EFFECTS OF L-CARNITINE AND ASCORBIC ACID SUPPLEMENTATION ON PRODUCTIVE, REPRODUCTIVE, PHYSIOLOGICAL AND IMMUNOLOGICAL PERFORMANCE OF GOLDEN MONTAZAH LAYING HENS

By

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Abstract: *One hundred and Eighty hens + Eighteen cocks of 50 weeks old were randomly chosen from a large flock with insignificant differences in body weight and laying rate and were divided into 6 groups (each of 30 birds+3 cocks) The birds classificated into six groups of three replicates each:*

1- The first group was control and fed egg production diet only.

2-The second group fed egg production diet with 0 L-carnitine /kg diet + 1 g ascorbic acid / kg diet .

3-The third group fed egg production diet with 100 mg L-carnitine/kg diet + 0 g ascorbic acid / kg diet .

4-The fourth group fed egg production diet with 100 mg L-carnitine/kg diet + 1g ascorbic acid / kg diet .

5-The fifth group fed egg production diet with 200 mg L-carnitine /kg diet + 0 g ascorbic acid / kg diet .

6-The sixth group fed egg production diet with 200 mg L-carnitine /kg diet + 1 g ascorbic acid / kg diet .

Birds were housed in individual wire cages during the whole experimental period (50 to 70 weeks of age).

Using 30 cockes for 6 group, 5 cocks / group and classeficated into the same six groups for determined of the semen quality perameters and plasma testosterone hormone .

Body weight, weight gains, feed intake and feed conversation of birds were recorded 4 week, egg number, egg weight and egg mass were recorded daily and calculated 4 week and egg quality, fertility, hatchability%, and semen quality were taken at the end of experimental period. The body temperature(°C) and respiratory rate (count /min) were taken at 4 weeks intervals during the whole experimental period, and the averages were estimated. These groups were taken along the experimental period which lasted five months during summer season,the temperatures degree were over 30 ° C during the experimental period .

At the end of the experimental period five laying / group were randomly chosen, weighted, slaughtered and eviscerated. Some physiological and immunological traits were determined and illustrated in this study. The results indicated that:

- Body weight and body gain were decreased and improving feed conversation in groups fed L-carnitine alone or with ascorbic acid compared with control group.

- *Egg number, egg mass and egg production percentage were significantly increased by using L-carnitine alone or with ascorbic acid compared with control group, while egg weight increased by using L-carnitine with ascorbic acid compared with other groups.*

- *Yolk weight, shell thickness, yolk color and Haugh units were significantly increased, but albumin weight was significantly decreased , while other egg quality did not affect by using L-carnitine alone or with ascorbic acid compared with control group.*

- *Fertility and hatchability percentages were significantly increased and improving semen quality by supplementation of L-carnitine alone and with and ascorbic acid to the layer diets as compared with control group.*

- *Body temperature do not affected, while respiratory rate was significantly decreased by using L-carnitine alone or with ascorbic acid compared with control group.*

- *Levels of plasma calcium, phosphorus, total protein and globulin were significantly increased by using L-carnitine alone or with ascorbic acid compared with control group.*

-*Levels of plasma T3and testosterone hormones were significantly increased, Ratio of T3/T4 and AST enzyme were significantly decreased, while T4 hormone and ALT enzyme were did not affected by using L-carnitine alone or with ascorbic acid compared with control group.*

- *Levels of plasma and yolk cholesterol, LDL, HDL and total lipids were reduced significantly by using L-carnitine alone or with ascorbic acid compared with control group.*

-*Using both L-carnitine and ascorbic acid alone or their combinations was significantly increased found in antibody titters against avian Newcastle and Influenza diseases compared with control and the relative weights of spleen and thymus were significantly increased by using either L-carnitine alone or with ascorbic acid compared with control group.*

- *Using both L-carnitine and ascorbic acid alone or their combinations was significantly decreased of gizzard, liver and abdominal fat relative weights and was significantly increased of kidney, ovary relative weights and oviduct length compared with control group.*

It can be concluded that supplementation of 100 or 200 mg L-carnitine + 1 g ascorbic acid /kg diet, improved productive, reproductive , physiological and immunological performance and using 200 mg L-carnitine + 1 g ascorbic acid /kg diet gave the best results for old Golden Montazh laying hens at 50- 70 week of age during summer season.

Key Word: L-Carnitine, Ascorbic Acid, Immunological, Performance, Golden Montazah

INTRODUCTION

Physiological additives are those that help the normal development of physiological functions or that make up for their deficiencies **(Peris and Calafat, 2005).** L- carnitine and ascorbic acid supplementation as physiological feed additives, L- carnitine a zwitterionic compound synthesized in vivo from lysine and methonine, is essential for the transport of long – chain fatty acid across the inner mitochondria membrane for β – oxidation and remove toxic accumulations of fatty acids from mitochondria, keeping these organelles healthy and functioning at their best, L-carnitine has antioxidant properties **(Borum, 1983 and Mayes, 2003).**

Many authors study the effects of adding L-carnitine alone and with ascorbic

acid on productive, reproductive, physiological and immunological performance.

Neuman *et al.*, (2002) reported that L-carnitine also reduce the availability of lipids for peroxidation by transporting fatty acids into the mitochondria for β- oxidation to generate adenosine triphoshate (ATP) energy. L-carnitine prevents obesity of abdominal fat of advanced age in the breeder chickens. Also, hatching rate was increased from 83% to 87 % and from 82.4 to 85.3% in groups of Hubbard breeders supplemented with 50 and 100 mg L carnitine/ kg diet respectively **(Harmeyer, 2002). Baumgartner, (2003)** showed that supplementation of L-carnitine 20-30 ppm diet improved hatchability for breeding hens and layers of various species. Body weight gain was improved by dietary L-carnitine supplementation at the level of more than 500 mg/kg, and breast muscle weight also increased significantly with rising dietary L-carnitine levels from 200 to 500 mg/kg **(Kita *et al.*, 2002).**

Nofal *et al.* (2006) showed that egg weight was significantly ($P \leq 0.001$) heavier of hens fed 50 and 75 mg/ kg of L-carnitine levels compared with the control group. Addition of only 100 mg L-carnitine to laying hens diets significantly ($P \leq 0.05$) increased egg mass (g / hen / day). The egg production tended to increase, but not significantly, in 44 to 72 weeks old hens dietary supplemented by high L- carnitine doses (50 and 100 mg / kg). The relative albumen weight and height were significantly increased by supplementary L-carnitine (50 mg /kg) in drinking water **(Celik *et al.*, 2004).**

Shafey *et al* .(2010) showed that in ovo administration of L-carnitine at 25-500 micro / egg did not influence hatchability traits and hatching period of eggs, and found that the linear relationship between in ovo administration of carnitine and glycogen status of hatches chicks indicated that increasing in ovo doses improved glycogen status of hatches chicks. **Nofal *et al.*, (2006)** reported that hens fed diet supplemented with 25, 50, 75, 100, and 125 mg L-carnitine/ kg diet increased fertility percentage.

Thiemel and Jelinek (2004) found that the hatching rate of eggs laid by experimental layers increased by 8.89%. The analysis of the number of unhatched eggs revealed that a higher hatching rate was attributed to a higher rate of egg fertilization. They assumed that the increased rate of hatching results from the action of L-carnitine on the metabolism of both layers and breeding roosters which were fed with the same feeding mixture.

This assumption is also confirmed by the findings of **Neuman *et al.* (2002),** who reported that the increased levels of sperm cells in breeding roosters that were administered L-carnitine.**Zhai *et al.*, (2008)** showed that supplementing diets with L-carnitine improved sperm concentration compared with control group. Most likely because of the high numbers of sperm that were inseminated artificially in both the control and L-carnitine supplemented hens.

Rezaei *et al.*, (2007) found that adding L-carnitine (500 mg /kg) to diets significantly decreased the level of serum triglyceride, cholesterol and VLDL for broilers. Also, **Lien and Horng (2001)** showed that serum cholesterol and total lipids concentration were affected significantly ($P \leq 0.05$) by supplementation of L-carnitine levels / kg diet for 6 weeks in broiler. On the contrary **(Arslan, 2006)** observed that oral L-carnitine supplementation at 200 mg/ liter water not affect serum cholesterol, total lipids and total protein of ducks.

Deng *et al.*, (2006) recorded a higher serum primary antibody response to sheep red blood cells (SRBC) and enhanced subsequent humoral immunity by using 100 mg L-carnitine/ kg diet compared with control group in Leghorn chickens.

Also, **Geng *et al.*, (2007)** showed that serum IgG was improved by L-carnitine supplementation alone by using levels of 75 and 100 mg /kg diet and using L-carnitine (75 and 100 mg/kg diet) + Coenzyme Q10 (40mg/kg diet) supplementation together had positive effects on some immune response of ascites-susceptible broilers, which might benefit for the reduction of broilers susceptibility to ascites. Complex effects on cardiopulmonary haemodynamics by using L-carnitine supplementation may be impractical for broilers **(Tan *et al.*, 2008).**

Because of the ascorbic acid, is required as cofactor in the L-carnitine biosynthesis pathway, supplementation of L-carnitine alone or in combination with ascorbic acid examined. **(Celik and Ozturkcan, 2003)**showed that the body weight gain was significantly enhanced in vitamin supplemented (L-carnitine, ascorbic acid or both) under high temperature conditions, whereas L-carnitine or L-carnitine + ascorbic acid supplementations significantly reduced the growth performance in broilers under normal ambient temperature .

Bayram et *al.* (1999) reported that supplementation with L-carnitine (500 mg/kg diet) alone or with ascorbic acid (500 mg/kg diet) in diet did not improve growth and carcass yield. However, egg production was significantly enhanced by L- carnitine.

The objective of the present study were to investigate the effects of dietary supplementation of L-carnitine and ascorbic acid in productive, reproductive, physiological and immunological performances of Golden Montazah aged breeder hens.

MATERIALS AND METHODS

The present study was carried out at El-Fayum Research Station, Animal Production Research, Institute, Agriculture Research Center, Ministry of Agriculture.

One hundred and Eighty Golden Montazah hens + Eighteen cocks of 50 weeks old were randomly chosen from a large flock reared on floor. Birds in the same group were housed in individual house with insignificant differences in body weight without egg production.

Birds were divided into 6 groups (each of 30 hens + 3 cocks), during the whole experimental period (from 50 to 70 weeks of age).

1. The control diet (T1) (Table 1).
2. The control diet + 0 L-carnitine + 1 gm ascorbic acid (T2).
3. The control diet +100 mg L-carnitine+ 0 ascorbic acid (T3).
4. The control diet +100 mg L-carnitine+ 1 gm ascorbic acid (T4).
5. The control diet +200 mg L-carnitine+ 0 gm ascorbic acid (T5).
6. The control diet +200 mg L-carnitine+ 1 gm ascorbic acid (T6).

During the experimental period feed and water were provided *ad- libitum* and hens were exposed to 16-hr light daily. These groups were taken along the experimental period which lasted five months during summer season under hot climate condition over 30 °C in whole experimental period.

Productive performance measurements:

All birds were individually weighed at the beginning of the experiment and after 4 weeks and calculated final body weight body, weight gain and feed intake recorder at 50- 70 weeks and calculated feed intake per gram per day and feed conversation per gram feed / gram egg and calculated the means at the end of the experimental period

Egg weight, egg number, egg production percentage and egg mass were recorded daily and calculated weekly. At the end of the experimental period were taken 30 eggs for each group to calculated

egg quality traits. Haugh units score for each individual egg was calculated according to **Haugh (1937)**, as follows: HU = 100 log (H + 7.57 – 1.7 $W^{0.37}$); Where H = Albumen height; W= egg weight. Egg specific gravity (Sp.gr) was calculated according to **Harms *et al.*, (1990).**

Reproductiveperformance measurements:

Fertility and hatchability percentages were estimated after 3 weeks of initial experimental period. Hens were artificially inseminated twice weekly with 0.05 ml of semen mixed with 0.05 ml saline 0.9%. Eggs of each group were collected from the corresponding hens beginning from the second day after artificial insemination and were marked and stored at room temperature (20 ℃ and 60% RH), incubated and hatched and fertility, hatchability percentages were calculated.

30 cocks rearing individual and taken the same hens feeding to determine the semen quality parameters. At the end of the experimental period, semen sample taken in tubes and immediately after collection , the amount of ejaculate volume (ml) and the spermatozoa concentration (number of sperms /ml) were recorded by using a graduated tube and hemocytometer respectively . For evaluation of percentage of sperm motility drop of semen was examined under the low power of total and motile sperm out put / ejaculate were calculated and estimated other semen quality.

Environmental and physiological performance:

The body temperature(°C) and respiratory rate (count /min) were taken at 4 weeks intervals during the whole experimental period, and the averages were estimated.

Five blood samples were individually drawn from wing vein of five layers from each group at the end of experimental period to determine calcium ,phosphorus , total protein, albumin , cholesterol, LDL, HDL and total lipids according to the a colorimetric method using the commercial kits. Also, five eggs were collected from five hens of each group to determine yolk cholesterol, LDL, HDL and total lipids using the method of **Folch *et al.*, (1957).**

Blood samples were taken from the brachial vein into heparinzed tubes from all birds. Plasma was obtained from blood samples by centrifuging the blood samples at 4000 RPM for 15 minutes and then stored at -20°C until use for chemical analysis. The frozen plasma was allowed to thaw at room temperature prior to analysis.

Plasma calcium, inorganic phosphorus, total protein, albumin, Plasma and yolk cholesterol, LDL, HDL, total lipids and hepatic enzymes (AST and ALT) were determined by enzymatic colorimetric methods using commercial kits at Animal Production Research Institute, Ministry of Agriculture, Giza. The plasma globulin was calculated as the difference between plasma total protein and albumin.

Plasma testosterone, triiodothyronine (T3) and thyroxin (T4) hormones were determined by the double antibody radioimmunoassay with commercial purchased from antibodies incorporated (P.O.Box 442, Davis, Californias 95616).The radioactivity was measured by gamma counter as described by **Peebles and Markes (1991).**

Immunological performance:

At 66 and 70 weeks of age, hemagglutination-inhibition (HI) test was applied for determination of antibodies response in plasma samples according to **OIE manual (2005).** After 2 weeks of against of the flock immunization by Lasota vaccine Newcastle Disease Virus (NDV) and against Avian Influenza Disease Virus (AIDV).

Commercial kits were used for detection of antibodies against nucleoprotein and matrix against of NDV and AIDV (Biockek B.V, Gouda and Holland).

Hemagglutination-inhibition (HI) test titter regarded as positive if there is inhibition at serum dilution of 1/16 (4 log 2).

Slaughter traits:

To study the effect of L-carnitine and ascorbic acid supplementation on the internal organs, birds were weighted at the end of experimental period, five birds of each group were randomly chosen and slaughter. Birds were eviscerated and carcass traits, and taken heart, gizzard, liver, kidney, abdominal fat, intestine, ovary, oviduct and oviduct lengths (cm) and calculated the total giblet, and calculated relative percentages. The lymphoid glands (spleen and thymus) were weighted and calculated the relative weight of the organ = weight of the organ/ body x 100.

After measuring the egg quality, yolk samples for each treatment were separated from the broken eggs, calculated and extracted to determine the cholesterol, LDL, HDL and total lipids. Yolk was rapidly dissected out chilled in ice cold. One gram of yolk put in glass containing 0.1 ml phosphate buffer solution (PH 7.4) and was homogenized with on electric motor. The homogenate solution was centrifuged at 2000 PRM for 5 minutes, clear homogenate solution was separated, stored in deep-freezer at-20°c until the time of al analysis. Cholesterol, LDL, HDL and total lipids were determined by kits according to **Zollner and Kirsch, (1962).**

Statistical analysis:

The data were analyzed according to one way model procedure by using **SPSS 10 (2006)** computer program using the following model:

$Y_{ij} = \mu + T_i + e_{ij}$. Where Y_{ij} = An observation treatment. μ = Overall mean. T_i = the i treatment effect (I =1---- 6) e_{ij} = The random error. Percentages were transformed to arcsine before being analyzed to approximate normal distribution. Multiple range test was used to determine the significant differences among means **(Duncan.s, 1955).**

RESULTS AND DISCUSSION

Productive performance:

Body weight, body gain , feed intake and feed conversion :

The results presented in Table (2) showed that, initial body weight and feed intake were not significantly affected by dietary supplementation of L-carnitine 100 and 200 mg/ kg diet alone and with 1 g / kg diet ascorbic acid.

These results agree with those showed by **Rabie *et al.*, (1997), Richter *et al*, (1998)** of caged Tetra SL laying hens from 65 to 73 weeks of age and **Nofal et al., (2006)** of aged Gimmizah laying hens from 60- 68 weeks of age.

Also, **Deng et al., (2006)** showed that no differences in growth rates and fee intake existed among using 100 mg L-carnitine / kg diet and control group for Leghorn chickens.

Final body weight and body weight gain were significantly ($P \leq 0.001$) decreased of groups fed 100 and 200 mg L- carnitine / kg diet alone (T3 and T5) and with 1 g / kg diet ascorbic acid(T4 and T6) compared with control group and dietary supplementation of ascorbic acid alone (T2).

Theses results are agreement with those obtained by **Celik and Ozturkcan (2003)** who showed that body weight gain was reduced in receiving supplemental L-carnitine or L – carnitine + ascorbic acid compared to broilers received unsupplemented diet under high temperature.

The results presented in Table (2) showed that, feed conversion ratio (g feed / g eggs) was significantly ($P \leq 0.05$) improved by supplementation of 200 mg L-carnitine / kg diet alone (T5) and with 1 g / kg diet ascorbic acid (T6) compared with

control group and dietary supplementation of ascorbic acid alone (T2) of aged laying hens during 50to 70 weeks of age .This may be due to the increase egg mass and egg production % with not significantly affected on feed intake.

Theses results are agreement with those obtained by **Celik and Ozturkcan (2003)** who showed that supplemental L-carnitine or L – carnitine+ ascorbic acid significantly improved feed conversion efficiency, the improvement was relatively greater under high temperature.

It could be concluded that the addition 200 mg L-carnitine /kg diet alone and with 1g ascorbic acid /kg diet significantly improved ($P \leq 0.05$) feed conversion ratio of aged laying hens during 50 to 70 weeks of age.

These results are in close agreement with those reported by **Rabie et al. (1997)** and **Richter *et al.* (1998)** of caged Tetra SL laying hens from 65 to 73 weeks of age. Also, **Haremeyer, (2002)** showed that dietary L-carnitine supplementation of about 50 mg / kg diet had a beneficial effect on feed conversion ratio.

Keralapurath *et al.* (2010) showed that increasing the levels of L-carnitine added to_commercial vaccine between 0.5 and 0.8 mg/ 100 micro L in ovo injection did not significantly influence subsequent broiler grow-out performance.

Egg production:

Egg number, egg mass and egg production percentage were significantly affected by supplementation of L-carnitine alone or with ascorbic acid as compared with control group (Table3).

Theses results are close agreement with those obtained by **Richter *et al.* (1998)** showed that supplemental 50 and 100 mg L-carnitine / kg diet increased egg production by 2.1 and 2.7 % respectively of Zeh ' s Brown Warren laying hens. Also, dietary supplementation of 20 to 30 ppm L-carnitine improved egg yield of Tetra SL breeding hens and layers **(Baumgartner, 2003).**

This may be due to increase egg mass (g / hen / day), egg production percentage and improved feed conversion ratio of these groups, or improve laying performance of aged laying hens due to decrease in abdominal fat , increase ovary relative weight and oviduct length by L-carnitine alone or with ascorbic acid compared with control group.

Data in Table (3) showed that egg weight was significantly ($P \leq 0.001$) increased of hens used ascorbic acid 1g/kg diet alone (T2) and 100 and 200 mg/ kg of L-carnitine with ascorbic acid (T4 and T6) compared with other groups and the control group.

These findings disagree with those obtained by **Rabie *et al.* (1997)** reported that supplementation of L-carnitine 500 mg /kg diet had no effect on egg production rate during the early laying period in Hungarian brown line. Also, **Rabie *et al.* (1997)** and **Richter *et al.* (1998),** who showed that dietary supplementation of L-carnitine from 50 to 500 mg / kg diet, did not influence egg weight of Tetra SL laying hens at 65 to 73 weeks of age.

Rabie *et al.* (1997) and Richter *et al.*, (1998), who showed that dietary supplementation of L-carnitine from 50 to 500 mg / kg diet, did not influence egg mass of Tetra SL laying hens from 65 to 73 weeks of age.

On the other hand, **Rezaei et al., (2007)** showed that adding L-carnitine to diets had not significant on performance and carcass characteristics for broilers.

Egg quality traits:

Data in Table (4 a) show that relative weights of albumin and yolk were affected significantly ($P \leq 0.05$), while, egg weight, egg length, egg bright and shell weight % were not affected significantly by dietary L-carnitine levels and ascorbic acid .

The lowest albumin relative weight was recorded of laying hens fed 100 and 200 mg L-carnitine /kg diet with 1g ascorbic acid compared with other groups and the control group.The same group also had the heaviest yolk relative weight.

These results agreed with those showed by **Rabie *et al.*, (1997)** who found that egg albumen weight increased, yolk weight decreased and shell weight was not influenced by supplementation of L-carnitine from 50 to 500 mg /kg diet of caged laying hens at 65 weeks of age. **Celik *et al.* (2004)** showed that using 50 ppm L-carnitine supplementation for old laying hens during 47 to 55 weeks of age affected on some egg quality characteristics under high environmental temperature.

Results in Table (4b) showed that shape index %, yolk index % and specific gravity were not significantly affected ($P \leq 0.001$). While shell thickness, yolk color and Haugh units was significantly increased in groups fed 100 and 200 mg L-carnitine / kg diet alone or with ascorbic acid fed 1g /kg diet as compared with fed 1g ascorbic acid /kg diet and the control groups.

This may be due to increase in shell thickness due to increase in levels of plasma calcium and phosphorus in the same groups using L-carnitine alone or with ascorbic acid as compared with other groups.

On the other hand shell percentage and shell thickness were not affected by dietary supplemental L-carnitine. Similar results were obtained by **Rabie *et al.*, (1997).**

These results agree with those of **Rabie *et al.*, (1997)** who found that Haugh unit score improved by supplementation of L-carnitine from 50 to 500 mg / kg diet of Tetra SL breeding hens and layers. These results indicate that dietary L-carnitine supplementation the laying diets improved albumen quality (Haugh Unit score).

These results are in close agreement with those obtained by **Celik *et al.*, (2004)** showed that L-carnitine supplementation not affected on egg weight, yolk weight, shell weight, yolk index, egg shape index, yolk color score and shell thickness in laying hens. **Rabie *et al.*, (1997)** who reported that yolk index improved after 7 weeks of supplementing 50 mg L-carnitine / kg diet as compared with control in laying hens.

Reproductive performance:

Fertility and hatchability percentages of total eggs increased significantly ($P \leq 0.05$) by dietary supplementation of L- carnitine alone and with ascorbic acid (Table 5). Hens fed diet supplemented with 100 and 200 mg L-carnitine/ kg diet alone and combination ascorbic acid increased fertility and hatchability %.

Table (5) showed that all groups fed diets of L-carnitine levels of 100 and 200 mg /kg diet alone and with 1g ascorbic acid / kg diet were improved and recorded the best values of fertility and hatchability percentages. This improvement was increased with increasing L-carnitine level compared with the hens fed 1g ascorbic acid /kg diet alone and the control group at the end of the experimental period.

Similar results was obtained by **Leibetseder, (1995)** who found that hatching rate was increased from 83% to 87 % and from 82.4 to 85.3% in groups of Hubbard broiler breeders supplemented with 50 and 100 mg L-carnitine / kg diet respectively. Also, **Blum and Leibetseder, (1994)** found that increase in hatching percentage was improved when dietary L-carnitine was fed to breeders hens. Dietary supplementation of 50 to 100 mg L-carnitine/ kg diet increased hatching rates in laying hens **(Harmeyer, 2002).**

Baumgartner, (2003) showed that supplementation of 20-30 ppm L-carnitine improved hatchability of breeding hens and layers in various species. These may be due to improved fertility increased sperm concentration by dietary L-carnitine

supplementation and the decrease sperm lipid peroxidation or its antioxidant properties that may preserve sperm membranes in roosters, thereby extending the life span of sperm **(Neuman *et al.*, 2002).**

Also, **Nofal *et al.*, (2006)** showed that fertility, hatchability percentages were increased by dietary supplementation of 25, 50, 75, 100 and 125 mg L- carnitine/kg diet compared with control group. **Keralapurath *et al.*, (2010)** showed that increasing the levels of L-carnitine added to commercial vaccine between 0.5 and 0.8 mg/ 100 micro L for commercial in ovo injection increasing incubation length and hatchability of broiler hatching eggs.

The increase fertility and hatchability percentages due to L-carnitine may be due to the change in the fatty acid composition of abdominal fat, thus controlling obesity and improving the fertility and hatchability percentages and / or due to improved in egg albumen quality.

These results in agreement with those obtained by **Rinaudo *et al.* (1991)** who found that increasing L-carnitine content of eggs was found to be a beneficial for development of chick embryo of Hungarian brown hybrid line hens.

On the other hand, **Zhai *et al.* (2008)** found that dietary L-carnitine as compared with the control diet did not affect hatchability rate, decreased hatching yolk sac weights and decreased yolk sac lipid content at hatch. Also, **Shafey *et al* .(2010)** showed that in ovo administration of carnitine at 25-500 micro / egg did not influence hatchability traits and hatching period of eggs, and found that the linear relationship between in ovo administration of L-carnitine and glycogen status of hatches chicks indicated that increasing in ovo doses improved glycogen status of hatches chicks.

The may be due to increase fertility and hatchability percentages by using 100 or 200 mg L-carnitine supplemented groups back to L-carnitine was observed to play an important role in energy metabolism by transport of long chain fatty acids into mitochondria for oxidation **(Borum, 1983).** The may be due to increase fertility and hatchability percentages by using 100 or 200 mg L-carnitine supplemented groups back to L-carnitine was observed to play an important role in improved the semen quality and increased level of plasma testosterone hormone for cocks.

Some physiological and environmental characteristics:

Results in Table (6) showed that, body temperature (°C) was not significantly affected by dietary supplementation of L-carnitine 100 and 200 mg/ kg diet alone and with 1 g / kg diet ascorbic acid. But, respiratory rate (count / min) decreased significantly by using of L-carnitine 100 and 200 mg/ kg diet alone and with 1 g / kg diet ascorbic acid compared with control group during 50 – 70 weeks of age.

The may be due to decreased respiratory rate (count / min) back to the effects of using of L-carnitine alone and with ascorbic acid as affected on reduction of abdominal fat, give little rest of hens and improved the respiratory rate, body temperature (°C) was not significantly affected may be due to the experimental period was lasted five months during summer season under hot climate condition over 30 °C in whole experimental period.

These results agreed with those of **Lohakare *et al.* (2002)** found that supplementation of ascorbic acid for diets was reduced plasma corticosterone, a stress hormone, the heterophil / lymphocyte (H: L) ratio, reduced Basal Metabolic Rate (BMR) , respiratory rate and improving the productive performance and immunity of commercial broilers.

Physiological performance:

Semen quality traits:

Effects of L-carnitine and ascorbic acid on semen quality are illustrated in Table (7).

Results show that cocks of Golden Montazh during 50 to 70 weeks of age adding of L-carnitine (100 and 200 mg/ kg) alone or with ascorbic acid (1g /kg) into diets improved semen quality ($P \leq 0.05$) compared with control group.

Data in (Table 7) shows that cocks fed L-carnitine (100 and 200 mg/ kg) alone and with ascorbic acid (1g /kg) into diets decreased significantly($P \leq 0.05$) dead spermatozoa % and abnormal spermatozoa % compared with cocks fed 1g ascorbic acid / kg diet alone and control group. However, semen pH do not affected by supplementation L-carnitine (100 and 200 mg/ kg) alone and with ascorbic acid (1g /kg) into diets.

These results agreed with those of **Neuman *et al.*, (2002)** who showed that sperm concentration was increased by dietary by dietary L-carnitine supplementation and the decrease sperm lipid peroxidation or its antioxidant properties that may preserve sperm membranes in roosters, thereby extending the life span of sperm.

Also, **Zhai *et al.*, (2008)** showed that supplementing diets with L-carnitine improved sperm concentration compared with control group. Most likely because of the high numbers of sperm that were inseminated artificially in both the control and L-carnitine supplemented hens.

Plasma calcium, phosphorus, total protein, albumin and globulin:

Results in Table (8) observed that there were significantly affecting of L-carnitine (100 and 200 mg/ kg diet) alone or combination with ascorbic acid (1g /kg diet) on plasma concentration of calcium, phosphorus, total protein and globulin, While the level of plasma albumin do not affected.

These results are in contrary to those obtained by **Uysal *et al.* (1999)** who reported that feeding 500 ppm L-carnitine between 6 and 9 weeks significantly ($P \leq 0.05$) decreased total protein level compared to the control diet in Japanese quails.

However, **Arslan (2006)** found that oral supplementation of L-carnitine as 200 mg / liter of water for 8 weeks of age did not affect total protein level in ducks which in partial agreement with the present results.

The may be due to increased of plasma calcium and phosphorus levels back to the effects of using of L-carnitine alone and with ascorbic acid as affected on improved the bone resistance .

Plasma AST, ALT, testosterone, T3, T4 hormones and T3 / T4 ratio:

Results in Table (9) indicated that adding of L- carnitine alone or combination with ascorbic acid significantly increased plasma T4 and testosterone hormones levels anddecreased plasma AST and ratio T3/ T4 compared with control group.

The results also, showed that this supplementation did not influence the levels of T3 hormone and ALT enzyme.

These results are similar to those obtained by **Lien and Horng (2001)** showed that L-carnitine supplementation did not significantly affect on activates of other fatty acid beta-oxidation enzymes. **Xu *et al.*, (2003)** showed that using L-carnitine (25, 50, 75 and 100 mg/kg) could reduce the deposit of subcutaneous fat by decreasing total activities of enzymes in the fat and enhance intramuscular fat by decreasing the activity of L-carinitine palmitoyttransferase-I in breast muscles.

Plasma cholesterol, LDL, HDL and total lipids:

Obviously there was a significant ($P \leq 0.05$) decrease in the plasma

cholesterol, LDL ,HDL and total lipids levels due to supplementation of L-carnitine(100 and 200 mg/diet) and ascorbic acid (1g/kg diet) alone and their combinations of each dose (Table 10).

The reduction of plasma levels cholesterol and total lipids were increased using 200 mg L-carnitine/kg diet compared with using 100 mg L-carnitine/kg diet and other groups. Also, laying hens fed of L-carnitine (100 and 200 mg/diet) combination ascorbic acid (1g/kg diet) were gave the high reduction of plasma levels cholesterol and total lipids compared with fed ascorbic acid alone(1g/kg diet) and control groups.

These results are similar to those obtained by **Lien and Horng (2001)** who showed that serum cholesterol and total lipids concentration was decreased significantly ($P \leq 0.05$) by supplementation of L-carnitine/kg diet for 6 weeks in broilers. **Nofal *et al.* (2006)** showed that serum levels cholesterol and total lipids were decreased by dietary supplementation of 25, 50, 75, 100 and 125 mg L- carnitine/kg diet compared with control group and the decreased in serum cholesterol and total lipids was maximized at 75 and 100 mg L- carnitine /kg diet. Also, **Rezaei *et al.* (2007)** found that adding L-carnitine (500 mg /kg) to diets significantly decreased the level of serum triglyceride, cholesterol and VLDL for broilers.

On contrary **Lien and Horng (2001)**indicated that supplementary L-carnitine 160 mg/kg diet for 6 weeks the effect on serum cholesterol, phospholipids concentrations and lipoprotein profiles were not significant .

Arslan (2006) observed that L-carnitine administration of oral 200 mg / liter water did not affect serum cholesterol of ducks.

The reduction in serum cholesterol and total lipids due to feeding of L-carnitine may be due to its metabolic role of L-carnitine in the transportation of long chain fatty acids into the metaconderial matrix or β- oxidation **(Bremer, 1983).**

Yolk cholesterol, LDL, HDL and total lipids:

There was a significant ($P \leq 0.05$) decrease in yolk cholesterol, LDL, HDL and total lipids levels due to supplementation of L-carnitine and ascorbic acid to laying hens diets (Table 11). The reduction percentages in yolk cholesterol were about, 23.30, 13.20, 16.80, 12.20 and 2.38 % for groups supplemented T6, T5, T4 T3 and T2 , respectively compared to the control group (T1). Similar trend was observed with yolk total lipids, where the percentages of reduction in yolk total lipids were 11.00, 4.83, 10.51, 5.79 and 1.27 % for groups supplemental T6, T5, T4 T3 and T2, respectively compared to the control group (T1).

The reduction in yolk cholesterol and total lipids due to dietary L-carnitine may be due to the reduction in plasma cholesterol and total lipids as a result of fatty acid oxidation and decrease in long – chain fatty acids.

These results are similar to those obtained by **Nofal *et al.*, (2006)** showed that yolk levels cholesterol and total lipids were decreased by dietary supplementation of 25, 50, 75, 100 and 125 mg L-carnitine/kg diet compared with control group and the decreased in yolk cholesterol and total lipids was maximized at 75 and 100 mg L- carnitine /kg diet.

The lower plasma and yolk cholesterol, LDL, HDL and total lipids by using levels of 100 and 200 mg L-carnitine supplemented group alone or with ascorbic acid groups may be due to the decrease in activity of the rate –limiting enzyme in cholesterol synthesis HMG-Co A reductase in liver and reduction of abdominal fat affected by adding L-carnitine alone or with ascorbic acid.

Immunological performance:

Antibody titters against avian Newcastle and Influenza diseases:

The results provided of immune response parameters are shown in Table (11).

Antibody titters against avian Newcastle and Influenza diseases determined are shown in Table (12) using both L-carnitine alone or with ascorbic acid were significantly increased of antibody titters against avian Newcastle and Influenza diseases compared with control group at the end of experimental period .

The use of L-carnitine or ascorbic acid may be attributed played role of antioxidant, antiheat stress feed additives and an important role for increasing immuno response against some diseases and also attributed towards Golden Montazah laying hens survivability during old ages.

These results are similar to those obtained by **Mast *et al.*, (2000)** found that dietary L-carnitine 100 mg/kg diet supplementation appeared to be beneficial in enhancing specific humoral responses on vaccination in broiler chickens.

L-carnitine has antioxidant properties and a zwitterionic compound synthesized in vivo from lysine and methonine is essential for the transport of long – chain fatty acid across the inner mitochondria membrane for β – oxidation and remove toxic accumulations of fatty acids from mitochondria, keeping these organelles healthy and functioning at their best, **(Mayes, 2003 and Borum, 1983).**

A higher serum primary antibody response to sheep red blood cells (SRBC) and enhanced subsequent humoral immunity by using 100 mg L-carnitine/ kg diet compared with control group in Leghorn type chickens(**Deng *et al.*, 2006).**

Also, **Geng *et al.*, (2007)** who showed that serum IgG was improved by L-carnitine supplementation alone by using levels of 75 and 100 mg /kg diet and using L-carnitine (75 and 100 mg/kg diet) + Coenzyme Q10 (40mg/kg diet) supplementation together had positive effects on some immune response of ascites-susceptible broilers, which might benefit for the reduction of broilers susceptibility to ascites. Complex effects on cardiopulmonary haemodynamics by using L-carnitine supplementation may be impractical for broilers **(Tan *et al.*, 2008).**

Slaughter traits:

Immuno organs relative weight:

Table (12) indicated that relative weights of spleen and thymus were significantly ($P \leq 0.05$) increased by using either L-carnitine (100 and 200 mg/diet) alone or with ascorbic acid (1g/kg diet) when compared with control group.

These results agree with **Deng *et al.*, (2006)** found that higher relative thymus weight at week 12 of age gave by using 100 mg L-carnitine/ kg diet compared with control group.

Some internal organs

Conclusion

It can be concluded from the results obtained that addition 100 or 200 mg L-carnitine combination with 1 g ascorbic acid /kg diet improved the egg production, fertility and hatchability percentages, semen quality, depuration the levels of plasma and yolk cholesterol, increasing the immuno responses against Newcastle and avian Influenza and improved function of organs for old Golden Montazh laying hens to produce good healthily animal product for human consumption during summer season.

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

Ingredients	%
Yellow corn	63.50
Soybean meal (44%)	24.57
Wheat bran	2.00
Lime stone	7.77
Premix*	0.30
Salt	0.30
Di-calcium phosphate	1.50
DL- methionine	0.06
Total	100
Calculated analysis**	
CP%	16.00
Kcal ME /kg	2703.34
Crude fiber%	3.47
Crude fat %	2.86
Calcium %	3.32
Available phosphorus %	0.406
Lysine %	0.889
Methionine %	0.350
Methionine + Cystine %	0.620
Sodium%	0.135

Premix contain per 3kg vit A 12 000 000, vit D3 3000 000 IU, vit E 50000mg, vit K3 3000mg , vit B1 2000mg, vit B2 7500mg, vit B6 3500 mg, vit B12 15mg, Pantothenic acid 12000mg, Niacin 30000mg, Biotin 150mg, Folic acid 1500mg, Choline 300gm, Selenium 300mg, Copper 10000mg, Iron 40000mg, Manganess 80000mg, Zinc 80000mg, Iodine 2000mg, Cobalt 250 mg and $CaCO_3$ to 3000g.

**According to Egyptian Feed Composition Tables for Animal and Poultry Feedstuffs (2001)

Table (2): Effect of dietary L-carnitine and ascorbic acid supplementation on live body weight, body gain, feed intake and feed conversation of Golden Montazah aged hens during 50 -70 weeks of age.

Treatments	Initial body weight(g)	Final body weight(g)	Body weight gain (g)	Feed intake (g/day)	Feed conversion (g feed / g eggs)
T1	2032.50 ±24.11	2035.80± 25.66^{a}	3.30±1.71^{b}	103.23±0.71	4.73±0.19^{a}
T2	2041.53±24.12	2051.17±25.53^{a}	9.63± 1.63^{a}	105.37±1.17	4.73±0.26^{a}
T3	2022.33±24.06	1970.70±25.61^{c}	-51.63± 1.66^{c}	106.40±1.19	4.20±0.15^{ab}
T4	2019.43±24.09	1990.77±25.71^{b}	-28.67± 1.93^{c}	104.80±0.71	4.22±0.16^{ab}
T5	2061.53±24.12	1977.20±25.85^{c}	-84.33± 1.90^{d}	104.90±0.64	4.11±0.20^{b}
T6	2070.50±24.13	1974.37±24.87^{c}	-96.20± 2.39^{d}	105.27±0.65	3.31±0.08^{c}
Overall mean	2041.32±9.81	2000.00±10.55	- 41.32±3.10	104.99±0.36	4.22±0.08
Significance	NS	**	*	NS	**

*Means within the same column with different letters differ significantly (P≤0.05).
**; (P≤ 0.001); NS = Non significant

Table(3): Effect of dietary L-carnitine and ascorbic acid supplementation on egg weight, egg number, egg mass and egg production percentage of Golden Montazah aged hens during 50 -70 weeks of age.

Treatments	Egg weight (g)	Egg number (egg)	Egg mass (g)	Egg production %
T1	*53.81± 0.38 ^{b}	12.73±0.48 ^{c}	685.86±27.26 ^{d}	42.45± 1.6 ^{c}
T2	54.24±0.15 ^{a}	13.07±0.51 ^{c}	708.40±27.17 ^{d}	43.56±1.69 ^{c}
T3	52.93±0.58 ^{b}	14.80±0.41 ^{b}	781.96±22.23 ^{c}	49.33±1.37 ^{b}
T4	54.27±0.22 ^{a}	14.20±0.45 ^{b}	770.65±24.85 ^{c}	47.33±1.51 ^{b}
T5	52.99±0.18 ^{b}	15.27±0.60 ^{b}	809.88±23.49 ^{b}	50.89±2.01 ^{b}
T6	55.11±0.14 ^{a}	17.60±0.41 ^{a}	969.25±21.64 ^{a}	58.67±1.36 ^{a}
Overall mean	53.89±0.14	14.61±0.23	787.67±12.57	48.70±0.76
Significance	*	*	*	*

*Means (X ± SE) within the same column with different letters differ significantly (P≤0.05). **; (P≤ 0.001); NS = Non significant

Table (4a): Effect of dietary L-carnitine and ascorbic acid supplementation on egg quality of Golden Montazah aged hens during 50 -70 weeks of age.

Treatments	Egg Weight (g)	Egg length (cm)	Egg breadth (cm)	Albumin weight (%)	Shell weight (%)	Yolk weight (%)
T1	*48.77±0.54	4.86±0.45	3.75±0.46	60.83±0.77 ^{a}	8.96±0.21	30.21±0.62 ^{b}
T2	49.11±0.67	5.11±0.56	3.82±0.47	60.11±0.67 ^{a}	9.78±0.20	30.11±0.56 ^{b}
T3	48.56±0.63	5.23±0.57	3.79±0.52	59.07±0.63 ^{ab}	9.14±0.29	31.79±0.73 ^{ab}
T4	48.23±0.42	5.16±0.56	3.86±0.56	58.48±0.42 ^{b}	9.54±0.24	31.98±0.46 ^{a}
T5	47.98±0.86	4.92±0.47	3.69±0.50	59.58±0.86 ^{ab}	9.17±0.19	31.26±0.73 ^{ab}
T6	48.60±0.79	5.34±0.58	3.91±0.62	57.52±0.79 ^{b}	9.45±0.18	33.03±0.84 ^{a}
Overall mean	48.54±0.60	5.11±0.55	3.80±0.55	59.27±0.30	9.34±0.09	31.39±0.28
Significance	NS	NS	NS	*	NS	*

*Means (X ± SE) within the same column with different letters differ significantly (P≤0.05).
**; (P≤ 0.001); NS = Non significant

Table (4b) : Effect of dietary L-carnitine and ascorbic acid supplementation on egg quality of Golden Montazah aged hens during 50 - 70 weeks of age.

Treatments	Shape index (%)	Yolk index (%)	Shell thickness (mm)	Yolk Color	Haugh units (%)	Specific gravity
T1	*74.68±0.83	49.64±0.75	0.338±0.10^{b}	6.24±0.62^{b}	88.89±1.55^{b}	0.93±0.01
T2	75.09±0.82	50.09±1,00	0.336±0.10^{b}	7.02±0.56^{b}	89.56±1.51^{b}	0.92±0.01
T3	75.37±1.26	48.02±1.00	0.358±0.11^{ab}	7.33±0.73^{ab}	92.56±1.43^{a}	0.93±0.01
T4	75.11±0.84	48.85±0.76	0.392±0.16^{a}	7.62±0.46^{a}	92.47±1.56a	0.92±0.01
T5	74.71±0.79	48.49±1.07	0.375±0.12^{a}	7.60±0.73^{a}	91.14±1.62^{ab}	0.92±0.01
T6	76.33±1.04	49.50±0.60	0.389±0.14^{a}	7.75±0.84^{a}	92.56±1.86^{a}	0.92±0.01
Overall mean	75.21±0.38	49.10±0.36	0.364±0.11	7.36±0.75	91.03±0.66	0.92±0.01
Significance	NS	NS	**	*	*	NS

*Means (X ± SE) within the same column with different letters differ significantly (P≤0.05).
**; (P≤ 0.001); NS = Non significant

Table (5): Effect of dietary L-carnitine and ascorbic acid supplementation on fertility %, hatchability %, dead early %, dead late %and male- position % of Golden Montazah aged hens during 50 -70 weeks of age.

Treatments	Fertility %	Hatchabilit y %	Dead early %	Dead late %	Male-position %
T1	*88.42±1.55^{c}	77.50±1.02^{d}	5.00±0.45^{a}	3.75±0.20^{a}	2.50±0.22^{a}
T2	92.40±1.64^{b}	80.42±1.21^{c}	5.00±0.45^{a}	3.75±0.20^{a}	2.50±0.22^{a}
T3	93.07±1.68^{b}	84.20±1.35^{b}	3.75±0.40^{b}	3.75±0.20^{a}	2.50±0.22^{a}
T4	95.22±1.85^{a}	83.55±1.30^{b}	3.75±0.40^{b}	2.50±0.15^{b}	1.25±0.13^{b}
T5	95.20±1.84^{a}	85.80±1.36^{a}	2.25±0.15^{c}	2.50±0.15^{b}	2.50±0.22^{a}
T6	96.55±1.92^{a}	86.11±1.41^{a}	2.25±0.15^{c}	2.50±0.15^{b}	1.25±0.13^{b}
Overall mean	93.48±1.59	82.93±1.30	3.75±0.38	3.13±0.33	2.08±0.28
Significance	*	*	*	*	*

* Means (X ± SE) within the same column with different letters differ significantly (P≤0.05). **; (P≤ 0.01); NS = Non significant

Table (6): Effect of dietary L-carnitine and ascorbic acid supplementation on some physiological characteristics of Golden Montazah aged hens during 50 -70 weeks of age.

Treatments	Body temperature (∘ c)	Respiratory rate (count / min)
T1	*42.87±3.33	109.67±2.73^{a}
T2	42.83±3.33	108.67±1.72^{a}
T3	42.77±3.33	102.33±1.45^{b}
T4	42.73±3.33	101.00±1.43^{b}
T5	42.67±3.33	95.00±1.37^{c}
T6	42.57±3.33	97.67±1.38^{c}
Overall mean	42.74±2.69	102.39±1.39
Significance	*	*

*Means within the same column with different letters differ significantly (P≤0.05).
**; (P≤ 0.001); NS = Non significant

Table (7): Effect of dietary L-carnitine and ascorbic acid supplementation on semen quality of male Golden Montazah aged hens during 50 -70weeks of age.

Treatments	Semen pH	Sperm motility (%)	Sperm concentration (10^6/ml)	Live spermatozoa (%)	Dead spermatozoa (%)	Abnormal spermatozoa (%)
T1	*7.20±0.57	51.55±3.55 ^{c}	318.10±8.33 ^{d}	87.40±4.46 ^{c}	12.60±1.80 ^{a}	22.55±2.33 ^{a}
T2	7.23±0.33	52.00±3.61 ^{c}	320.20±8.40 ^{d}	88.67±4.52 ^{b}	11.33±1.74 ^{ab}	21.70±2.25 ^{a}
T3	7.20±0.57	54.64±3.72 ^{b}	349.80±8.62 ^{b}	89.22±4.60a ^{b}	10.78±1.52 $^{a b}$	18.45±2.21a ^{b}
T4	7.23±0.33	57.85±3.85 ^{a}	355.50±8.71 ^{b}	90.40±4.71a ^{b}	9.60±1.41 ^{b}	16.20±2.10 ^{c}
T5	7.26±0.38	54.57±3.74 ^{b}	330.60±8.45 ^{c}	90.25±4.71 ^{ab}	9.75±1.45 ^{b}	17.44±2.14 ^{b}
T6	7.23±0.33	59.55±3.90 ^{a}	372.40±8.94 ^{a}	91.43±4.80 ^{a}	8.57±1.30 ^{c}	16.84±2.11 ^{c}
Overall mean	7.23±0.19	55.03±3.70	341.10±8.50	89.56±4.60	10.44±1.25	18.86±2.25
Significance	NS	*	*	*	*	*

*Means within the same column with different letters differ significantly (P≤0.05).
**; (P≤ 0.001); NS = Non significant

Table (8): Effect of dietary L-carnitine and ascorbic acid supplementation on some plasma parameters of Golden Montazah aged hens during 50 - 70 weeks of age.

Treatments	Ca (mg/dl)	P (mg/dl)	Total protein (mg / dl)	Albumin (mg / dl)	Globulin (mg / dl)
T1	* 12.76±0.54 ^{c}	4.71±0.42 ^{b}	4.48±0.36 ^{b}	2.86±0.23	1.62±0.11 ^{b}
T2	13.40±0.57 ^{b}	5.66±0.46a ^{b}	5.11±0.38a ^{b}	3.01±0.26	2.10±0.13 ^{ab}
T3	13.85±0.61 ^{ab}	5.85±0.55 ^{a}	5.08±0.38 ^{ab}	2.82±0.21	2.26±0.15 ^{a}
T4	14.80±0.67 ^{ab}	5.94±0.58 ^{a}	5.72±0.49 ^{a}	3.40±0.35	2.32±0.17 ^{a}
T5	14.11±0.64 ^{a}	5.45±0.51 ^{ab}	5.60±0.46 ^{a}	3.30±0.32	2.30±0.17 ^{a}
T6	15.62±0.72 ^{a}	6.22±0.64 ^{a}	5.87±0.56 ^{a}	3.36±0.34	2.51±0.19 ^{a}
Overall mean	14.09±0.63	5.64±0.45	5.31±0.40	3.13±0.28	2.19±0.14
Significance	*	*	*	NS	*

*Means (X ± SE) within the same column with different letters differ significantly (P≤0.05).
**; (P≤ 0.001); NS = Non significant

Table (9): Effect of dietary L-carnitine and ascorbic acid supplementation on some plasma parameters of Golden Montazah aged hens during 50 -70 weeks of age.

Treatments	AST (IU/L)	ALT (IU/L)	Testosterone (pg/ml)	T3 (ng /ml)	T4 (ng /ml)	Ratio T3/T4
T1	*58.55±7.28 ^{a}	25.22±6.32	186.17±8.22 ^{b}	1.83±0.03	12.55±2.33 ^{b}	0.146±0.04 ^{a}
T2	57.80±7.10 ^{a}	24.68±6.11	185.66±8.22 ^{b}	1.66±0.02	13.45±2.40 ^{ab}	0.123±0.03 ^{b}
T3	53.44±6.94 ^{ab}	24.75±6.11	195.22±8.40 ^{ab}	1.70±0.02	13.60±2.51 ^{ab}	0.125±0.03 ^{b}
T4	50.37±6.84 ^{ab}	23.98±6.05	224.40±8.73 ^{a}	1.82±0.03	13.95±2.71 ^{a}	0.130±0.03 ^{b}
T5	47.82±6.47 ^{b}	24.79±6.25	219.50±8.65 ^{a}	1.73±0.02	13.80±2.64 ^{ab}	0.125±0.02 ^{b}
T6	42.70±6.33 ^{c}	25.01±6.30	226.30±8.81 ^{a}	1.71±0.02	14.33±2.84 ^{a}	0.119±0.02 ^{c}
Overall mean	51.78±6.90	24.74±6.10	206.21±8.50	1.74±0.02	13.61±2.50	0.128±0.03
Significance	*	NS	*	NS	*	**

*Means within the same column with different letters differ significantly (P≤0.05).
**; (P≤ 0.001); NS = Non significant

Table (10): Effect of dietary L-carnitine and ascorbic acid supplementation on some plasma parameters of Golden Montazah aged hens during 50 - 70weeks of age.

Treatments	Cholesterol (mg/dl)	LDL (mg/dl)	HDL (mg/dl)	Total lipids (mg/dl)
T1	*135.30±5.34 ^{a}	86.85±3.22 ^{a}	48.45±1.56 ^{a}	246.77±9.11 ^{a}
T2	126.16±5.19 ^{ab}	84.55±3.19 ^{a}	41.61±1.42 ^{b}	242.80±8.75 ^{a}
T3	119.54±5.14 ^{b}	82.10±3.08 ^{ab}	37.44±1.38 ^{c}	235.92±8.63 ^{b}
T4	113.73±5.06 ^{b}	80.25±3.05 ^{ab}	33.48±1.34 ^{d}	227.80±8.37 ^{c}
T5	106.38±4.92 ^{c}	74.25±2.98 ^{b}	32.13±1.34 ^{d}	221.33.±8.50 ^{c}
T6	108.54±4.95 ^{c}	72.66±2.90 ^{b}	35.34±1.30 ^{cd}	218.51±8.20 ^{c}
Overall mean	118.28±5.10	80.11±3.00	38.08±1.40	232.19±8.60
Significance	*	*	*	*

*Means (X ± SE) within the same column with different letters differ significantly (P≤0.05).
**; (P≤ 0.001); NS = Non significant

Table (11): Effect of dietary L-carnitine and ascorbic acid supplementation on some yolk parameters of Golden Montazah aged hens during 50 -70weeks of age.

Treatments	Cholesterol (mg/g)	LDL (mg/g)	HDL (mg/g)	Total lipids (mg/g)
T1	*17.66±2.15 ^{a}	12.20±1.60 ^{a}	5.44±0.81 ^{a}	302.15±5.55 ^{a}
T2	17.24±2.11 ^{a}	12.01±1.58 ^{a}	5.23±0.76 ^{a}	298.30±5.30 ^{ab}
T3	15.50±2.05 ^{b}	11.13±1.41 ^{b}	4.37±0.65 ^{b}	284.66±5.28 ^{b}
T4	14.70±2.06 ^{b}	10.47±1.36 ^{b}	4.23±0.61 ^{b}	270.40±5.25 ^{c}
T5	15.33±2.00 ^{b}	10.74±1.39 ^{b}	4.59±0.69 ^{b}	287.55±5.30 ^{b}
T6	13.54±1.95 ^{c}	9.22±1.20 ^{c}	4.34±0.65 ^{b}	268.92±5.00 ^{c}
Overall mean	15.63±1.96	10.96±1.40	4.70±0.70	295.33±5.20
Significance	*	*	*	*

*Means (X ± SE) within the same column with different letters differ significantly (P≤0.05).
**; (P≤ 0.001); NS = Non significant

Table (12): Effect of dietary L-carnitine and ascorbic acid supplementation on antibody titters against avian Newcastle, Influenza diseases as and some immuno organs of Golden Montazah aged hens during 50 -70 weeks of age.

Treatments	Newcastle titter against	Influenza titter against	Spleen relative weight %	Thymus relative weight %
T1	*127.54±6.35 ^{c}	6.80 ±0.28 ^{b}	0.11± 0.03 ^{c}	0.04±0.01 ^{b}
T2	135.77 ±6.72 ^{b}	6.95 ±0.36 ^{b}	0.14 ± 0.01 ^{b}	0.05±0.01 ^{b}
T3	140.23 ±7.80 ^{ab}	7.62 ±0.34 ^{ab}	0.13 ± 0.02 ^{b}	0.07±0.01 ^{a}
T4	149.80 ±7.04 ^{a}	8.57 ±0.41 ^{ab}	0.14 ± 0.01 ^{b}	0.07±0.01 ^{a}
T5	152.67 ±7.55 ^{a}	8.00 ±0.47 ^{a}	0.18 ± 0.04 ^{a}	0.07±0.01 ^{a}
T6	159.59 ±7.62 ^{a}	8.74 ±0.42 ^{a}	0.17 ± 0.01 ^{a}	0.08±0.01 ^{a}
Overall mean	144.27±7.22	7.78±0.39	0.14 ± 0.01	0.07±0.01
Significance	*	*	**	**

*Means (X ± SE) within the same column with different letters differ significantly (P≤0.05).
**; (P≤ 0.001); NS = Non significant

Table (13a): Effect of dietary L-carnitine and ascorbic acid supplementation on some internal organs relative weight of Golden Montazah aged hens during 50 - 70 weeks of age.

Treatments	Blood %	Feather %	Gizzard %	Heart %	Liver %	Kidney %
T1	* 5.05±0.06	6.26±0.70	2.98±0.27^{c}	0.58±0.04^{a}	2.91±0.17^{a}	0.20±0.04^{b}
T2	5.26±0.43	6.94±0.30	3.64±0.11^{b}	0.63±0.03^{a}	1.95±0.03^{b}	0.23±0.05^{b}
T3	5.94±0.17	7.78±0.74	4.43±0.13^{a}	0.47±0.05^{b}	1.77±0.15^{b}	0.21±0.01^{b}
T4	5.22±0.16	7.23±0.18	2.52±0.06^{c}	0.48±0.04^{b}	2.42±0.21^{ab}	0.27±0.05^{a}
T5	5.48±0.28	6.81±0.13	2.81±0.25^{c}	0.50±0.07^{b}	2.02±0.23^{b}	0.26±0.03^{a}
T6	5.12±0.09	6.91±0.43	3.88±0.47^{b}	0.50±0.05^{b}	1.79±0.17^{b}	0.23±0.03^{b}
Overall mean	5.34±0.12	6.99±0.20	3.38±0.18	0.53±0.02	2.14±0.11	0.24±0.01
Significance	NS	NS	*	**	*	**

*Means (X ± SE) within the same column with different letters differ significantly (P≤0.05).
**; (P≤ 0.001); NS = Non significant

Table (13b): Effect of dietary L-carnitine and ascorbic acid supplementation on some serum parameters of Golden Montazah aged hens during 50 - 70 weeks of age.

Treatments	Abdominal fat %	Intestine %	Oviduct %	Oviduct length (cm)	Ovary %	Gallbladder %
T1	*6.28±0.28^{a}	4.97±0.12	2.23±0.18	54.00±2.08^{b}	2.55±0.67^{b}	0.01±0.01
T2	5.61±0.41^{a}	4.80±0.33	2.24±0.19	60.00±3.93^{a}	2.33±0.30^{b}	0.02±0.02
T3	3.21±0.13^{b}	4.30±0.23	2.22±0.08	51.00±7.02^{b}	2.08±0.20^{b}	0.02±0.06
T4	2.73±0.46^{b}	5.02±0.77	2.25±0.16	51.20±3.76^{b}	3.14±0.38^{a}	0.01±0.01
T5	3.23±0.20^{b}	5.59±0.30	2.45±0.18	60.00±4.62^{a}	3.12±0.40^{a}	0.02±0.02
T6	2.94±0.29^{b}	5.36±0.46	2.56±0.30	60.33±4.62^{a}	3.88±0.28^{a}	0.02±0.02
Overall mean	4.00±0.36	5.02±0.21	2.32±0.07	56.09±1.75	2.85±0.20	0.02±0.01
Significance	**	NS	NS	**	**	NS

*Means (X ± SE) within the same column with different letters differ significantly (P≤0.05).
**; (P≤ 0.001); NS = Non significant

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الملخص العربى

تأثيرات اضافة ال- كارنتين وفيتامين ج على الآداء الانتاجى والتناسلى والفسيولوجى والمناعى لدجاج المنتزة الذهبى البياض

مجدى سيد حسن حسن – صباح فاروق يوسف – نادية معوض الباهى

قسم بحوث تربية الدواجن – معهد بحوث الانتاج الحيوانى- مركز البحوث الزراعية - وزارة الزراعة واستصلاح الاراضى

أجريت هذة الدراسة فى محطة بحوث الدواجن بالفيوم حيث تم أختيار عدد ١٨٠ دجاجة + ١٨ ديك عشوائيا من عمر ٥٠ أسبوع وحتى عمر ٧٠ أسبوع وتم تقسيمهم الى ٦ معاملات تحتوى كل معاملة على ثلاث مكررات يحتوى كل مكررة على ١٠ دجاجات + ١ ديك وقسمت المجموعات على النحو التالى:

١- المجموعة الأولى كانت كنترول وكانت نسبة أضافة الكارنتين صفر ونسبة أضافة فيتامين ج صفر

٢- المجموعة الثانية لم يضاف الكارنتين وتم أضافة ١ جم فيتامين ج / كجم علف الى عليقة الكنترول

٣- المجموعة الثالثة نسبة أضافةالكارنتين ١٠٠ مجم كارنتين / كجم علف ولم يضاف فيتامين ج الى عليقة الكنترول

٤- المجموعة الرابعة نسبة أضافةالكارنتين ١٠٠ مجم كارنتين / كجم علف وتم أضافة ١ جم فيتامين ج / كجم علف الى عليقة الكنترول

٥- المجموعة الخامسة نسبة أضافةالكارنتين ٢٠٠مجم كارنتين / كجم علف ولم يضاف فيتامين ج الى عليقة الكنترول

٦- المجموعة السادسة نسبة أضافةالكارنتين ٢٠٠مجم كارنتين / كجم علف وتم أضافة ١ جم فيتامين ج / كجم علف الى عليقة الكنترول

من ناحية أخرى تم أختيار ٣٠ ديك أخرى منفصلة عن الإناث وقسمت الى ٦ مجموعات بنفس المعاملات وبمعدل ٥ ديوك لكل معاملة حيث تم التسكين فى ٦ عنابر منفصلة لدراسة صفات السائل المنوي وتقدير هرمون التستستيرون . وبالتالي كان

إجمالي العدد ١٨٠ دجاجة + ٤٨ ديك. وأستمرت المعاملات السابقة لمدة ٥ أشهر أثناء إنتاج البيض خلال فصل الصيف ، وتم تربية الدجاج تربية أرضية وتحت نفس ظروف حرارة الصيف المرتفعة حيث كانت الحرارة معظم شهور التجربة اعلى من ٣٠ درجة مئوية والتهوية والاضاءة والرطوبة النسبية والماء حر للطيور خلال فترة التجربة وتم أخذ القياسات الآتية :

- تم اخذ وزن الجسم واستهلاك العلف كل شهر و تم اخذ وزن البيض و عدده يوميا ثم حسب كتلة البيض شهريا من بداية حتى نهاية التجربة.وتم تقدير صفات جودة البيض الداخلية والخارجية لعدد ١٢٠ بيضة بمعدل (١٠ بيضة × ٦ معاملات × ٢فترة) على عمر٥٤ ، ٦٤ أسبوع .

- عند عمر٧٠ أسبوع تم اخذ عدد١٨عينة صفار بيض لتقدير الكوليستيرول و LDLو HDL والدهون الكلية.

وتم تقدير جودة السائل المنوي بأخذ عينات من الديوك المنعزلة عن الإناث على عمر ٧٠ أسبوع من عدد ٣ ديوك من كل معاملة و فحص صفات السائل المنوي (الحجم، التركيز، العدد الكلي، درجة الحموضة، الحركة).

وتم تفريخ عدد ٤٨٠ بيضة يتم تفريخها بالمحطة (٤٠ بيضة × ٦ معاملات × ٢ دفعة تفريخ) لدراسة نسب الخصوبة والتفريخ و النفوق الجنيني ، الأوضاع الجنينية الشاذة. وتم تسجيل درجة حرارة الجسم ومعدل التنفس للطيور شهريا.

- عند عمر ٧٠ أسبوع اثناء الذبح تم أخذ عينات دم لتقدير كلا من الكالسيوم و الفوسفور والبروتين الكلى والالبيومين وهرمونات التستستيرون وT4 و T3 وأنزيمات ALT, AST بالدم والكولستيرول و LDLو HDL والدهون الكلية في كل معاملة بأجمالى ٣٠ عينة. تم تقدير الاستجابة المناعية ضد مرضى النيوكاسيل وأنفلونزا الطيور. وتم ذبح عدد ٥ دجاجة من كل معاملة مع أخذ وزن الأعضاء الداخلية والأعضاء المسئولة على المناعة وتقدير نسبة دهن البطن

وكانت أهم نتائج هذة الدراسة :

- نقص كلا من وزن الجسم النهائى ووزن الجسم المكتسب وتحسن معامل التحويل الغذائى فى المجاميع التى اخذت الكارنتين فقط أو مع وجود فيتامين ج بالمقارنة بالمجموعة الكنترول.

- أدى أضافة ال- كارنتين بصورة فردية او مع اضافة فيتامين ج الى العليقة الى زيادة عدد وكتلة البيض ونسبة الانتاج بالمقارنة بعليقة الكنترول ، بينما وزن البيض زاد بواسطة أضافة ال- كارنتين مع اضافة فيتامين ج الى العليقة بالمقارنة ببافى المجاميع .

- ادى اضافة كلا من الكارنتين أو فيتامين ج منفردة الى العليقة الى تحسين جودة البيض وزاد التحسن عند اضافتهما معا بالمقارنة بعليقة الكنترول.

- زادت نسبة كلا من الفقس والخصوبة وتحسنت مواصفات السائل المنوى وجودتة مع زيادة نسبة الكارنتين فى وجود فيتامين ج بالعليقة بالمقارنة لعليقة الكنترول .

- لم تتأثر درجة حرارة الجسم ونقص معدل التنفس بأضافة ال -كارنتين بصورة فردية او مع اضافة فيتامين ج بالمقارنة بالعليقة الكنترول.

- زاد مستوى كلا من الكالسيوم والفوسفور والبروتين الكلى والجلوبيولين بالدم عند اضافة الكارنتين منفردا او مع فيتامين ج بالمقارنة بمجموعة الكنترول .

- زاد مستوى كلا من هرمونT4 وهرمون التستستيرون بالدم بزيادة نسبة الكارنتين بالعليقة وزادت فى وجود فيتامين ج بالعليقة بالمقارنة بعليقة الكنترول ، ولم يتاثر هرمون T3 والنسبة بين هرمونات الدرقية لا بالكارنتين ولابوجود فيتامين ج بالعليقة.

- لم يتاثر كلا من أنزيم ALT بالدم لا بوجود الكارنتين ولا بوجود فيتامين ج بالعليقة ونقص مستوى أنزيم AST بوجود الكارنتين منفردا او مع فيتامين ج بالعليقة بالمقارنة بمجموعة الكنترول .

- أدى اضافة الكارنتين وفيتامين ج الى العليقة منفردة او معا الى نقص نسب كلا من الكوليستيرول و LDL و HDL والدهون الكلية فى كلا من الدم وصفار البيض وزاد النقص بزيادة نسبة الكارنتين بالعليقة بالمقارنة بمجموعة الكنترول.

- زادت الاستجابة المناعية ضد مرضى النيوكاسيل وأنفلونزا الطيور فى كل المعاملات التى احتوت على الكارنتين وفيتامين ج بصورة منفردة او متجمعة بالمقارنة بمجموعة الكنترول .

- زاد الوزن النسبى للاعضاء المناعية لكلا من الطحال والغدة الثيموثية وكذلك زاد الوزن النسبى للمبيض وطول قناة المبيض وقل الوزن النسبى لدهن البطن والكبد والقلب بزيادة الكارنتين مع وجود فيتامين ج بالمقارنة بمجموعة الكنترول ،ولم يتاثرباقى الاعضاء الداخلية لا بوجود الكارنتين ولا فيتامين ج .

توصى الدراسة بأهمية اضافة ١٠٠أو ٢٠٠ مجم ال- كارنتين / كجم عليقة + ١ جم حمض الاسكوربيك / كجم عليقة حيث أدت الاضافة الى تحسين الأداء الانتاجى والتناسلى و الفسيولوجى والمناعى و اضافة ٢٠٠ مجم ال- كارنتين + ١ جم حمض الاسكوربيك / كجم اعطى أفضل النتائج لدجاج المنتزة الذهبى البياض على عمر ٥٠ - ٧٠ أسبوع مما يعود على المربى بزيادة العائد من التربية أثناء موسم الصيف .