et al.*, 2001; Daskiran and Teeter, 2001; Wang *et al*., 2003). Working with Nicholas Large White Turkeys, Barker and Sell, (1994) found that 21-day old body weight was not affected by adding L-carnitine levels of 0.0, 50, or 100 mg/kg in the starter diet. In contrary, the present results disagreed with those obtained by Schuhmacher *et al.*(1993), Torrele *et al.* (1993) and Ozcelik and Yalcin, (2004), found that growth performance can be improved by dietary supplements with L-carnitine in Ross broiler chickens. Similar results were obtained by Rodehutscord (2002) in Arbor Acres broiler chickens. Also, Baumgartner (2003) showed that supplementation of L-carnitine in diets influenced body weight of breeding hens and layer breeder in various species.

Feed intake:

Data presented in Table 2 showed that feed intake was not significantly affected by supplementation of L-carnitine to the diet of cocks. Such trend agreed with that reported by Rabie *et al.* (1997) on caged Tetra SL laying hens at 65 to 73 weeks of age and Rechter *et al*. (1998) on laying hens, Janssen *et al*. (2000) on pigeons and Neuman *et al*. (2002) on White Leghorn roosters fed diets supplemented with L-carnitine did not affect feed consumption of birds. In the contrary, Celgk *et al.* (2003) found that supplementation of L-carnitine (50 mg/liter water) significantly improved feed intake during the first 3 weeks of the experimental period in $Cobb_{500}$ broiler chicks.

Gross and metabolizable energy values:

Data presented in Table 3 show the metabolizable energy values (AME; AMEn; TME and TMEn) which increased with increasing dietary supplementation of L-carnitine from 0 to 125 mg/kg diet. The highest values of ME were recorded with TME followed by TMEn; AME and AMEn of cocks received the experimental diet supplemented with 125 mg L-carnitine/kg, while the lowest values were recorded with AMEn followed by AME; TMEn and TME of cocks received the control diet. This improvement in energy utilization in response to feeding the L-carnitine-supplemented diets may be

due to some modifications in the metabolism of nutrients, particularly lipid and carbohydrates, probably induced by L-carnitine. In line with the present results this regard, Nofal *et al* (2006) observed an increase in plasma glucose when laying hens were fed diets supplemented with increasing levels of L-carnitine.

Table (3): Apparent and true metabolizable energy values of 68 weeks old of Gimmizah cock fed diet supplemented with L-carnitine level

Item / Treatments	AME	AMEn	TME	TMEn
L-carnitine 0.0 mg/ kg	2676.9	2667.1	2746.3	2730.4
25.0 mg / kg	2696.6	2686.5	2766.0	2749.8
50.0 mg / kg	2701.3	2691.2	2770.7	2754.5
75.0 mg / kg	2714.4	2704.2	2783.8	2767.5
100.0 mg / kg	2743.3	2732.9	2812.3	2796.5
125.0 mg / kg	2762.8	2752.2	2832.2	2815.4

Gross energy (GE) = 3840 Kcal /kg

AME = Apparent metabolizable energy; AMEn = AME – (8.22 x ANR / FI); Where ; ANR = apparent nitrogen retention (gm) calculated as the difference between nitrogen intake and nitrogen output.

TME = True metabolizable energy; TMEn = AMEn + (EEL / FI) – (8.22 x ENL) / FI ; Where ENL = The endogenous nitrogen loss . 8.22 = value of energy in Kcal/ gm nitrogen retained by the bird.

Semen characteristics:

Data in Table (4) indicated that ejaculate volume, percentages of motility and livability of spermatozoa were significantly (P≤ 0.05) affected by dietary supplementation of L-carnitine. Ejaculate volume showed numerical increase by increasing dietary supplementation of L-carnitine, but the highest significant increase was recorded in cocks supplemented with 125 mg L-carnitine/kg diet as compared with control group.

Table (4): Means and standard errors of ejaculate volume and percentages of motile live and dead spermatozoa of aged Gimmizah cocks as affected by L-carnitine supplementation

Treatments	Ejaculate volume (ml)	Motility (%)	Live sperm (%)	Dead sperm (%)
L-carnitine 0.0 mg/ kg	0.463±0.04b	66.25±4.6b	90.63±1.57d	9.38±1.48a
25.0 mg / kg	0.500±0.046	75.63±2.1ab	91.13±0.13cd	8.88±0.13ab
50.0 mg / kg	0.563±0.01ab	73.75±3.1ab	91.75±0.43bcd	8.25±0.43abc
75.0 mg / kg	0.563±0.03ab	74.38±1.6ab	93.75±0.48ab	6.25±0.48cd
100.0 mg / kg	0.581±0.03ab	80.00±2.0a	94.25±078a	5.75±0.78d
125.0 mg / kg	0. 0.600±0.0	82.50±3.2a	93.13±0.55abc	6.88±0.55bcd
Overall mean	0.545±0.017	75.42±1.5	92.44±0.40	7.56±0.40
Significance	*	**	**	**

a-d: Means within the same column with different letters differ significantly (P≤0.05); *:(P≤ 0.05); **:(P≤ 0.01).

Regarding sperm motility percentage, it was observed that Gimmizah cocks fed the diets supplemented with 100 and 125 mg L-carnitine/kg diet exhibited significantly (P≤0.05) higher means of sperm motility, but addition of 25, 50 or 75 mg L-carnitine/kg diet insignificantly improved the sperm motility as compared to the control group. These results disagreed with those

obtained by Neuman *et al.* (2002) who found that feeding high levels of L-carnitine (500 mg/kg diet) did not affect semen volume or mass motility of spermatozoa.

Live and dead percentages of spermatozoa of Gimmizah cocks were significantly affected (P≤ 0.05) by dietary supplementation of L-carnitine (Table 4). Live sperm percentage markedly increased with increasing L-carnitine in diet, with the highest mean of live sperm percentage was recorded for cocks fed the diet supplemented 100 mg/kg of L-carnitine compared with the control. On the other hand, dead sperm percentage decreased significantly (P≤ 0.01) with increasing L-carnitine level in diet, being the lowest (5.75 %) in group supplemented with 100 mg L-carnitine/kg diet as compared to the control. These results are in close agreement with those obtained by Neuman *et al.* (2002). The observed improvement in sperm livability of cocks fed L-carnitine may be attributed to that L-carnitine has antioxidant properties that may preserve sperm membranes in cocks, thereby extending the life span of the sperms.

It was evident from data in Table (5) that cocks fed L-carnitine-supplemented diets significantly (P≤0.05) improved sperm cell concentration as compared to the control. The improvements of total sperm output per ejaculate were calculated to be 9.78, 21.60, 29.93, 29.24 % and 47.53 %, in cock groups fed 25, 50, 75, 100 and 125 mg L-carnitine/kg diet, respectively, as compared to the control group. These results are in agreement with those obtained by Neuman *et al*. (2002), who found that roosters fed carnitine had significantly greater sperm concentrations than the control.

Table (5): Means and standard error of sperm cell concentration, total sperm output and sperm abnormality of aged Gimmizah cocks as affected by L-carnitine supplementation

Treatments	Sperm concentration (x 10^9 /ml)	Total sperm output (x 10^9/ejaculate)	Abnormal sperm (%)	Normal sperm (%)
L-carnitine 0.0 mg/ kg	3.598±0.205 d	1.568±0.195 c	16.50±0.345 a	83.50±0.354 b
25.0 mg / kg	3.950±0.150cd	1.975±0.145 bc	12.88±0.826 b	87.13±0.826 a
50.0 mg / kg	4.375±0.218bc	2.463±0.238 ab	12.25±0.661 b	87.75±0.661 a
75.0 mg / kg	4.675±0.085 b	2.632±0.168 ab	13.00±0.842 b	87.00±0.842 a
100.0 mg / kg	4.650±0.250 b	2.702±0.054 a	13.50±0.345 b	86.50±0.354 a
125.0 mg / kg	5.308±0.108 a	3.185±0.158 a	11.50±1.173 b	88.50±1.173 a
Overall mean	4.426±0.132	2.421±0.103	13.27±0.824	86.73±0.428
Significance	**	**	**	**

a-d: Means within the same column with different letters differ significantly (P≤0.05);: (P≤ 0.01).**

Normal and abnormal sperm percentages of cocks were significantly affected (P≤ 0.01) by supplemental dietary L-carnitine. Normal sperm percentage significantly increased with all levels of L-carnitine, with the highest normal sperm percentage was recorded in the group fed 125 mg L-carnitine/kg diet as compared to the control. However, an opposite trend was noticed with sperm normality percentages (Table 5). L-carnitine may protect sperm cells from peroxidative damage and/or improve fatty acid efficiency during sperm development and maturation.

Testes weight:

Dietary supplementation of L-carnitine significantly (P≤0.05) increased the absolute and relative weights of testes as compared with control (Table 6). Absolute and relative testes weights were increased in response to increasing L-carnitine level, but the increase was significant only with the highest three levels of L-carnitine (*i.e.* 75, 100 and 125 mg/kg) as compared with control (Table 6). These results disagree with those reported by Neuman *et al*. (2002), who found that absolute and relative testes weights were not affected significantly by dietary supplementation of L-carnitine.

Table (6): Means and standard errors of absolute and relative weights of testes of aged Gimmizah cocks as affected by L-carnitine supplementation

Treatments	Testes weight	
	Absolute (g)	Relative to body weight (g/kg)
L-carnitine 0.0 mg/ kg	18.90 ± 0.540 b	7.92 ± 0.023 b
25.0 mg / kg	19.37 ± 0.637 ab	8.16 ± 0.019 ab
50.0 mg / kg	20.25 ± 0.380 ab	8.61 ± 0.040 ab
75.0 mg / kg	20.60 ± 0.334 a	8.78 ± 0.028 a
100.0 mg / kg	20.85 ± 0..564 a	8.79 ± 0.090 a
125.0 mg / kg	20.83 ± 0.437 a	8.82 ± 0.034 a
Overall mean	20.13 ± 0.236	8.51 ± 0.012
Significance	*	*

a and b: Means within the same column with different letters differ significantly (P≤0.05); *: (P≤ 0.05).

Blood parameters:

Plasma total protein was significantly (P≤0.05) increased of cocks fed diets supplemented with 100 and 125 mg/kg of L-carnitine, while other levels of L-carnitine had no significant effect. Such trend is in close agreement with those obtained by Nofal *et al*. (2006) on Gimmizah laying hens, but disagrees with the findings of Uysal *et al*. (1999), who found that 500 ppm dietary L-carnitine significantly (P≤0.05) decreased plasma total protein concentration in Japanese quails, between 6 and 9 weeks of age, as compared to the control group. Yet, Arslan *et al*. (2003) found that oral supplementation of L-carnitine at 200 mg/liter of water for 8 weeks of age did not affect plasma total protein concentration in ducks.

In association with increasing concentration of total proteins, plasma albumin concentrations were significantly (P≤0.05) increased by feeding diets containing supplemental L-carnitine at levels of 100 and 125 mg, while globulin concentration was not affected by increasing level of L-carnitine (Table 7). These results agreed with those obtained by Uysal *et al*. (1999) who showed that feeding 500 ppm L-carnitine/kg in the diet of Japanese quails, from 6 to 9 weeks of age, increased plasma albumin concentration as compared to control. An opposite trend was obtained by Nofal *et al*. (2006) on Gimmizah laying hens. On the other hand, the later authors found that increasing level of L-carnitine in diet of aged Gimmizah laying hens did not affect concentration of globulin in blood plasma.

Table (7): Means and standard errors of concentrations of total protein, albumin, globulin, and albumin/globulin ratio in blood plasma of aged Gimmizah cocks as affected by L-carnitine supplementation

Treatments	Total protein (g/dl)	Albumin (g/dl)	Globulin (g/dl)	Albumin/globulin ratio
L-carnitine 0.0 mg/ kg	4.93±0.088 c	3.76±0.145 b	..16±0.120	3.22±0.409 c
25.0 mg / kg	5.00±0.058 c	3.90±0.116 b	1.10±0.100	3.54±0.389 bc
50.0 mg / kg	5.20±0.116 bc	4.13±0.120 ab	1.06±0.252	3.87±0.869 bc
75.0 mg / kg	5.26±0.318 bc	4.20±0.208 ab	1.06±0.133	3.92±0.434 b
100.0 mg / kg	5.60±0.173 ab	4.46±0.145 a	1.13±0.146	3.94±0.769 b
125.0 mg / kg	6.13±0.186 a	5.10±0.153 a	1.03±0.318	4.93±0.420 a
Overall mean	5.35±0.116	4.26±0.075	1.09±0.106	3.90±0.256
Significance	**	*	NS	*

a-c: Means within the same column with different letters differ significantly (P≤0.05);*: (P≤0.05); **: (P≤ 0.001).

The observed increase in the concentration of plasma albumin coincided with insignificant means of globulin by dietary L-carnitine supplementation of cocks resulted in gradual increase in albumin/globulin ratio, which was more evident for the group of cocks fed the L-carnitine level of 125 mg/kg diet as compared to the control group (Table 7).

It is obvious from Table 8 that there was a significant (P≤0.001) increase in the plasma glucose levels due to increasing levels of L-carnitine. The increase in plasma glucose was about 26.41, 43.89, 41.58, 70.62, and 77.56% for the experimental groups fed 25, 50, 75, 100 and 125 mg L-carnitine/kg diet, respectively, as compared to the control group. These results are in close agreement with those obtained by Nofal *et al.* (2006), who found that dietary supplementation of L-carnitine increased the concentration of blood glucose in aged Gimmizah laying hens..

Table (8): Means and standard errors of concentrations of serum glucose, cholesterol and total lipids of aged Gimmizah cocks as affected by L-carnitine supplementation

Treatments	Glucose (mg/dl)	Cholesterol (mg/dl)	Total lipids (g /dl)
L-carnitine 0.0 mg/ kg	101.0 ± 2.081 d	193.6 ± 5.044 a	17.30 ± 0.436 a
25.0 mg / kg	127.6 ± 2.963 c	172.0 ± 4.726 b	15.43 ± 0.536 b
50.0 mg / kg	145.3 ± 3.180 b	167.3 ± 2.848 b	11.33 ± 0.601 c
75.0 mg / kg	143.0 ± 2.309 b	159.3 ± 2.333 bc	8.33 ± 0.406 d
100.0 mg / kg	172.3 ± 4.333 a	152.0 ± 3.512 c	7.60 ± 0.436 d
125.0 mg / kg	179.3 ± 2.729 a	136.0 ± 7.810 d	7.47 ± 0.865 d
Overall mean	144.7 ± 6.645	163.3 ± 4.516	11.24 ± 0.961
Significance	***	***	***

a-d: Means within the same column with different letters differ significantly (P≤0.05); *: (P≤ 0.001).**

It is of interest to note that concentration of cholesterol and total lipids showed marked reduction by increasing dietary L-carnitine level (Table 8). The significant (P≤0.05) decrease in plasma cholesterol was 11.19, 13.60, 17.73, 21.52 and 29.78 % for groups of cocks fed 25, 50, 75, 100, and 125mg L-carnitine/kg diet, respectively, compared with the control group.

Similar trend was observed with plasma total lipids, it reduced by 10.78, 34.51, 51.85, 56.07 and 56.82 % for groups of cocks fed 25, 50, 75, 100, and 125mg L-carnitine/kg diet, respectively, as compared to control group. The pronounced decrease in plasma cholesterol and total lipids concentration was recorded for groups of cocks fed the levels of 100 and 125 mg L-carnitine/kg diet. These results are in line with the findings of Lien and Horng (2001), who found that plasma concentrations of cholesterol and total lipids in cocks significantly decreased in response to L-carnitine supplementation. Similar trend was observed in aged Gimmizah laying hens (Nofal *et al* 2006). On the other hand, Arslan *et al*. (2003) observed that oral L-carnitine administration (200 mg/liter water) did not affect plasma cholesterol of ducks. The reduction in plasma cholesterol and total lipids due to feeding L-carnitine in the present study may be due to its metabolic role on β-oxidation of long-chain fatty acids in the mitochondria matrix (Bremer, 1983).

It can be concluded that addition of L-carnitine in cock diets proved to be effective in improving the utilization of ME values and semen characteristics of aged Gimmizah cocks.

REFERENCES

Arslan, C., Citil, M and Saatci, M. (2003). Effects of L-carnitine administration on growth performance, carcass traits, blood serum parameters and abdominal fat composition of ducks. Archives of Animal Nutrition, 57: 381–388.

Barker, D.L. and J.L. Sell (1994). Dietary carnitine did not influence performance and carcass composition of broiler chickens and young turkeys fed low or high fat diets. Poultry Sci., 73: 281–287.

Baumgartner, M. (2003). Breeders perform better with L-carnitine. International. Hatchery Practice, 17: 4-15.

Bremer, J. (1983). Carnitine metabolism and functions. Physiological Reviews, 63: 1420–1480.

Brillard, J.P. and McDaniel, J, R. (1985). The reliability and efficiency of various methods for estimating spermatozoa concentration. Poultry Sci., 64:155-158

Buyse, J.; G.P.J. Janssens and E. Decuypere (2001). The effects of dietary L-carnitine supplementation on the performance, organ weight and circulating hormone and metabolic concentrations of broiler chickens reared under a normal or low temperature schedule. Br. Poultry Sci., 42: 230–241.

Celgk, O.O.; T.C. Gnal; N. Canacankatan and L. Kayrin (2003). Effects of L-carnitine and niacin supplied by drinking water on fattening performance, carcass quality and plasma L-carnitine concentration of broiler chicks. Archives, of Animal nutrition. 2: 127 –136.

Daskiran, M. and R. G. Teeter (2001). Effects of dietary L-carnitine supplementation on overall performance and carcass characteristic of seven week old broiler chickens. Animal Sci. Research, Report, Agriculture . Experiment. Station .Oklahoma . State ,University . No .P 986, 5 pp

Duncan D.B. (1955). Multiple Range and Multiple F- Tests . Biometrics, 11 : 1 – 42.

Janssens, G. P. J; J. Buyse; V. Seynaeve; E. Decuypere; R. Wilde de and R. De–Wilde (1998). The reduction of heat production in exercising pigeons after L-carnitine supplementation. Poult. Sci., 77: 578- 584.

Kalaiselvi, T. and C. Panncerselvam (1998). Effect of L-carnitine on the status of lipid peroxidation and antioxidants in aging rats. J. Nutr. Bioch. 9: 575-581.

Lien, T.F. and Y. M. Horng (2001). The effect of supplementary dietary L-carnitine on the growth performance , serum components , carcass traits and enzyme activities in relation to fatty acid – beta –oxidation of broiler chickens . Br. Poult. Sci., (42): 92 – 95.

Neuman, S. L.; T. L. Lint and P. Y. Hester (2002). The effect of dietary Carnitine on semen traits of White Leghorn roosters. Poult. Sci., 81:495 – 503 .

Nofal, M.E.; H. R. Samak; Y. A. Mariey and R. M. Mahamoud (2006). Production performance and serum constituents of aged Gimmizah hens as affected by dietary supplementation with L-carnitine. Egypt Poult. Sci., 26 (4): 1269 – 1283.

NRC (1994). Nutrient Requirements of Poultry. 9th Revised Edition, National Academy Press, Washington, D.C., USA.

Ozcelic, H. and S. Yalcin (2004). The use of L-carnitine and Sodium humate in broiler rations. Ankara- Universitesi- veteriner- Fakultesi- Dergisi. 51: 63 – 69 .

Rabie, M.H.; S. Mihaly and G. Tibor (1997). Effects of dietary L-carnitine on the performance and egg quality of laying hens from 65 –73 weeks of age .Br. J. of Nutrition. 78 : 615 – 623.

Richter, V.G.; C. Schlumbohm; M. Boumgartner and W. L. Ochrimenko (1998). Studies of L-carnitine effects in laying hens. Archiv – fur. Geflugelkunde, 62: 1-6 .

Rodehutscord,M.; R. Timmer and A. Dieckmann (2002). Effect of L-carnitine supplementation on utilization of energy and protein in broiler chicken fed different dietary fat levels. Archives of Animal Nutrition, 56: 431–441.

Schuhmacher, A.; C. Eissner and J. M. Gropp (1993). Carnitine in fish , Piglets and quail . In vitamin , weiterezusanstaffe bei Mensch and Tier (Vitamins and other supplements for Human and Animls). pp. 407–412 (G. Flochowsky and R. Schubert , editors). Jena, Germany, Friedrich, Schiller. University.

SPSS. 10. (1997). SPSS Users Guide Statistics. Version 10. Copyright SPSS Inc., USA.

Torrele, E.; A. Van der Sluiszen and J. Verreth (1993). The effect of dietary L-carnitine on the growth performance in the fingerlings of the African catfish (Clarias garie pinus) in relation to dietary lipid. Br. Journal of Nutrition 69: 289–299.

Uysal, H.; I. Bayram; A. Deniz and A. Altintas (1999). The effect of L-carnitine and vitamin C on some blood parameters in Japanese quails (Coturnix Coturnix Japonica). Veteriner , Fakultsi, Dergisi, Ankara. Universitesi, 46: 77–84.

Wang, Z.R.; M. Q. Xu; H. X. Mao; X. A. Zhan and C. N. Hu (2003). Effects of L-carnitine on growth performance, carcass composition and metabolism of lipids in male broilers. Poultry Sci., 82: 408 –413.

دور الكارنتين في تحسين بعض الصفات الغذائية والفسيولوجية لديوك الجميزة المتقدمة في العمر

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أجريت هذه الدراسة لبحث تأثير إضافة مستويات مختلفة من الكارنتين إلى العليقة على وزن الجسم وإستهلاك الغذاء والطاقة الممثلة للعليقة وخواص السائل المنوي وبعض قياسات الدم لديوك ألجميزة كبيرة العمر. استخدم في هذه الدراسة ٤٨ ديك من سلالة الجميزة عمر ٦٠ أسبوعا وقسمت عشوائيا إلى ٦ مجموعات تجريبية (بكل مجموعة ٨ طيور) طبقا لمستويات إضافة الكارنتين إلى العليقة (صفر، ٢٥، ٥٠، ٧٥، ١٠٠، ١٢٥ ملجم/كجم عليقه). تم تسكين الطيور في بطاريات فردية خلال فترة التجربة (٦٠ إلى ٦٨ أسبوعا من العمر). وكانت أهم النتائج كالتالي:

١ – لم يتأثر معنويا وزن الجسم النهائي ومعدل التغير في وزن الجسم ؛ وإستهلاك الغذاء بإضافة المستويات المختلفة من الكارنتين إلي علائق الديوك.

٢- وجد أن هناك تحسن في الاستفادة من طاقة الغذاء نتيجة إضافة المستويات المختلفة من الكارنتين بالمقارنة بمجموعة الكنترول.

٣ –أدت إضافة مستويات الكارنتين لعلائق الديوك إلى حدوث زيادة معنوية في حجم القذفة والأوزان المطلقة والنسبية للخصيين والحركة الكلية للاسبرمات ونسبة الاسبرمات الحية وتركيز الاسبرمات ونسبة الاسبرمات الطبيعية عند مقارنتها بمجموعة االكنترول .

٤ – أدت إضافة مستويات الكارنتين لعلائق الديوك إلى حدوث زيادة معنوية في تركيز البروتين الكلي والألبيومين ونسبة الألبيومين/الجلوبيولين والجلوكوز في بلازما الدم بينما لم يتأثر تركيز الجلوبيولين معنويا في حين انخفضت تركيز كل من الكولسترول والدهون الكلية في بلازما الدم بزيادة مستوى الكارنتين في علائق الديوك.

نستنتج من التجربة أن إضافة الكارنتين إلى علائق الديوك المتقدمة فى العمر يمكن أن يحسن الاستفادة من طاقة الغذاء بالإضافة إلي تحسين صفات السائل المنوي.