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# EFFECT OF L-CARNITINE ADMINISTRATION ON GROWTH PERFORMANCE, RUMEN AND BLOOD PARAMETERS AND CARCASS TRAITS OF GROWING Rahmani LAMBS

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## ABSTRACT

The current study was carried out at Animal Experimental Station and the Laboratory of Physiology and Biotechnology, belonging to the Animal Production Department, Faculty of Agriculture, Mansoura University, during the period from September to December 2014. The aim of this experiment is to study the effect of daily oral administration of free L-canitine (LC) at two levels (350 and 700 mg/h/d) during an experimental period of 63 days on growth performance, rumen and blood parameters, and carcass quality of growing Rahmani lambs. A total of nine Rahmani lambs weighing 33.9±0.69 kg and about 10 months old were assigned according to body weight into 3 groups which were then assigned at random to receive the three experimental treatments. Animals in the 1st group (G1) were fed the control diet (14.4% CP). The 2nd and 3rd groups were fed the same diet, but orally treated with LC at levels of 350 (G2) and 700 (G3) mg/h/d for 63 days as an experimental period. Growth performance parameters, rumen and blood parameters at slaughter and carcass traits were determined. The obtained results revealed that overall feed intake by lambs in G2 and G3 was reduced by about 2.4 and 6.1% as compared to the controls during the whole feeding period. Live body weight of lambs in G2 and G3 was slightly lighter than that in the control group during all intervals of the experimental period. Averages of total and daily body gains of lambs were not significantly affected by LC treatment, although total gain was slightly higher in G2 and slightly lower in G3 than in G1. Feed conversion was almost the best in G2 than in G3 and G1 during feeding intervals or during the experimental period. Ruminal pH value and $NH_3$-N concentration decreased ($P<0.05$) in G2 as compared to that in G1, being 6.88 and 8.88 mg/dl, and 7.2 and 17.77 mg/dl, respectively. However, pH value and $NH_3$-N concentration insignificantly decreased to 7.06 and 13.62 mg/dl in G3, but did not differ significantly from those in G2 and G1. Total VFA's concentration in rumen liquor increased ($P<0.05$) by about 34.7% in G3 as compared to G1. While, nearly similar VFA's concentration was obtained for G2 and G1 (16.33 mEqui./dl). Only concentration of total proteins in blood plasma decreased ($P<0.05$) in G2, while triglycerides concentration decreased ($P<0.05$) in G2 and G3 by about 52.6 and 50.3% as compared to G1, respectively. Concentration of thyroid hormone (T3) insignificantly increased in G2 and G3 (1.95 and 1.68 ng/ml) as compared to 1.6 ng/ml in G1, respectively. The LC had no effect on urea-N concentration in blood plasma. Carcass traits were not significantly affected by LC treatment, although there was an increase in dressing percentage of lambs in both treatment groups (G2 and G3, being 48.13 and 50.94% as compared to 47.93% in the control lambs, respectively. It could be concluded that LC treatment slightly improved feed conversion as a result of improving rumen parameters.

**Keywords:** Lambs, L- Carnitine, growth, rumen parameters, blood, carcass.

## INTRODUCTION

Carnitine can be synthesized in the animal body from protein-bound lysine and methionine, being in the form of L-carnitine and D-carnitine, but biologically the active form is L-carnitine (Vaz and Wanders, 2002). L-carnitine (*β*-hydroxy-*γ*-trimethylammonium butyrate) is vitamin-like amino acid as a polar natural compound (Groff and Gropper, 2000). It play an important role in the cellular detoxification (Arrigoni-Martelli and Caso, 2001) and in lipid metabolism by carrying long-chain fatty acids to the mitochondria for β-oxidation to produce ATP required for cell function (Hoppel, 2003). In addition, it is also important as antioxidant for protection of the cell membranes against oxidative damages (Kalaiselvi and Panneerselvam, 1998).

Despite some studies indicated that supplemental LC in the diet is not required, it's use is recommended in domestic animals to increase performance and to support medical treatment (La Count *et al*., 1995). In addition, some other studies indicated that dietary supplementation with L-carnitine (20 to 500 mg/kg diet) raised L-carnitine level in blood plasma, liver and milk of ruminants (La Count *et al.*, 1995). It also increases growth performance (Carlson *et al.,* 2006) by improving apparent digestibility of lipid, energy and fatty acids (La Count *et al*., 1995) and enhanced digestibility of most nutrients and rumen fermentation (Sherief, 2014).

There are scant information in the literature regarding the effect of L-carnitine on growth performance and carcass traits of local Egyptian sheep. Therefore, this experiment aimed to study the effect of daily oral treatment of free L-canitine at two levels (350 and 700 mg/h/d) during an experimental period of 63 days on growth performance, rumen and blood parameters, and carcass quality of growing Rahmani lambs.

## MATERIALS AND METHODS

The current study was carried out at Animal Experimental Station and the Laboratory of Physiology and Biotechnology, belonging to the Animal Production Department, Faculty of Agriculture, Mansoura University, during the period from September to December 2014.

**Animals:**

A total number of 9 Rahmani lambs (averaged 33.9±0.69 kg live body weight and about 10 mo old) was purchased from the flock of El-Serw Experimental Station, belonging to Animal Production Research Institute. Animals were assigned into 3 groups similar in LBW and age (3 animals in each). The 3 groups were assigned at random to receive 3 experimental dietary treatments. Animals in the 1$^{st}$ group (G1) were fed a control diet without any treatments. In the 2$^{nd}$ and 3$^{rd}$ groups, animals were fed the same diet, but orally dosed with L-carnitine at levels of 350 (G2) and 700 (G3) mg/h/d for 63 days as treatment period, respectively. The experimental animals of each treatment were kept in semi-open pen and were maintained under the same environmental and managerial conditions.

**Feeding system:**

Animals were group fed on a basal diet including concentrate feed mixture (CFM), berseem hay (BH). The CFM contained 50% barely, 32% ground yellow corn, 15% soybean meal, 1% limestone, 1% vitamins and minerals and 1% common salt. Based on the chemical analysis, the basal ration contained 91.5% DM, 14.39% CP, 4.5% CF, 0.50% EE, 67.61% NFE and 4.50% ash, while BH contained 88.5% DM, 14.59% CP, 38% CF, 0.50% EE, 25.41% NFE and 10% ash.

Prior to the beginning of the experiment, lambs were fed hay and concentrate feed mixture (CFM) *ad libitum* for at least 2 weeks, as an adaptation period. After that, lambs were fed on adjusted amount of hay (750 g/h) and CFM (750 g/h). Amounts of feeds were then adjusted every 2 weeks according to body weight to reach 1.5 kg hay and 1.2 kg CFM at the end of the experimental period.

**Experimental procedures**

**Growth performance parameters:**

Live body weight of lambs were individually recorded at the beginning of the experiment, and on days 21, 42 and 63 (end of the experimental period), then total and average daily gain were calculated.

**Slaughter and carcass traits:**

At the end of the experiment (63 days), all lambs were slaughtered after fasting for about 12 h. Pre-slaughter weight, net carcass weight, and weights of internal organs, head, skin and legs were recorded, then dressing percentage was calculated.

**Rumen liquor samples:**

Rumen liquor samples were collected at the end of the experiment after slaughter from all animals in each group. All animals were fasted for 12-14 h before slaughtering. Rumen contents were collected and filtered through double layers of cheese cloth. Rumen pH value was immediately determined using Orian 680 digital pH meter, then samples were stored in dry clean glass bottles with added 2 drops of mercuric chloride and kept in a deep freezer for later chemical analysis. The concentration of total VFA's was determined in rumen liquor samples by the steam distillation method (Warner, 1964) using markham micro-distillation apparatus. The concentration of $NH_3$-N was determined using saturated solution of magnesium oxide distillation according to AOAC (1990).

**Blood sampling:**

Blood samples were collected from all animals at the end of the experimental period into dry clean glass heparinized tubes. The collected blood samples were centrifuged at 3000 rpm for 15 min. to separate blood plasma, which was stored at -20$^{o}$C till analyses to determine concentrations of some biochemical and hormones in blood plasma. Biochemical blood parameters in plasma were determined calorimetrically using commercial kits (diagnostic system laboratories, INC, USA) and spectrophotometer. Concentrations of total proteins, total cholesterol, triglycerides, high (HDL) and low (LDL) density lipoproteins, and urea nitrogen, as well as concentration of hormones triiodothyronine (T3) and tetraiodothyronine

(Thyroxin, T4) were determined by Eliza Kit as methods described by manufactured company (Mono bind Inc, USA).

**Statistical analysis:**

Data were statistically analyzed by the one way analysis of variance using the General Linear Model procedures of SAS (2004). Duncan multiple range test was used to test the differences among means (Duncan, 1955) at $P<0.05$.

## RESULTS AND DISCUSSION

**Growth performance parameters of lambs:**

**Feed consumption:**

Average total feed intakes by lambs during different intervals of the experimental feeding period (63 days) are presented in Table 1. Results revealed that feed intake from the concentrate feed mixture and berssem hay as a whole diet showed some differences between both treatment groups (G2 and G3) as compared to the control group (G1). Lambs in treatment groups decreased their feed intake at different feeding intervals as compared to the control group, but the rate of decrease was marked for lambs in G3 than in those in G2. As overall, lambs in G2 and G3 reduced their feed consumption by about 2.4 and 6.1% as compared to the controls during the whole feeding period. This means that increasing LC dose from 350 to 700 mg/h/d resulted in reducing feed intake of lambs.

In contrary, Noseir *et al*. (2003) found that DM and TDN intakes were significantly greater with LC administration during the first 2 months of postpartum period in multiparous buffalo cows. Similarly, Newton and Haydon (1988 and 1989) found that weanling animals fed diet supplemented with LC had increased feed intake. Recently, Sherief (2014) found that feed intake as DM, TDN and DCP was significantly ($P<0.05$) higher for bulls treated with 2 g LC/h/d than in the control group, while those treated with 1 g LC/h/d did not significantly differ from that in both groups.

**Table 1: Effect of L-carnitine on feed consumption (kg) of lambs during different feeding intervals.**

| Interval | Control (G1) | L–Carnitine level | |
|---|---|---|---|
| | | 350 mg (G2) | 700 mg (G3) |
| Feed amount (kg/group): | | | |
| 0 ~ 21 days | 130.0 | 120.9 | 128.3 |
| 21 ~ 42 days | 170.7 | 169.2 | 166.2 |
| 42 ~ 63 days | 152.0 | 151.8 | 130.6 |
| 0 ~ 63 days | 452.7 | 441.9 | 425.2 |

**Live body weight:**

Averages of live body weight (LBW) of lambs at different feeding intervals of the experimental period are presented in Table 2. Results show that LBW of lambs was not significantly affected by LC treatment. Despite these small differences, lambs in treatment groups tended to be slightly

lighter than those in the control group during all intervals of the experimental period.

These results revealed that LC treatment at levels of 350 and 700 mg/h/d did not improve LBW of lambs. Such results may be attributed to LC treatment level, being lower doses. In this respect, Sherief (2014) found significant (P<0.05) improvement in LBW of bulls treated with 2 g LC/h/d, but LC treatment at lower level (1 g/h/d) had no significant effect on LBW.

**Table 2: Effect of L-carnitine on live body weight (kg) of lambs during different feeding intervals.**

| Item | Control (G1) | L–carnitine level | | ±SEM |
|---|---|---|---|---|
| | | 350 mg (G2) | 700 mg (G3) | |
| Average live body weight (kg): | | | | |
| Initial weight | 33.26 | 32.70 | 33.33 | 0.48 |
| At 21 days | 37.60 | 36.86 | 37.33 | 0.84 |
| At 42 days | 43.70 | 42.83 | 42.36 | 1.15 |
| At 63 days (final weight ) | 48.10 | 47.96 | 46.60 | 0.57 |

**Body weight gain:**

Average weight gain as total weight gain (TWG) and daily gain (ADG) of lambs at different feeding intervals of the experimental period is presented in Table 3. Results show that TWG and ADG of lambs were not significantly affected by LC treatment, although TWG was slightly higher in lambs treated 350 mg LC/h/d (G2) and slightly lower in those treated with 700 mg LC/h/d (G3) than in the controls (G1).

It is of interest to note that ADG showed inconsistent trend of differences among the experimental groups, being lower in treatment groups than in the control one at the first and second feeding intervals (0~ 21 or 21~ 42 days). However, at the following intervals (42~ 63 d) or during the whole feeding period, lambs treated with 350 mg LC/h/d (G2) showed slightly higher ADG than the control lambs, while those in G3 treated with 700 mg LC/h/d showed the lowest ADG, being lower than the control lambs. However, all differences in TWG and ADG were not significant.

**Table 3: Effect of L-carnitine on total and daily weight gain (kg) of lambs during different feeding intervals.**

| Item | Control (G1) | L–carnitine level | | ±SEM |
|---|---|---|---|---|
| | | 350 mg (G2) | 700 mg (G3) | |
| Total weight gain (kg/63 days) | 14.83 | 15.26 | 13.26 | 0.73 |
| Average daily gain (g/h/d): | | | | |
| 0 ~ 21days | 206.35 | 198.41 | 190.47 | 30.03 |
| 21~ 42 days | 290.47 | 284.12 | 239.68 | 46.75 |
| 42~ 63 days | 209.52 | 244.44 | 201.58 | 54.29 |
| 0 ~ 63 days | 235.45 | 242.32 | 210.58 | 11.63 |

In disagreement with the present results, Sherief (2014) found significant (P<0.05) improvement in TWG and ADG. Bulls treated with 2 g LC/h/d showed significantly (P<0.05) the highest TWG and ADG as compared to those treated with 1 g LC/h/d and control bulls. Also, Weeden *et*

*al.* (1990) found that dietary LC supplementation increased weight gain of weaning pigs.

These results revealed that LC treatment at levels of 350 or 700 mg/h/d failed to induce significant increase in weight gain of lambs during the experimental period. Such results may be attributed to LC treatment level, being lower doses.

**Feed conversion ratio:**

Feed conversion ratio (FCR) of lambs at different feeding intervals of the experimental period is presented in Table 4. Results show that FCR was almost the best for lambs treated with 350 mg LC than those treated with high LC dose of the control lambs during feeding intervals or during the experimental period, but these differences were not tested statistically, because feed intake was in group.

**Table 4: Effect of L-carnitine on feed conversion ratio of lambs during different feeding intervals.**

| Interval | Control (G1) | L–carnitine level | |
|---|---|---|---|
| | | 350 mg (G2) | 700 mg (G3) |
| Feed conversion ratio (feed intake (kg)/kg gain): | | | |
| 0 ~ 21days | 10.00 | 9.67 | 10.69 |
| 21~ 42 days | 9.33 | 9.45 | 11.01 |
| 42~ 63 days | 11.52 | 9.86 | 10.28 |
| 0 ~ 63 days | 10.17 | 9.65 | 10.68 |

In agreement with the present results regarding FCR of lambs treated with 350 mg LC/h/d, supplemental LC in diet of weaning pigs (Weeden et al., 1990). Also, Owen *et al.* (1996) reported that adding up to 1,000 ppm of carnitine to nursery pig diets containing soybean oil (SBO) improved feed efficiency 3 to 5 wk post weaning. On the other hand, Sherief (2014) reported that LC treatment at a level of 1 or 2 g/h/d significantly ($P<0.05$) improved FCR of bulls. Yavuz *et al*. (1997) and White *et al*. (1998) reported that LC and various protein sources decreased gain: feed ratio in Holstein calves fed broiler litter and LC. Also, Greenwood *et al*., (2001) found that oral dose of LC (2 g LC/d) had no effect on average daily gain and feed conversion ratio of growing and finishing steers.

Researchers hypothesized that supplementing animals with carnitine during the weaning period may help the animals to reap more benefits from their high energy diets (Rincker *et al*., 2001). This finding was indicating for growing lambs treated with 350 mg LC/h/d in this study.

Generally, the reported trends regarding growth performance parameters in comparison with the present results on lambs may indicate that LC treatment may be affected by treated species, age at treatment as well as dose and type of LC administration.

**Rumen liquor parameters:**

Rumen liquor parameters, including pH value, and concentrations of total volatile fatty acids (TVFA) and ammonia-nitrogen ($NH_3$-N) in rumen liquor (RL) of lambs, taken at slaughter (post-12 h fasting) are presented in Table 5. Results show that only ruminal pH value and $NH_3$-N concentration were

significantly (P<0.05) affected by LC treatment. Ruminal pH value and $NH_3$-N concentration significantly (P<0.05) decreased in G2 as compared to that in G1(control), being 6.88 and 8.88 mg/dl, and 7.2 and 17.77 mg/dl, respectively. However, pH value and $NH_3$-N concentration insignificantly decreased to 7.06 and 13.62 mg/dl in G3, but did not differ significantly from that in G2 and G1.

In addition, TVFAs concentration in RL significantly (P<0.05) increased by about 34.7% in G3 as compared to G1 (control). While, nearly similar $NH_3$-N concentration was obtained for G2 and G1 (16.33 mEqui./dl).

The present results indicated that LC treatment at level of 700 mg/h/d significantly (P<0.05) increased TVFA concentration and insignificantly decreased pH value and $NH_3$-N concentration in RL, although LC treatment at a level of 350 mg/h/d decreased pH value and NH3-N (significantly, P<0.05) without significant (P<0.05) effect on TVFAs concentration. Such results may be attributed to $NH_3$-N concentration in each group, being markedly lower in G2 and with less degree in G3.

**Table 5: Effect of L-carnitine on rumen liquor parameters of lambs at slaughter.**

| Item | Control (G1) | L–carnitine level /h/d | | ±SEM |
|---|---|---|---|---|
| | | 350 mg (G2) | 700 mg (G3) | |
| Rumen parameters: | | | | |
| pH value | 7.20[a] | 6.88[b] | 7.06[ab] | 0.05 |
| TVFAs (mEq/dl RL) | 16.33[b] | 16.33[b] | 22.00[a] | 1.64 |
| Ammonia-N (mg/dl RL) | 17.77[a] | 8.88[b] | 13.62[ab] | 1.87 |

**a and b: Means denoted within the same row with different superscripts are significantly different at P<0.05. TVFAs: Total volatile fatty acids.**

In accordance with the present results, Bunting *et al*. (2002) reported that rumen TVFAs concentration did not differ in Holstein calves fed supplemental LC from those fed the control diets. Also, La Count *et al*. (1996) observed that ruminal proportions of the major VFA were not affected when graded levels of LC were fed up to a maximum of 300 ppm of diet. However, La Count *et al*. (1995) reported that TVFA concentration and molar proportions of propionate tended to increase, and molar proportions of acetate tended to decrease, in cows fed supplemental LC. These effects were attributed to potential effects on DM intake and carbohydrate supply than to direct changes in ruminal biochemistry.

In agreement with the obtained results, White *et al*. (2001) showed a decrease in ruminal $NH_3$-N concentration in grazing calves fed a molasses-urea based liquid supplement with LC. However, Morris *et al*., (1998) found that oral administration (1 g/day) of an LC solution in mature ewes for 10 days did not affect ruminal $NH_3$-N concentrations. However, several authors indicated an opposite trend (La Count *et al*., 1995 and 1996; Fernandez *et al*., 1997).

It is well known that ruminal pH value is the most important factor affecting microbial fermentation and function of microorganisms in the rumen (Prasad *et al*., 1972). The optimal pH value for the maximal activity of photolytic microorganisms ranged between 6 and 7 (Abou-Akkada and Blackbrum, 1963). However, the maximum activity of cellulolytic

microorganisms can be noticed near the neutral pH value (Mehrez *et al*., 1977 and Ganev *et al*., 1979).

In contrast to the current study, many authors found that pH value of ruminal fluid was higher in lambs fed LC containing diets and ruminants fed diets containing as affected by LC (Kertz *et al*., 1982 and Fernandez *et al*., 1997). It should be stressed that rumen liquor parameters are greatly influenced by time of sampling and type of basal diet which can help in explaining variations in different studies.

**Blood metabolites and thyroid hormones:**

Blood metabolites, including concentration of total protein (TP), total cholesterol (TC), triglycerides (TG), high (HDL) and low (LDL) density lipoproteins, and urea-nitrogen (UN) as well as concentration of thyroid hormones (T3 and T4) in blood of lambs, taken at the end of experimental period (day 63) are presented in Table 6. Results show that only concentration of TP and TG were significantly (P<0.05) affected by LC treatment. However, other metabolites and thyroid hormones concentrations were not affected by LC treatment.

**Table 6: Effect of L-carnitine on some biochemicals and thyroid hormones in blood plasma of lambs at slaughter.**

| Item | Control (G1) | L–carnitine level /h/d | | ±SEM |
|---|---|---|---|---|
| | | 350 mg (G2) | 700 mg (G3) | |
| Blood plasma metabolites: | | | | |
| Total protein (g/dl) | 6.68 [a] | 6.32 [ab] | 6.05 [b] | 0.14 |
| Total cholesterol (mg/dl) | 52.55 | 54.12 | 48.05 | 2.68 |
| Triglycerides (mg/dl) | 37.75 [a] | 17.90 [b] | 18.77 [b] | 2.24 |
| HDL (mg/dl) | 18.17 | 18.53 | 13.03 | 1.70 |
| LDL (mg/dl) | 26.83 | 32.00 | 31.26 | 3.10 |
| Urea nitrogen (mg/dl) | 50.92 | 46.55 | 49.17 | 3.11 |
| T3 (ng/ml) | 1.60 | 1.95 | 1.68 | 0.11 |
| T4 (ng/ml) | 11.38 | 10.25 | 8.53 | 2.29 |

**a and b: Means denoted within the same row with different superscripts are significantly different at P<0.05.**

Concentration of TP significantly (P<0.05) decreased only in G2, while TG concentration significantly (P<0.05) decreased in G2 and G3 by about 52.6 and 50.3% as compared to G1 (control), respectively. It is of interest to note that T3 concentration increased in G2 and G3 (1.95 and 1.68 ng/ml) as compared to 1.6 ng/ml in G1, respectively.

In agreement with the present results, Sherief (2014) reported that LC treatment significantly (P<0.05) increased concentration of total protein (TP) as a result of significant (P<0.05) increase in globulin (GL) and insignificant increase in albumin (AL) concentrations. Other authors found that serum AL concentration of lambs was not significantly affected by carnitine treatment (Chapa *et al*., 1998) or in cows (Carlson *et al*., 2007), however, Citil *et al*. (2009) observed an increased amount of AL in blood samples of carnitine treated ewes.

Several reports found that LC supplementation could influence lipid metabolism (Heo *et al*., 2000) and LC treatment decreased tissue lipid content (Chen *et al*., 2008). This effect of LC could be associated with stimulation of lipid metabolism through transfer of acyl groups across the mitochondrial membranes (Owen *et al*., 1996). The present results indicated significant (P<0.05) reduction in TC and TG concentrations in blood plasma of lambs (Table 6) as also reported in bulls by Sherief (2014). Similarly, Citil *et al*. (2009) reported that oral carnitine treatment in healthy suckled ewes resulted in alterations in TG and TC, which are indicators of energy metabolism. Addition of 500 mg carnitine to ewe diet led to a reduction in serum TC level. Similar results were reported by Kellog and Miller (1977). Supplementation of LC reduced the concentration of TG in blood plasma (Hausenblasz *et al.,* 1996), because it lowered esterification rate of palmitate to triglycerides (Drackley *et al*., 1991 a and b), which showed the essential role of LC for fatty acid oxidation in ruminant liver.

L-carnitine administration did not induce statistically significant changes in blood serum concentrations of TC, and HDL.

The present results in Table 6 also showed that LC had no effect on urea-N concentration in lamb plasma. In the same line, Rincker *et al*. (2003) observed no difference in urea-N in weanling pigs fed added LC. However, others reported that LC addition (500 mg) to ewe diet led to a reduction in serum urea level (Citil *et al*., 2009).

**Carcass traits:**

Carcass traits, including weights of net carcass, head, legs, skin- wool and dressing percentage of lambs are presented in Table 7. Results revealed that all carcass traits studied were not affected significantly by LC treatment, although there was an increase in dressing percentage of lambs in both treatment groups (G2 and G3, being 48.13 and 50.94% as compared to 47.93% in the control lambs, respectively. The observed tendency of increasing dressing percentage in lambs of both treatment groups in spite decreasing their net carcass weight may attributed to tendency of reduction in weight of head and skin-wool relative to pre-slaughter weight

**Table 7: Effect of L-carnitine on carcass traits of lambs at slaughter.**

| Item | | Control (G1) | L–carnitine level /h/d | | ±SEM |
|---|---|---|---|---|---|
| | | | 350 mg (G2) | 700 mg (G3) | |
| Pre-slaughter weight (kg) | | 48.23 | 47.10 | 45 | 0.75 |
| Carcass net weight (kg) | | 23.10 | 22.67 | 22.97 | 0.96 |
| Head | Weight (kg) | 3.57 | 3.49 | 3.05 | 0.21 |
| | Relative weight (%) | 7.37 | 7.38 | 6.78 | 0.39 |
| Legs | Weight (kg) | 1.17 | 1.13 | 1.12 | 0.02 |
| | Relative weight (%) | 2.34 | 2.47 | 2.50 | 0.08 |
| Skin-wool | Weight (kg) | 7.42 | 6.56 | 6.42 | 0.23 |
| | Relative weight (%) | 15.43 | 14.57 | 13.64 | 0.48 |
| Dressing (%) | | 47.93 | 48.13 | 50.94 | 1.57 |

Some researches indicated decrease in weight of body fat and increase in weight of body muscle as affected by LC. In this respect, oral LC supplements increased the LC content in lean muscle (Benevenga *et al*., 1989; Iben and Meinart, 1997) and can result in greater lean muscle deposition and reduced back fat thickness (Owen *et al.,* 1993 and 2001 a and b).

## CONCLUSIONS

It could be concluded that LC treatment slightly improved feed conversion as a result of improving rumen parameters.

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## تاثير تجريع الـكارنتين على الأداء الإنتاجي, قياسات سائل الكرش والدم، وصفات الذبيحة في الأغنام الرحماني النامية

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أجريت هذه الدراسة في وحدة بحوث الإنتاج الحيواني ومعمل الفسيولوجى والتكنولوجيا الحيوية التابعين لقسم إنتاج الحيوان - كلية الزراعة - جامعة المنصورة خلال الفترة من سبتمبر(أيلول) الى ديسمبر(كانون الأول)٢٠١٤م.

كان الهدف من هذه التجربة دراسة تأثير تجريع الـ- كارنتين بـ تركيزين( ٣٥٠,٧٠٠ ملغرام/يوم/حيوان) خلال فترة التجربة (٦٣يوم)على الأداء الإنتاجي, قياسات سائل الكرش والدم, وصفات الذبيحة للأغنام الرحماني النامية.

استخدم في هذه التجربة ٩حملان رحماني بمتوسط وزن (٣٣,٩±٠,٦٩كغم) وعمر١٠شهور ووزعت الحيوانات عشوائيا الى ثلاث مجموعات. غذيت الحيوانات في المجموعة الأولى (G1) على العليقة القياسية (١٤,٤% بروتين خام). بينما في المجموعة الثانية والثالثة غذيت الحيوانات على نفس العليقة ولكن عوملت بالـكارنتين بالتجريع عن طريق الفم بتركيزين ٣٥٠ملغرام (G2) و ٧٠٠ ملغرام (G3) لكل حيوان في اليوم طول مدة التجربة ٦٣ يوم كفترة تجريبية .

تم دراسة الأداء الإنتاجي، وقياسات سائل الكرش (درجة الحموضة pH– تركيز الامونيا $NH_3$-N – تركيز الأحماض الدهنية الطيارة VFA) وصفات الدم (الكوليسترول – الجلسريدات الثلاثية – الدهون عالية الكثافة – الدهون المنخفضة الكثافة – البروتين الكلي – هرمون الثيرونين

ثلاثي اليود – هرمون الثيروكسين – نتروجين الأمونيا) وصفات الذبيحة (الذبيحة – الرأس– الأطراف – الجلد والصوف – نسبة التصافي) .

اشارت النتائج إلى تناقص معدل الغذاء الكلي المأكول في حملان المجموعة الثانية والثالثة بمعدل (٢,٤ و ٦,١%) على التوالي بالمقارنة بالمجموعة القياسية وذلك خلال الفترة التجريبية الكلية . كان معدل وزن الجسم الحي في حملان المجموعة الثانية والثالثة اخف بدرجة طفيفة عن المجموعة القياسية للفترات التجريبية المختلفة (٠-٢١, ٢١-٤٢, ٤٢-٦٣, ٠-٦٣ يوم).

لم يتأثر متوسط الوزن المكتسب الكلي واليومي معنويا بالمعاملة بالـكارنتين وبرغم من ذلك كان الوزن المكتسب الكلي اعلى بدرجة طفيفة في المجموعة الثانية واقل بدرجة طفيفة في المجموعة الثالثة عن المجموعة القياسية. كان احسن معدل تحويل غذائي في المجموعة الثانية بالمقارنة بالمجموعة الثالثة والقياسية خلال فترات التغذية او خلال الفترة التجريبية الكلية.

تناقصت درجة حموضة الكرش وتركيز نتروجين الامونيا معنويا في المجموعة الثانية بالمقارنة مع المجموعة الأولى حيث كانت (٦,٨٨ و٨,٨٨ ملغرام/١٠٠مل) و(٧,٢ و ١٧,٧٧ ملغرام/١٠٠مل) على التوالي. أيضاً تناقصت درجة الحموضة وتركيز نتروجين الامونيا الى (٧,٠٦ و١٣,٦٢ ملغرام/١٠٠مل) في المجموعة الثالثة وكان هذا التناقص غير معنوي بالمقارنة مع المجموعة الثانية والأولى.

زاد تركيز الاحماض الدهنية الطيارة في سائل الكرش معنويا بحوالى ٣٧,٧% في المجموعة الثالثة بالمقارنة مع المجموعة الأولى , بينما كان تركيز الاحماض الدهنية الطيارة متشابه في كل من المجموعة الثانية والأولى (١٦,٣٣ ملمكافئ/١٠٠مل).

تناقص البروتين الكلي في بلازما الدم معنويا في المجموعة الثانية، بينما تناقص تركيز الجلسريدات الثلاثية معنويا بحوالي ٥٢,٦ % و ٥٠,٣% على التوالي بالمقارنة مع المجموعة القياسية. زاد تركيز هرمون التيروزين الثلاثي اليود زيادة غير معنوية في المجموعة الثانية والثالثة ( ١,٩٥ و١,٦٨نانوغرام /مل) بالمقارنة بالمجموعة القياسية (١,٦ نانوغرام/مل) على التوالي. ولم يكن هنالك تأثير للـ الـ- كارنتين على تركيز نتروجين اليوريا في بلازما الدم للحملان النامية.

لم تتأثر صفات الذبيحة معنويا بالمعاملة بالـكارنتين وبالرغم من ذلك كان هنالك زيادة غير معنوية لنسبة التصافي للحملان في المجموعة الثانية والثالثة حيث كانت ٤٨,١٣% و ٥٠,٩٤% بالمقارنة مع المجموعة القياسية ٤٧,٩٣% على التوالي.

نستخلص من هذه النتائج أن المعاملة بالـكارنتين حسنت بدرجة طفيفة من معدل التحويل الغذائي كنتيجة لتحسين قياسات سائل الكرش.

**الكلمات المفتاحية:** الحملان، الـ- كارنتين، النمو، سائل الكرش، الدم، الذبيحة.