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EFFECT OF IN-OVO INJECTION WITH L-CARNITINE ON HATCHABILITY AND POSTHATCHING PERFORMANCE OF GROWING DUCKLINGS UNDER SUMMER CONDITIONS IN EGYPT

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ABSTRACT: The aim of this study was to investigate the effects of in-ovo L-carnitine injection on hatchability of Domyati duck eggs and posthatching growth performance of ducklings. A total of 540 eggs were randomly divided into six treatments group. The 1st, 2nd, and 3rd groups were: negative control (C); sham-injected control (P) and solution injected (S) groups, while, the 4th, 5th, and 6th groups were in-ovo injected with 0.1 ml/egg saline solution containing 10, 20 or 30 mg of L-car, respectively. A total number of 180 ducklings hatched from the six experimental treatment groups were weighed and distributed into six experimental groups (30 ducklings each) and reared during growth period (0-12 wks of age) to study the effect of in-ovo experimental treatments on growth performance, carcass traits, blood plasma parameters and breast muscle histology.

The obtained results could be summarized as follows:

1. In-ovo L-car (10 mg) injection had significantly ($p \leq 0.01$) the best value of hatchability (%) followed by control groups.
2. All L-car doses (10, 20, and 30 mg) recorded high significant ($p \leq 0.01$) values for live body weight from hatch up to the end of experimental period, with the low dose (10 mg) being the best.
3. The body weight gain, and feed conversion ratio were significantly increased, while, feed consumption was decreased in ducklings from L-car treated eggs during the overall periods compared to the control groups.
4. Carcass traits for ducklings from all L-car treated eggs were significantly ($p \leq 0.01$) improved while, decreased in abdominal fat (%) as compared to control groups.
5. Plasma HDL was significantly ($p \leq 0.05$) increased and LDL decreased in ducklings from in-ovo L-car injection treatments as compared with the control groups.
6. Plasma triiodothyronine (T3) and Insulin-like growth factot-1 concentration were significantly ($p \leq 0.01$) higher for the in-ovo L-car injected groups than the control groups.
7. Histological observations showed pronounced increases in myofibrils size and number in breast muscle sections of L-car ducklings compare to the control ones; the 10 mg injected group was the best.

It is concluded that in-ovo injection of 10 mg L-car in Domyati duck eggs at day 17 of incubation period had positive effects on hatchability, blood plasma constituents, IGF-1, T3 hormone, growth performance and carcass traits during summer condition in Egypt.

Keywords: L-carnitine- in-ovo injection- Ducks- Hatchability- Carcass- Blood.

INTRODUCTION

Hatchability is an important economic trait of domestic poultry and represents a major component of reproductive fitness (Weis et al., 2011). Different factors play an important role on hatchability during embryogenesis and post- hatch performance such as genetic, incubation condition and egg quality characteristics (Abiola et al., 2008). The influence of L-carnitine (L-car) administration on hatchability and post-hatch performance has generated considerable interest in recent years. L-carnitine (β-OH-γ-N- trimethylamino-butyrate) is a water soluble quaternary amine that naturally occurs in micro-organisms, plants and animals. It can be synthesized from lysine and methionine in animals.The L-car acts as an antioxidant that ultimately results in a decrease in reactive oxygen species (ROS) by removing excessive levels of intracellular acetyl CoA, which induces mitochondrial (ROS) production. Therefore, it may work as an antioxidant to scavenge free radicals (Agarwal et al., 2005). Also, L-car transports long chain fatty acids across mitochondrial membranes for β-oxidation of fatty acids for energy production. In such situations, exogenous supplementation of L-car could prove advantageous (Buyse et al., 2001), and could in turn be used by the chick during hatching. Poultry diets have a high percentage of cereal grains that are poorly in essential amino acids for better performance, and this plant diets contain low amount of L-car (Buyse et al., 2001), therefor, hens fed plant-originated diets, produced eggs contain low concentration of L-car (Chiodi et al., 1994). It was also documented that chicken embryos have a limited capacity to synthesize L-car during incubation due to the low activity of the enzme γ- butyrobetainehydroxlase, which is essential for L-car biosynthesis (Borum, 1983; and Rebouche, 1992).Thus, the injection of L-car in the fertile eggs may decrease embryonic mortality by reducing oxidative stress during the hatch process, thereby increasing hatch rate.

In-ovo feeding of supplemental nutrients may help to overcome the constraint of limited egg nutrients (Foye et al., 2006), and may provide poultry companies with an alternative method to increase hatchability and weight of newly- hatched chick (Ohta et al., 2001). The injection of amino acid mixture into growing embryos in broiler breeder eggs resulted in high body weight at hatch and at 56 d of age compared with chick from control embryos (Ohta et al., 1999). The ratio of esterified short- chain L-car to free L- car is high in the tissues of avian embryo on d 18 of incubation, thus indicating the importance of fatty acid oxidation for energy production in embryos (Rinaudo et al., 1991).

Sato et al. (2006) have suggested that the difference in lipid metabolic rate between meat-type strains and egg-type strains of poultry could influence response toward in-ovo administration of L-car. Salmanzadeh et al. (2012) Studied the effect of in-ovo injection with different levels of L-car (10, 20 and 30 mg per turkey egg) on day 6 of incubation, they reported significant reduction in hatchability of fertilized eggs and significant improvement in BWG, FCR and carcass yield for turkey from L-car treated eggs as compared with control group. Keralapurath et al. (2010) suggested that in-ovo L-car dosages greater than 49.6 μmol /egg (8.0 mg /egg) have the potential significantly increasing incubation length and hatchability of broiler hatching eggs.

Domyati ducks are one of the local breeds in Egypt, being derived from mallard duck, and it is favorable to the Egyptian consumer. However, ducks are genetically predisposed to the fatness. Excessive fat in ducks is unattractive to consumers who are concerned about the negative effects of saturated fatty acids intake on health (Arslan et al., 2003). Recently a tremendous research has been done to enhance the

productive and reproductive performance of poultry by reducing fat and adipose tissue development by different magnitudes. L-car injected or as dietary supplement was used to reduce fat deposition and repartitioning in different avian and mammalian species (Arslan et al., 2003; Abdel-Fattah and Shourrap, 2012; and Abd El-Azeem et al., 2014). Extensive studies have been carried to evaluate the beneficial effects of L–car on performance of different poultry species. However, use of L-car for in-ovo injection in Domyati duck eggs and the subsequent performance and carcass quality of ducklings after hatching are very scarce. Therefore, the objective of the current research was to study the effect of in-ovo injection of L-car on hatchability and post-hatch performance of Domyati ducklings; under Egyptian summer condition.

MATERIALS AND METHODS

This study was carried out at El – Serw Water Fowl Research Station, Animal Production Research Institute, Agriculture Research Center, Ministry of Agriculture, Egypt.

Egg injection protocol and artificial incubation:

A total of 600 eggs with an average weight of 68 g were obtained from a Domyati duck breeder flock at 36 weeks old. All eggs were incubated at 37.5 °C and 65% relative humidity in an automatic incubator. At day 17 of incubation, the eggs were candled, so 540 fertile eggs were randomly divided into six groups each of 90 eggs; in three replicates each of 30 eggs. Eggs were punctured in the large end to make a hole by hard and thin stylus; this area was disinfected by using ethyl alcohol. All the eggs were injected in air cell by using graded insulin syringe (1 ml), then sealed using non-toxic glue. L–carnitine hydrochloride 98% purity was used. The in-ovo injection of the six experimental groups was designed as follows:

1. The first group (C) was negative control.
2. The second group (P) was sham-injected control (Dry punch).
3. The third group (S) was sham-injected control (injected with 0.1 ml saline solution as a solvent).
4. The fourth, fifth and sixth groups were injected with 0.1 ml of saline solution containing 10, 20 and 30 mg L-carnitine, respectively.

Birds, management and diets:

A total number of 180 ducklings hatched from the experimental treatment groups were weighed and distributed into six experimental groups (30 ducklings each). Each experimental group was consisted of three replicates (10 ducklings each). Ducklings were reared under similar environmental and managerial conditions. Ducklings from all six treatment groups were fed on commercial starter (1-42 d) and Finisher (43-84 d) mash diets. The composition and calculated analysis of the experimental diets are shown in Table 1.

Data collection:

1-Hatchability percentage: At hatch, all hatched ducklings were individually weighted and the hatchability percentage of fertile eggs was calculated.

2-Growth performance parameters: Live body weight (LBW) of ducklings were recorded at hatch, 6 weeks and 12 weeks of age. The body weight gain (BWG), feed consumption (FC), and feed conversion ratio (FCR) were calculated through the periods from 0-6, 7-12, 0-12 wks of age.

3-Slaughter test of ducklings: At 12 wks of age, five ducklings from each treatment were randomly taken for slaughter. Ducklings were fasted for 12 hours before slaughter and individually weighed pre and after slaughtering. After scalding, feather picking and evisceration were performed, different body parts, organs and abdominal fat were dissected and weighed. Edible organs included heart; empty gizzard and liver were

weighed. Carcass and organs weights percentage were calculated on the basis of live body weights.

4-Plasma biochemical analysis: During slaughter test, individual blood samples were withdrawn from five birds within each treatment in heparinized test tubes; then centrifuged at 3500 rpm for 15 minutes to get blood plasma. Plasma samples were stored at – 20 °C until analysis to determine total protein (Gornal et al., 1949) and albumin (Doumas et al., 1971) by using commercial kits. However, globulin was obtained by subtraction of plasma albumin from total protein. Triglycerides, (Fassati and Prencipe, 1982), cholesterol (Allain et al., 1974), High density lipoprotein (HDL) –cholesterol (Lopez-Virella, 1977) and Low density lipoprotein (LDL)- cholesterol (Friedewald, 1972), were measured by available commercial kits. The radioimmunoassay (RIA) method was used for the determination of triiodothyronine (T3) and insulin like growth factor-1 (IGF-1), using commercial RIA kits.

5-Histological Technique: Representative sample from muscles were carefully dissected and immediately fixed in adequate volume of 10% formalin-saline solution. After dehydration in ascending grades of ethanol, samples were then cleared in zylene, embedded in paraffin wax, and transverse sections (T.S) of 4.5 microns thick were done by using a rotary microtome. All sections were stained by haematoxylline and eosin stains (H&E), and examined under a trinoculer light microscope (Labomed, Lx400, Labo America, Inc. USA) supplied with a computerized digital camera (ivu 3000).

6- Statistical analysis: Data were subjected to one – way analysis of variance using general linear model (GLM) procedure of SAS program (SAS, 2004) based on the following model:

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

where,

Yij = An observation, μ = Overall mean,

Ti = Effect of treatment (1, 2, ….., 6), and eij = Random error.

All percentage data were subjected to arcsine transformation of the square root before statistically reanalyzed however, the actual percentage means are presented. Significant differences among treatments were tested by Duncan's multiple range test (Duncan, 1955) at a probability level of 0.05 ($p \leq 0.05$).

RESULTS AND DISCUSSION

1- Productive performance traits:

Data in Table 2 showed significant effects of L-car on hatchability (%); hatch weight; post-hatching LBW at different ages. It is clear that in-ovo L-car (10 mg) injection improved significantly hatchability (%) followed by those eggs of control (C), saline (S) and punch (P) treatments, respectively. The lowest values were recorded for eggs injected with L–car levels of 20 and 30 mg. At the same time, the hatchability weight was significantly high for all L–car injected treatments compared with the control and sham injected (punch and saline) treatment groups. The response of develop embryos to L–car administration during embryogenesis differ according to many factors such as the injected dose, species, age and maternal diet composition, and time of injection. In this respect, contradictory results were observed in the literature. Zhai et al. (2008) reported that in-ovo injection of White Leghorn eggs at d 17 or 18 of incubation did not affect hatchability, yolk sac residue weight, hatchability and body weight. Similar results were also reported by Shafey et al. (2010) in broiler chickens; Nouboukpo et al. (2010) in broiler breeder Ross x Ross 308 chickens. Also, Salmanzadeh et al. (2013) found that in-ovo injection of L–car (10 to 30 mg) into Turkey breeder eggs at day 5 of

incubation caused significant reductions in hatchability of fertile eggs.

The positive effect of in-ovo L-car injection on hatchability (%) and hatching body weight were reported by Abdel-Fattah and Shourrap (2012); and Abd El-Azeem et al. (2014) which in close agreement with our results. However, the best results in the literature were achieved by L-car supplementation to diets of different poultry species (Leibetseder, 1995; Thiemel and Jelinek, 2004; Adabi et al., 2006; Al-Daraji and Tahir, 2014; and Oso et al., 2014). They reported that dietary L-car improved all hatchability traits of broiler and turkey breeder chickens. It is of interest to note that LBW of ducklings was significantly improved in response to in-ovo L-car injection from hatch to 12 weeks of age compared with the other treatments (Table 2). The best LBW was recorded for ducklings from the low L-car dose (10 mg) injected eggs. This may be a consequence of the high hatching weight of this group compared with the other groups. Moreover, the increased LBW at different ages is due mainly to the increased myogenesis during incubation as a result of L-car injection. It was demonstrated by many workers that L-car can induce satellite cells proliferation and maturation during embryogenesis and this effect was mediated by IGF-1 synthesis and thyroid hormones release. This assumption was proved by the research by Abdel-Fattah and shourrap (2012 and 2012); and Abd El- Azeem et al. (2014).

Data of BWG, FC and FCR of Domyati ducklings are presented in Table 3. It is observed that BWG, FC, and FCR of ducklings were significantly improved for the periods of 0-6, 7-12 and 0-12 weeks of age as a positive response to in-ovo injection with L-car. Since, ducklings hatched from eggs that had been injected with 10 mg, 20 mg and 30 mg gained more weight compared with those from the control punch and saline injected eggs, respectively. However, during the period 7-12 weeks of age, the best BWG was recorded for the 10 mg L-car injected group. This period was reported by several researches as the finishing stage where in birds tended to deposit more fat and to enhance feather covering which may explain the beneficial role of L-car in this concern. It is of great importance to observe that, the enhanced LBW and BWG of ducklings hatched from in-ovo L-car injection did not associated with increased feed consumption (Table 3) but was accompanied with better feed conversion ratio which may reflect the beneficial effect of in-ovo L-car injection during embryogenesis at day 17 of incubation period.

The improvement in FCR in response to in-ovo L-car injection may be explained by the improved BWG and the reduction of feed intake during the whole experiment period. These results are in close agreement with those reported by Salmanzadeh et al. (2012 and 2013) who reported that in-ovo injection with L-car in turkey egg improved LBW, BWG and FCR of birds. More recently, Rabie et al. (2015) studied the effect of in-ovo L-car injection on post hatching performance of broiler breeder chicks. They pointed out that BWG and FCR were positively affected with in-ovo L-car injection.

2- **Carcass traits:**

Table 4 shows the effect of in-ovo L-car injection on carcass traits of ducklings at 12 weeks of age. It is clear that in-ovo injection with the low dose (10 mg) or 20 and 30 mg of L-car resulted in significant increase in empty carcass (%), breast, thigh and total edible parts percentages, and significantly decrease the abdominal fat (%). However, total giblets percentage was not significantly differed between all treatment groups. The significant increase in the empty carcass, breast and total edible parts may be to the beneficial effects of L-car on muscle yield of the whole carcasses. It may be that in-ovo fortification with L-car during embryogenesis could help to overcome the traditional increase in energy demand. Since

L-car has an important role in facilitating the uptake of fatty acyl groups from egg yolk into embryonic tissues, which in turn increases the efficiency of energy utilization by these tissues and then enhanced their growth. These results are in close agreement with those reported by Salmanzadeh et al. (2013) in turkey and Abd El-Azeem et al. (2014) in broilers; they found that in-ovo L-car injection had significant effects on improving carcass yield by increasing lean to fat ratio. This holds true as the abdominal fat percentage was significantly reduced by in-ovo L-car injection (Table 4). However, Keralapurath et al. (2010) have reported that in-ovo injection of turkey eggs had no effect on all slaughter traits of turkey pullets.

3- **Blood parameters of Domyati ducklings:**

Data concerning blood parameters of Domyati ducklings at 12 weeks of age as influenced by in-ovo L-car injection are presented in Table 5. Injection of L-car during embryogenesis had no significant effects on plasma total protein, albumin, globulin, triglycerides and cholesterol, although, both triglycerides and cholesterol levels were numerically decreased. On the other hand, plasma HDL and LDL were significantly decreased in ducklings that hatched from eggs injected with different levels of L-car compared with the control treatments. Moreover, plasma triiodothyronine (T3) and Insulin-like growth factor-1 (IGF-1) concentration in birds from in-ovo L-car treatments were significantly higher than those from all control birds (control, saline, punch). The hypolipidemic effect of L-car associated with the reduction of plasma triglycerides, cholesterol and LDL concentration, may be due in part to the decreasing of lipoprotein lipase activity which catalyze the conversion of triglycerides to glycerol and fatty acids. In addition, L-car was known to increase the hydrolysis of LDL which play an important role in repartitioning of body fats and reduce subcutaneous fat deposition. This may explain the significant reduction of LDL in ducklings that hatched from eggs injected with L-car compared with the control ones.

Our results are in close agreement with those reported by Xu et al. (2003); Arslan (2006); Keralapurath et al. (2010); Abdel-Fattah and Shourrap (2012); Abd El-AZeem et al. (2014); and Rabie et al. (2015) who found that in-ovo injection of L-car during embryogenesis reduce plasma lipid fractions but increased HDL indicating its beneficial effect on birds physiological status. Similarly, the increased plasma concentration of T3 and IGF-1 in the present study in response to in-ovo L-car injection may be related to the role played by L-car as an antioxidant agent that protect living cell membrane damage, hence increased synthesis of T3 and IGF-1. It may be also that L-car has a sparing effect for methionine and lysine to further protein synthesis which in turn increase myogenesis and muscles hypertrophy, a process depends mainly on T3 and IGF-1 secretion. These results are in agreement with those reported by Shafey et al. (2010); Abdel-Fattah and Shourrap (2012 and 2013); and Abd El-Azeem et al. (2014).

4- **Histological observations:**

Figures 1 (a, b and c) show hematoxylin and eosin staining sections of breast muscle from the control (C), punch (P), and in-ovo injection of saline (S); and 3 graded levels of L-car (figures 2; a, b and c). It is clear from sections of the control ducklings that the breast muscle has well defined extra cellular matrix spaces (Perimysium (P) and endomysium (e) connective tissues). The myofibrils was not as large as that of those in-ovo injected with different levels of L-car (Fig. 2; a, b and c). On the other hand, the breast muscle section from in-ovo sham injected ducklings and from saline injected are characterized by reduced perimysial connective tissues septae and endomysium spaces, however, the number and size of myofibrils /bundle were greatly increased compared to the control section. Moreover,

The influence of in-ovo L-car injection on breast muscle structure was obvious and associated with a greater size of the muscle bundles (b) as seen in fig. 2, a and an increase in the number of myocytes (m) per bundle. This was also observed in Fig. 2, b and c although the muscle bundles were poorly defined with greatly reduced perimysial tissue spaces but increased endomysialconnective tissue. surrounding individual muscle fibers. This ultrastructure may be due to the high level of L-car (20 and 30 mg) might has a great effect on myocytes hyperplasia and hypertrophy. This was also observed for the low level of L-car (Fig. 2, a), however, the histological architecture of muscles was well arranged with an obvious reduction in the endomysial connective tissues spaces. This may explain the observed increase in breast muscle weight (%) of this treatment compared with the other two L-car treatments and all control ones (Table 4). Also, in-ovo L-car injection has profound and beneficial effects on muscle growth of Domyati ducklings. This enhancement in muscle growth in response to in-ovo injection of L-car during embryogenesis could be explained by the fact that L-car stimulates IGF-1 biosynsesis, and thyroid hormones influence on growth and metabolism. This in turn affects muscle development, where many recent studies demonstrated that IGF-1 has a major role in satellite cells proliferation and maturation during embryogenesis, where these cells are the precursors of myofibrils (Shafey et al., 2010; Abdel-Fattah and Shourrap, 2012 & 2013; and Abd El-Azeem et al., 2014).

CONCLUSION

It is concluded that in-ovo injection of 10 mg L-car in Domyati duck eggs at day 17 of incubation period could enhance embryonic development and improve posthatching growth performance and meat yield at marketing age.

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

Ingredients %	Starter	Grower
Yellow Corn	61.70	71.00
Soybean meal (44 %)	34.55	17.60
Wheat bran	0.00	7.60
Di-calcium phosphate	1.60	1.60
Limestone	1.45	1.50
Vit. & Min. premix[1]	0.30	0.30
NaCl	0.30	0.35
DL. Methionine	0.10	0.05
Total	100.0	100
Calculated Analysis [2]		
Crude protein %	20.01	15.02
ME (Kcal / kg)	2841	2870
Ether extract %	2.86	3.07
Crude fiber %	3.94	3.63
Calcium (%)	1.04	1.00
Av. phosphorus (%)	0.44	0.42
Lysine %	1.17	0.70
Methionine %	0.45	0.30
Methio + Cyst %	0.78	0.58
Sodium	0.13	0.16

1. Each 3 kg of the Vit and Min. premix manufactured by Agri-Vit Company, Egypt contains: Vitamin A, 10 MIU; Vit. D, 2 MIU; Vit E, 10 g; Vit. K, 2 g; Thiamin, 1 g; Riboflavin, 5 g; Pyridoxine, 1.5 g; Niacin, 30 g; Vit. B12, 10 mg; Pantothenic acid, 10 g; Folic acid, 1.5 g; Biotin, 50 mg; Choline chloride, 250 g; Manganese, 60 g; Zinc, 50 g; Iron, 30 g; Copper, 10 g; Iodine, 1 g; Selenium, 0. 10 g; Cobalt, 0.10 g; and carrier CaCO3 to 3000 g.
2. According to Feed Composition Tables for animal and poultry feedstuffs used in Egypt (2001).

Table (2): Effect of in-ovo injection by L-carnitine on hatchability and duckling live body weight from hatch to 12 weeks of age

Treatments	Hatchability (%)	Live body weight(g) at		
		Hatch	6 wks	12 wks
Control	76.6^{b}	41.0^{b}	1060.0^{b}	1816.7^{b}
Punch	74.3^{b}	41.0^{b}	1045.0^{b}	1813.3^{b}
Saline	75.1^{b}	41.0^{b}	1068.3^{b}	1852.3^{b}
L- car10mg	78.5^{a}	43.7^{a}	1170.0^{a}	2168.3^{a}
L- car20mg	68.9^{c}	43.0^{a}	1152.7^{a}	2076.7^{a}
L –car30mg	66.4^{d}	42.7^{a}	1156.7^{a}	2083.3^{a}
Pooled SEM	0.39	0.51	10.7	41.7
Significance	0.01	0.01	0.01	0.01

a, b, c, d means within columns with different superscripts are significantly different ($p \leq 0.05$).
Pooled SEM= Pooled standard error mean.

Table (3): Effect of in-ovo injection by L -carnitine on body weight gain, feed consumption and feed conversion ratio of Domyati ducklings in different growing periods

Treatment	Body weight gain			Feed consumption			Feed conversion ratio		
	0-6wk	7-12wk	0-12wk	0-6wk	7-12wk	0-12wk	0-6wk	7-12wk	0-12wk
Control	1019.0 ^{b}	756.7^{b}	1775.7^{b}	4044.7^{a}	3795.3^{a}	7840.0^{a}	3.97a	5.03^{a}	4.43^{a}
Punch	1004.0^{b}	801.7^{b}	1805.7^{b}	4048.3^{a}	3794.0^{a}	7841.0^{a}	4.03^{a}	4.73^{a}	4.33^{a}
Saline	1027.3^{b}	785.0^{b}	1812.3^{b}	4049.7^{a}	3789.7^{a}	7839.0^{a}	3.93^{a}	4.83^{a}	4.30^{a}
L-Car10mg	1126.3^{a}	998.3^{a}	2124.7^{a}	3950.0^{b}	3666.7^{b}	7616.7^{b}	3.53^{b}	3.73^{b}	3.63^{b}
L-Car20mg	1109.7^{a}	924.0^{a}	2033.7^{a}	3961.7^{b}	3673.7^{b}	7635.3^{b}	3.63^{b}	3.97^{b}	3.77^{b}
L-Car30mg	1114.0^{a}	921.7^{a}	2040.7^{a}	3970.0^{b}	3673.3^{b}	7643.3^{b}	3.57^{b}	4.03^{b}	3.77^{b}
Pooled SEM	11.03	50.39	43.1	7.99	4.6	9.4	0.05	0.23	0.09
Significance	0.01	0.05	0.01	0.01	0.01	0.01	0.01	0.01	0.01

a, b, c means within columns with different superscripts are significantly different ($p \leq 0.05$).
Pooled SEM= Pooled standard error mean.

Table (4): Effect of in-ovo injection by L- carnitine on carcass traits of Domyati ducklings at 12 wks of age

Treatments	%					
	Empty carcass	Breast	Thigh	T.giblets	T.edible parts	Abdom- fat
Control	67.16[b]	21.48[b]	19.12[b]	8.24	73.06[b]	0.58[a]
Punch	68.38[b]	21.66[b]	18.60[b]	8.04	73.66[b]	0.58[a]
Saline	68.4[b]	21.86[b]	18.48[b]	7.86	72.82[b]	0.60[a]
L-car10 mg	70.84[a]	24.04[a]	20.72[a]	8.80	77.06[a]	0.36[b]
L-car20 mg	70.74[a]	23.48[a]	20.96[a]	8.24	76.28[a]	0.34[b]
L-car30 mg	70.88[a]	23.70[a]	20.48[a]	8.14	76.84[a]	0.38[b]
Pooled SEM	0.71	0.40	0.31	0.26	0.81	0.04
Significance	0.01	0.01	0.01	NS	0.01	0.01

Pooled SEM= Pooled standard error mean; NS: non-significant; T.giblets= (Gizzerd, liver and heart); T.edible= (Empty carcass + T.giblets).

a, b, c means within columns with different superscripts are significantly different ($p \leq 0.05$).

Table (5): Effect of in-ovo injection of L–carnitine on blood plasma constituents of Domyati ducklings at 12 wks of age

Treatment	Total protein g/dl	Albu. g/dl	Glob. g/dl	Trigly mg/dl	Choles. mg/dl	HDL mg/dl	LDL mg/dl	T_3 nmol/l	IGF-1 ng/ml
Control	4.42	2.42	2.00	78.0	156.4	86.2[b]	54.6[a]	3.19[c]	120.87[b]
Punch	4.36	2.34	2.02	79.4	156.0	86.0[b]	54.0[a]	3.20[c]	121.82[b]
Saline	4.48	2.45	2.03	80.0	158.8	87.4[b]	55.2[a]	3.16[c]	118.86[b]
L –car10mg	4.74	2.42	2.32	77.6	103.4	92.8[a]	44.8[b]	5.36[a]	133.07[a]
L –car20mg	4.44	2.37	2.07	77.0	150.6	90.0[ab]	45.2[b]	4.07[b]	131.14[a]
L –car30mg	4.42	2.45	1.97	76.6	154.8	90.0[ab]	48.4[ab]	4.27[b]	130.24[a]
Pooled SEM	0.11	0.15	0.19	0.17	3.27	1.42	2.67	1.21	1.88
Significance	NS	NS	NS	NS	NS	0.05	0.05	0.01	0.01

SEM= standard error mean; NS: non-significant; HDL & LDL= high and low density lipoprotein; T_3= triiodothryonine.

a, b, c means within columns with different superscripts are significantly different ($p \leq 0.05$).

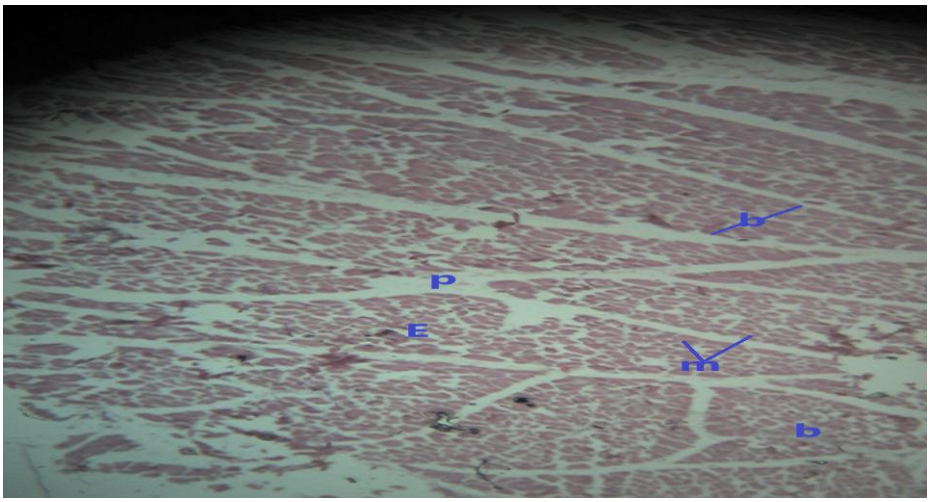

Fig.1, a.

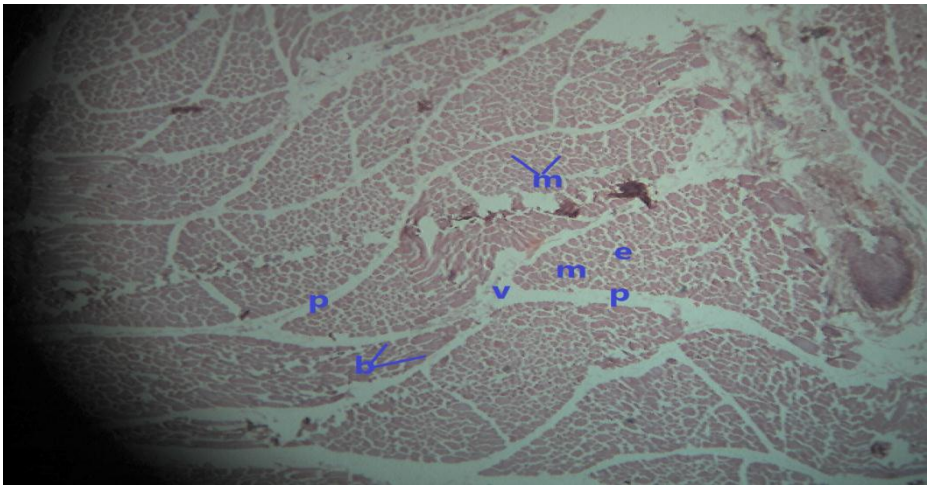

Fig. 1, b.

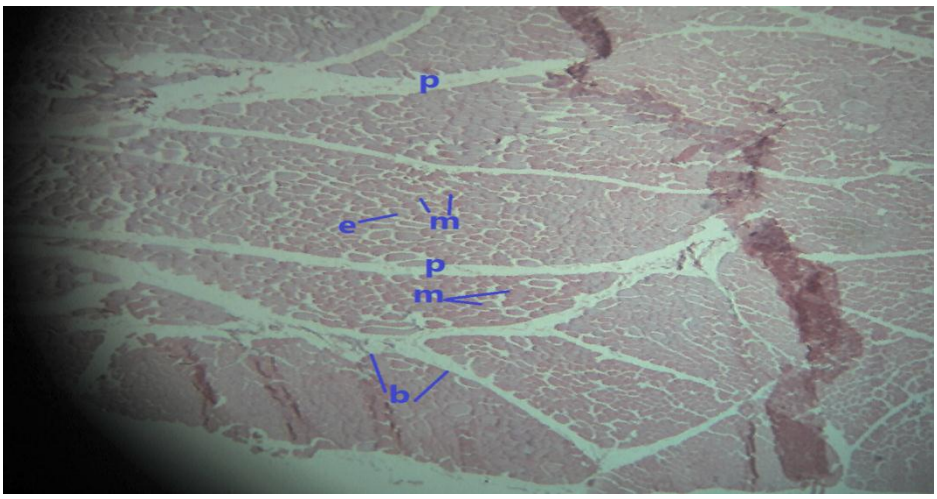

Fig.1, C.

Figure (Fig.), 1, a, b and c transverse sections (T.S) in breast muscle fibers

From the control treatments (C, P and S). H& E X 40.

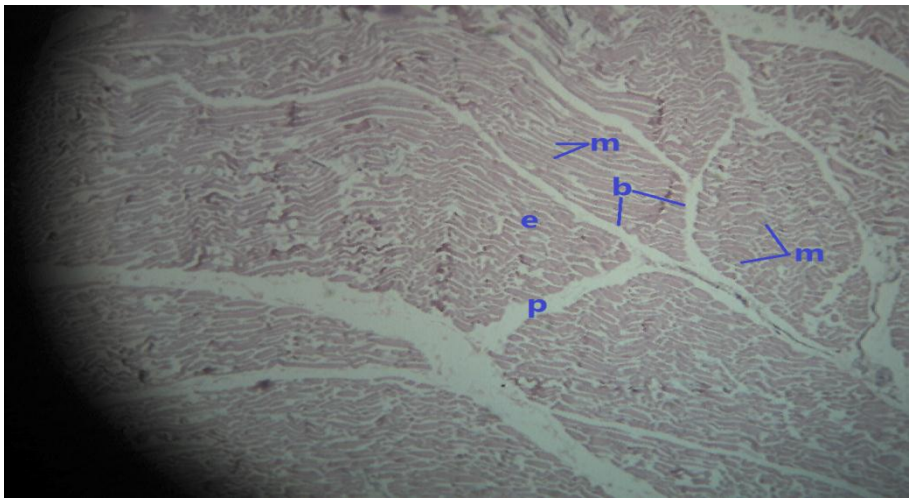

Fig. 2, a.

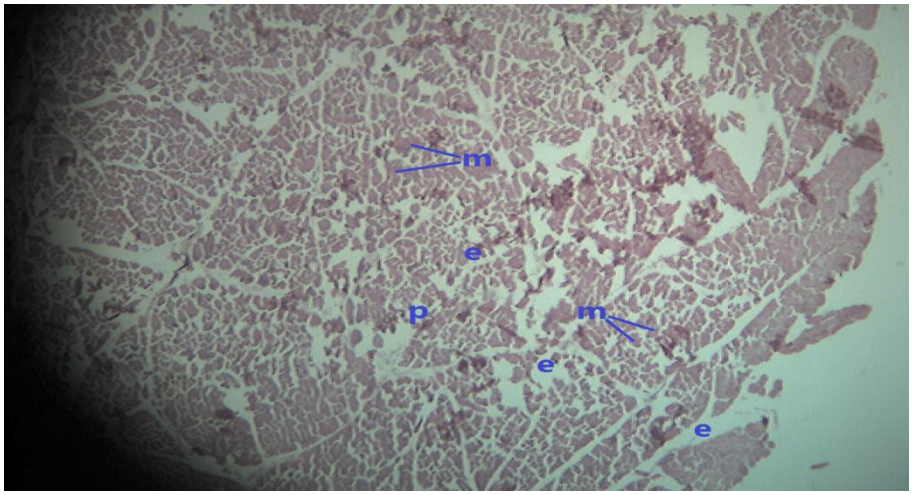

Fig. 2, b.

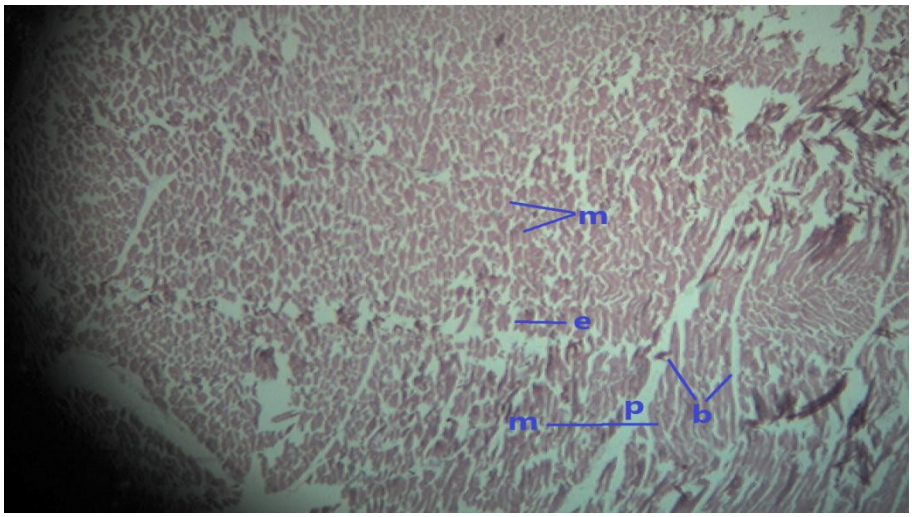

Fig. 2, C.

Figure (Fig), 2. A, b and c transverse sections (T.S) in breast muscle fibers From the L-carnitine treatments (10, 20 and 30 mg). H& E X 40.

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الملخص العربى

تأثير حقن بيض البط الدمياطى بإل- كارنيتين على نسبة الفقس واداء النمو لكتاكيت البط الدمياطى بعد الفقس تحت ظروف الصيف فى مصر

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تهدف هذه الدراسة إلى بحث تأثير حقن بيض البط الدمياطى بإل- كارنيتين على نسبة الفقس واداء النمو وصفات الذبيحة وتقدير بعض مكونات بلازما الدم وهستولوجيا عضلة الصدر للكتاكيت النامية بعدالفقس. حيث استخدم عدد ٥٤٠ بيضة مخصبة للبط الدمياطى المحلى تم تقسيمها إلى ٦ مجموعات تجريبية (٩٠بيضة / مجموعة فى ثلاث مكررات بكل منها ٣٠ بيضة).

تم حقن البيض فى الغرفة الهوائية عند اليوم ١٧ من التفريخ بإل- كارنيتين المذاب فى محلول ملح فسيولوجى (٠،٩% ص كل) و كانت المعاملات التجريبية كالاتى:١- مجموعة الكنترول السلبى بدون حقن ٢- مجموعة الكنترول تم ثقب القشرة فى اتجاه الغرفة الهوائية فقط. ٣- مجموعة الكنترول تم الحقن بمحلول ملح بواقع ٠،١ ملل /بيضة ٤- الحقن بمحلول ملح بواقع ٠،١ ملل محتوى على ١٠ أو٢٠ أو ٣٠ ملجم إل - كارنيتين /بيضة للمجاميع ٤، ٥، ٦ على التوالى.

عند الفقس وتمام جفاف الكتاكيت تم حساب نسبة الفقس لكل معاملة (حسب البيض المخصب) وتم عد ووزن الكتاكيت الناتجة فردياً لكل مجموعة. ثم تم إختيار عدد ١٨٠ كتكوت ممثلة لكل المجموعات التجريبية وتم تقسيمهم فى ستة مجاميع تجريبية (٣٠ كتكوت لكل مجموعة) وتمت تربيتهم تحت نفس ظروف التربية خلال فترة النمو (٠- ١٢ أسبوع من العمر) لبحث تأثير المعاملات السابقة خلال فترة التفريخ على صفات النمو وصفات الذبيحة وبعض صفات الدم وهستولوجى عضلة الصدر لهذه الكتاكيت.

ويمكن تلخيص أهم النتائج المتحصل عليها فيما يلى:

١. تحسنت نسبة الفقس معنوياً بحقن البيض بمستوى ١٠ملجم إل- كارنيتين بالمقارنة بمجاميع الكنترول بينما انخفضت نسبة الفقس معنوياً للمجاميع المحقونة بمستوى ٢٠ و٣٠ ملجم إل- كارنتين.
٢. سجلت مجاميع حقن البيض بإل- كارنيتين قيماً أعلى معنوياً لكل من وزن الجسم الحى والزيادة فى وزن الجسم وكذلك معدل تحويل الغذاء بينما انخفض العلف المستهلك بالمقارنة بمجاميع الكنترول خلال فترة التجربة.
٣. سجلت مجاميع حقن البيض بإل- كارنيتين قيماً أعلى معنوياً بالنسبة للوزن النسبى للذبيحة المجوفة ولحم الصدر والفخذ والأجزاء المأكولة الكلية بينما انخفض الدهن البطنى بالمقارنة بمعاملات الكنترول التجريبية.
٤. زادت قيم الكوليسترول عالى الكثافة معنوياً وانخفضت قيم الكوليسترول منخفض الكثافة للبط الناتج من البيض المحقون بإل- كارنيتين بالمقارنة بمجاميع الكنترول.
٥. زاد معنوياً محتوى بلازما الدم لمجاميع إل- كارنيتين من هرمون الترای ايودوثيرونين وكذلك هرمون النمو شبيه الانسولين بالمقارنة بمجاميع الكنترول.
٦. أوضحت القطاعات الهستولجية زيادة كبيرة فى عدد وحجم اللويفات العضلية فى عضلات الصدر للبط المأخوذ من البيض المحقون بإل- كارنيتين عند مقارنته بالمجموعات الاخرى وكانت أفضل مجموعة هى التى حقنت بمستوى ١٠ مليجرام.

توضح النتائج السابقة إمكانية استخدام إل- كارنيتين بمستوى ١٠ مليجرام / بيضة لحقن بيض البط الدمياطى عند اليوم ١٧ من التفريخ لتحسين نسبة التفريخ واداء النمو بعد الفقس وصفات الذبيحة لكتاكيت البط الدمياطى النامية.