EFFECT OF DIETARY SUPPLEMENTATION WITH L-CARNITINE ON GROWTH PERFORMANCE, CARCASS CHARACTERISTICS AND SOME BIOCHEMICAL PARAMETERS OF JAPANESE QUAILS

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ABSTRACT

This study has been conducted on one day old Japanese quail to determine the Effect of L-carnitine dietary supplementation on growth performance, carcass characteristics (hot carcass weights and yields), visceral organ masses (heart, liver, gizzard, and abdominal fat) and some biochemical parameters (cholesterol, triglyceride, Plasma total protein, albumin, glucose, aspartate aminotransferase (AST), alanine amino transferase (ALT)and uric acid concentrations) in Japanese quails with using four levels of L-carnitine.they were divided into five equalgroups the. first group fed on basal diet(without L-carnitine) act as control, second group fed on basal diet plus50mg L-carnitine /kg diet, third group fed on basal diet plus 100mg L-carnitine /kg diet, fourth group fed on basal diet plus 150mg L-carnitine /kg diet and fifth group. fed on basal diet plus 200mg L-carnitine /kg diet

The obtained results revealed that final live body weight, body weight gain, and feed conversion ratio were improved significantly by using L-carnitine. The statical analysis of the obtained data showed that no significant difference between all groups in dressing percentage. However there were significant increase in breast muscle. with significant decrease in abdominal fat and heart weight in all treated

groups when compared with control one. The present data revealed that serum total cholesterol, triglyceride, cholesterol LDL, glucose and albumin werw reduced significantly while serum total Protein, alanineaminotransferase (ALT) and aspartate aminotransferase (AST) were significantly increased.

Keywords: Japanese quails. Feed additives. Growth. Biochemical parameters L-carntine.

INTRODUCTION

L-carnitine is synthesized in farm animal tissues and it is also a component of their feeds. It is essential in fatty acids oxidation and important in regulating some biochemical processes e.g. urea cycle and gluconeogenesis. Carnitine was discovered in 1905, but its utilization in human and animal nutrition began about two decades ago ***(Kulasek and Krzeminski 2003)*** L-carnitine synthesised almost exclusively in the liver. lysine and methionine serve as primary substrates for its biosynthesis, L-carnitine plays a key role in energy metabolism of cells,. In addition, L-carnitine regulates coenzyme A concentrations L-carnitine promotes the lipid redistribution in organism, mainly in broilers, by increasing intramuscular fat, decreasing subcutaneous and abdominal fat deposits and by lowering plasma cholesterol and triglyceride concentrations. ***Arslan, (2006)*** L-carnitine is essential for the burning of fatty acids and acts as carrier in the transport of activated fatty acids into the mitochondria. In broilers, dietary L-carnitine supplements of about 50 mg/kg feed had beneficial effects on growth and feed conversion and led to an improvement of the meat:fat ratio. ***(Harmeyer. 2002)*** L-carnitine is a potential agent for reducing the incidence of metabolic diseases in broiler chickens. ***Buyse et al., (2001)*** L-carnitine has the potential to

improve the least-cost broiler production, dietary L-carnitine improved survivability and as dietary L-carnitine level increased, broiler survivability rate also increased ***Daskiran*** *and* ***Teeter (2001)*** supplemental L-carnitine or L-carnitinev + ascorbic acid may have positive effects on body weight gain, carcass weight under high temperature conditions. ***Celgk and Ozturkcan (2003)*** L-carnitine might serve as an anti-stress factor in broiler chickens. ***Khaled, et al., (2005)*** Supplementation with L-carnitine in the diet increased breast muscle yield (P<0.05) and decreased abdominal fat content (P<0.05). ***Xu et al., (2003)*** The liver and heart weights of the groups fed with rations containing L-carnitine were lower than that of the control group (P<0.05). ***Ozcelikand Yalcn (2004)*** L-carnitine had a significant effect on serum triglycerides, total cholesterol, free fatty acids, high density lipid, protein and abdominal fat percentage as compared with control. It seems that adding 100 mg/kg of L-carnitine can regulate fat and cholesterol metabolism better ***Du Rong et al., (2005)***. ***Karadenz et al., (2008)*** reported that L-carnitine supplementation positively regulates erythropoiesis and inflammatory and immune cells. Therefore the aim of the present study was to investigate the Effect of L-carnitine dietary supplementation on growth performance, carcass characteristics and some biochemical parameters of Japanese quail.

MATRIALS AND METHODS

2.1. Experimental Birds:

A total of one day old one hundred fifty healthy Japanese quail were used in this experiment. They were obtained from the General Egypt Poultry Organization. They were divided into 5 equal groups. each

group subdivided into 3 replicates. Each replicate was housed in a separate compartment. Each compartment was bedded by fresh clean wood shave forming a deep litter of 4 cm depth and changed every week. Each compartment was provided with continuous lightening program, suitable feeder and water supply. Prophylactic antibiotics program measures against the most common infectious bacterial and viral diseases were carried out.

2.2. Experimental feeding program:

The present feeding trial was lasted 6 weeks .the diets were formulated according to ***N.R.C. (1994)*** for Japanese quail (table 1) and the applied experimental feeding design according L-carnitine level (table 2).

Table (1): basal diet formulation throughout the experimental period.

Physical composition	%	Chemical composition	%
Yellow corn	57	ME Kcal/kg*	2953
Soy bean meal44%	29	Crude protein	24.29
Corn glutine 62%	10	Calcium	.8
Wheat bran	,51	Available phosphorus	.3
Dicalcium phosphate	.9	Lysine	1.3
Lime stone	1.3	Methionine+ cystine	.83
Lysine	.26	Cholin chloride	2000 mg/kg
Common salt	.4		
Cholin chloride	.33		
permix**	.3		

** The used premix (*Multivita Co.*) composed of vitamin A 12000000 IU, vitamin D_3 2200000 IU, vitamin E 10000 mg, vitamin K_3 2000 mg, vitamin B_1 1000 mg, vitamin B_2 5000 mg, vitamin B_6 1500 mg, vitamin B_{12} 10 mg, Niacin 30000 mg, Biotin 50 mg, Folic acid 1000 mg, Pantothenic acid 10000 mg, Iron 30000 mg, Manganese 60000 mg, Copper 4000 mg, Zinc 50000 mg, Iodine 1000 mg, Cobalt 100 mg, Selenium 100 mg, calcium carbonate ($CaCO_3$) carrier to 3000g.

Table (2): The applied experimental design during the experimental period

Group	Diet
1	Basal diet
2	Basal diet plus plus50mg L-carnitine /kg diet
3	Basal diet plus plus100mg L-carnitine /kg diet
4	Basal diet plus plus150mg L-carnitine /kg diet
5	Basal diet plus plus200mg L-carnitine /kg diet

2.3 Experimental Parameters:

2.3.1 Growth performance measurements:

Body weight ***(Vohra and Roudybush, 1971)***. Feed conversion ratio ***(Lambert et al., 1936)*** and body weight gain was calculated by the difference between two successive weeks or periods weights.

2.3.2. Dressing percentage, Total edible carcass %:

At the end of growing period (6 weeks), 10 birds were taken randomly from each group, weighed and slaughtered to complete bleeding and weighed to determine Abdominal fat, breast muscle, leg muscle, organs weight and their relative weights to body weight. and also to determine biochemical parameters.

2.3.3. Serum cholesterol *(Schettler et al., 1975)*:

Serum triglycerides ***(Fossatip, 1982)***. Serum HDL (high density lipoprotein) and serum LDL (Low density lipoprotein), ***(Young, 1995)***.

2.3.4 Serum total protein Doumas et al. (1981):

Serum albumin ***Reinhold (1953)***. glucose ***Trinder (1969),*** uric acid ***(Fossatti and prencipe, 1980),*** alanine aminotransferase and aspartate aminotransferase ***Reitman and Frankel (1957)***.

2.4 Statistical analysis:

The obtained numerical data were statistically analyzed using ***S.P.S.S., (1997)*** for one-way analysis of variance. When F- test was significant, least significant difference was calculated according to ***Duncan (1955).***

RESULTS AND DISCUSSION

3.1. Growth Performance:

Table (3): The Influence of L-carnitine level supplementation on growth performance during experimental period (42days):

Growth measurements	Group				
	1	2	3	4	5
Cumulative initial body weight	6.98±0.08	6.97±0.08	6.88±0.08	6.93±0.07	6.96±0.07
Cumulative final body weight	213.53±3.81[a]	216.92±3.23[a]	[a]213.23±3.24	[a,b]323.61±3.41	[b]230.76±2.85
Cumulative total body gain	206.55±3.82[a]	[a]209.94±3.19	[a]206.34±3.18	[a,b]216.68±3.36	[b]223.8±2.83
Feed conversion ratio	[a]3.12±0.06	[a,b]3.09±0.04	[a]3.14±0.04	[b]2.97±0.04	[c]2.81±0.03

Values are expressed as mean ± standard errors. Means in the same row had different letters significantly differ at ($p<0.05$).

Number=30

The analysis of variance of obtained data showed in table (3) indicated positive effect with dietary supplementation of L-carnitine on growth performance represented by the final live body weight, body weight gain and Feed conversion ratio. This improvement were increased significantly in groups fed on diets supplemented with L-carnitine 200mg and 150mg /kg diet compared to control .

The previous result agree with those obtained by ***Khoshkhoo et al., (2006)*** who reported that L-carnitine could improve significantly body weigh gain only in 35-49 days ($P<0.05$).This results were supported by those obtained by ***Hossininezhad et al., (2011)*** who found that feed Conversion ratio decreased in total period significantly ($P<0.05$). it is useful to increase amounts of L-carnitine supplement in broiler feed up to 200 mg/kg. Also our results are similar to those obtained by ***Abou-Zeid et al., (2007)*****:** who study the effects of using different levels of L-carnitine(0, 100, 200 and 300 mg/kg diet) on broiler**.**and found that birds fed 200 mg L-carnitine/kg diet possessed the best body weight, liveweight gain and feed conversion.They recommended that the level of 200 mg L-carnitine/kg diet could be added to broiler diets to improve growth performance and economic efficiency.

3.2. Carcass Characteristics:

Table (4): Influence of L-carnitine level supplementation on Carcass traits percentage at the end of experimental period (42days):

Items	Group				
	1	2	3	4	5
Dressing %	66.7±0.71	66.37±1.9	66.9±1.18	66.12±0.8	68.1±0.5
Head %	5.18±0.11 [a]	5.02±0.12 [a,b]	5.04±0.04 [a,b]	4.78±0.04 [b]	5.0±0.08 [a,b]
Liver %	1.94±0.2	1.74±0.16	1.73±0.12	1.75±0.22	1.79±0.17
Heart %	0.97±0.02 [a]	0.93±0.01 [a,b]	0.90±0.01 [b]	0.93±0.03 [a,b]	0.91±0.01 [a,b]
Gizzard %	1.86±0.07	1.84±0.05	1.83±0.06	1.84±0.05	1.83±0.04
Breast Muscle %	17.41±0.3 [a]	17.38±0.24 [a]	17.63±0.17 [a,b]	18.27±0.21 [b]	18.05±0.24 [a,b]
Leg Muscle %	11.9±0.45	11.91±0.59	12.06±0.68	12.02±0.64	12.85±0.60
Abdominal Fat %	1.0±0.1 [a]	0.83±0.07 [a,b]	0.77±0.10 [a,b]	0.81±0.09 [a,b]	0.67±0.06 [b]

Values are expressed as mean ± standard errors. Means in the same row had different letters significantly differ at ($p<0.05$).

Number=10

The statical analysis of the obtained data presented in table (4) showed that no significant difference between all groups in dressing percentage However there were significant increase in breast muscl in group given L-carnitine 150mg /kg diet e. while there were significant decrease in abdominal fat in group fed on 200mg /kg diet L-carnitine. and heart weights of the group fed with rations containing L-carnitine 100mg /kg diet compared with that of control group**.**

The previous findings are in agreement with those obtained by ***Xu et al., (2003)*** who found that Supplementation with L-carnitine in the diet increased breast muscle yield ($P<0.05$).

These results were similar also to that recorded by ***Lien and Horng (2001) Kheiri et al., (2011)*** who found that A significant ($p<0.05$) reduction was observed in abdominal fat due to supplemental L-carnitine. The previous findings agree also with those obtained ***Ozcelik*** and ***Yalcn (2004)*** who reported that heart weights of the groups fed with rations containing L-carnitine were lower than that of the control group ($P<0.05$).

3.3. Biochemicl parameteres:

Table (5): Influence of L-carnitine level supplementation on biochemicl parameteres at the end of experimental period. (42days):

items	Group				
	1	2	3	4	5
Cholesterol (mg/dl)	144.6 ^{a,b}± 0.81	147.2 ^{b} ±2.65	163.2 ^{b} ±3.89	121.2 ^{a} ±14.26	88.6 ^{c} ±6.56
HDL (mg/dl)	47.56 ^{a}±4.39	60.82^{b}±2.39	65.7 ^{b}±1.29	41.56 ^{c}±2.17	32.6 ^{d}±2.02
LDL (mg/dl)	39.78 ^{a}±1.9	58.46 ^{b} ±3.8	68.14 ^{c}±1.03	28.04 ^{d}±2.97	13.54 ^{f}±0.74
TRIGLYCIDE (mg/dl)	167.4 ^{a} ±21.36	165.2 ^{a} ±12.7	191.6 ^{a} ±1.46	109 ^{b} ±3.36	85.6 ^{b} ±2.2
Glucose (mg/dl)	262.4 ^{a}±3.44	236.8 ^{b,c}±8.45	248.6 ^{a,b}±3.31	230 ^{c}±7.19	267.2 ^{a}±6.46
ALT (U/l)	4.6^{a}±0.73	6.8 ^{b}±0.73	11.2 ^{c}±0.8	9.4 ^{c}±0.74	10.4 ^{c}±0.74
AST (U/l)	40.4 ^{a}±2.06	39.8 ^{a}±2.57	53.6 ^{b}±2.08	55.4 ^{b}±2.29	37.2 ^{a}±0.96
Uric acid (g/dl)	6.0±1.51 ^{a}	9.93±2.15 ^{a}	7.19±1.35 ^{a}	6.21±1.58 ^{a}	6.63±0.90 ^{a}
Total Protein (g/dl)	3.08 ^{a} ±0.13	3.16 ^{a} ±0.16	3.48 ^{a,b} ±0.28	3.9 ^{b,c} ±0.10	4.23 ^{c} ±0.18
Albumin (g/dl)	0.8 ^{a,b}±0.12	0.76 ^{b}±0.11	1.22 ^{b}±0.21	1.33 ^{a}±0.27	0.72 ^{c}±0.07

Values are expressed as mean ± standard errors. Means in the same row had different letters significantly differ at ($p<0.05$).

Number=10

The present data showed in table(5) revealed that serum total cholesterol, triglyceride, cholesterol, HDL, LDL, and albumin were reduced while serum total Protein, alanineaminotransferase (ALT) and aspartate aminotransferase (AST) were increased , these result difference were significant in group given 200 mg/kg of L-carnitine and in group given 150 mg/kg of L-carnitine in case of aspartate aminotransferase.

Our results are in agreement to those obtained by ***Rezaei et al., (2007)*** and ***Zhang Yong et al (2010)*****:** who reported that Total cholesterol, triglyceride, decreased (linear effect ($p<0.05$)and confirmed by those obtained ***Hossininezhad, et al., (2011)*****:** who found that Blood factors showed significant difference ($P<0.05$). A decrease was significant in treatment including 200 mg/kg of L-carnitine supplement and reduction of cholesterol, triglycerides, HDL and LDL.

Our results are in agreement to those obtained by ***Du Rong et al., (2005)***: who fed 4 groups on diets supplemented with L-carnitine at 0 (control), 30, 50 and 100 mg/kg. Results showed that L-carnitine had a significant effect on protein

Our results are in agreement with those obtained by ***Kheiri et al., (2011)*****:** who reported that L-Carnitine significantly ($p<0.05$) reduced triglyceride, and albumin in broiler chicks.

In contrast to our result ***Parsaeimehr et al., (2012)*****:** reported that L-carnitine in diet had no significant effect ,glucose and HDL. Our results also disagree also with those obtained by ***Erol and Yalcn (2009)*****:** who found that activities of alanine aminotransferase, aspartate aminotransferase, of blood serum were not affected by different levels of carnitine (0, 50, 100 and 150 mg/kg) supplementation to diets.

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تأثير إضافة ال-كارنتين فى العليقة على كفاءة النمو ومواصفات الذبيحة وبعض المقاييس البيوكيميائية فى السمان اليابانى .

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أجريت هذه التجربة لدراسة تأثير إضافة ال–كارنتين في العليقة على معدلات النمو ومعدلات التحول الغذائي. وقياس نسبة التصافي وكذلك نسبة وزن الأعضاء ونسبة دهن البطن بالنسبة لوزن الجسم . وكذلك بعض القياسات البيوكيميائية. وقد أجريت التجربة على 150 من السمان عمر يوم تم تقسيمهم إلى خمس مجموعات حيث غذيت المجموعة الأولى عليقه خالية من ال–كارنتين ثم تم إضافة ال–كارنتين إلى العليقة بنسب (50مجم/كجم عليقه و100مجم/كجم عليقه و150مجم/كجم عليقه و200مجم/كجم عليقه) على الرتيب للأربعة مجاميع الأخرى.

ولقد تم تحصين السمان ضد الأمراض الوبائية وتم وزن الطيور وكمية العلف المستهلكة أسبوعيا لكل مجموعة وذلك لحساب متوسط الوزن ومتوسط الزيادة فى الوزن ومعدلات النمو ومعدلات التحول الغذائي.

وقد أظهرت نتائج البحث زيادة فى متوسط معدل النمو ومتوسط الزيادة فى الوزن ومعيار التحول الغذائي بإضافة ال–كارنتين إلى العليقة وكانت الزيادة معنوية فى المجموعة التى تغذت على عليقة تحتوى و200مجم /كجم عليقه. وأظهرت النتائج أن دهن البطن انخفض معنويا بإضافة ال–كارنتين إلى العليقة بينما زادت نسبة لحم الصدر بإضافة ال–كارنتين إلى العليقة بالمقارنة بالمجموعة الضابطة.

وكذلك انخفضت نسبة الكولسترول الكلى والكولسترول عالي الكثافة والكولسترول منخفض الكثافة والجلسيريدات الثلاثية والجلوكوز والألبيومين بالمصل معنويا بينما زادت نسبة (ALT) و (AST) والبروتين معنويا بإضافته مقارنة بالمجموعة الضابطة.