

EFFECT OF ADDITIVE LYCOPENE POWDER ON DIETS AND /OR VITAMINS AD₃E ON PHYSIOLOGICAL TRAITS IN AWASSI MALE LAMBS.

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Abstract

This study was designed to evaluate the effect of Lycopene powder and /or vitamins AD₃E adding to growing Awassi Male Lambs on blood physiological traits.

Twenty healthy Awassi Male Lambs were selected for this study at approximately (4-5) month of age and average body weight (BW) of 19 kg and were reared in the livestock farm, experimental feeding was continued from 3/12/2019 to 2/3/2020 in addition to 15 day as adaptation period.

After adaptation period, lambs were randomly divided into four groups (5 lambs/group), The first group used as a control with no treatment, the second group received orally a solution of mixed vitamins (AD₃E) (A 20.000 IU, vitamin D₃ 10.000 IU and vitamin E 60 mg /lamb) biweekly, the third group, used Lycopene powder, (1% of the concentrate diet) and same dose of (AD₃E) and the fourth group, used Lycopene powder (1% of the concentrate diet). However, all groups were fed a concentrate diet (2.5% DM of live body weight) in addition to alfalfa hay (1 kg / head/day

. Blood samples were collected from jugular vein monthly for blood parameters measurement include: hemoglobin (Hb), packed cell volume (PCV), total serum protein (TSP), Albumin and Globulin were determined.

The results revealed that:-

1-There was no significant difference between groups of lambs in PCV% throughout the experimental period. There was significant increase ($P \leq 0.05$) in Hb concentration of G4 at wk6 compared with G2, while, there were significant differences ($P \leq 0.05$) between wk6 and wk0 in G3.

2-There was a significant ($P \leq 0.05$) increased in WBC count of the treated groups G4, G3, G2 respectively at wk12 compared with G1 and there was a significant ($P \leq 0.05$) increased in WBC count of G2 at wk12 compared with wk0 and wk6 respectively. Also, G3 was significantly ($P \leq 0.05$) increased at wk12 and wk6 compared with wk0.

3-Nutrophile cells % was significantly ($P \leq 0.05$) increased in G4 at wk6 compared with G3 and also, G2 at wk12 compared with G3, while G3 was significantly ($P \leq 0.05$) increased at week0 compared with Wk6. Lymphocyte cells % was

significantly ($P \leq 0.05$) increased in G3 at wk12 compared with G2, while there were non-significant differences between groups during wk0 and wk6, and between the three periods in all groups. There was non-significant difference in the Monocytes between all groups of lambs during the whole period of experiment. The Eosinophiles of G3 was significantly ($P \leq 0.05$) increased at wk12 compared with G2 and also at wk6 and wk12 compared with G4 at wk6 and wk12. In addition, Eosinophiles in G2 was significantly ($P \leq 0.05$) increased at wk6 compared with wk0 and wk12, also in G3 was significantly ($P \leq 0.05$) increased at wk6 compared with wk0. Basophil cells% showed that there was significant ($P \leq 0.05$) increased in G2 at wk12 compared with G3 and G4, while in G4 was significantly ($P \leq 0.05$) increased at wk6 compared with wk12.

4-The results of TSP showed that there was significant increase ($P \leq 0.05$) between G4 and G2 at wk12, while G4 increased significantly ($P \leq 0.05$) at wk12, compared with other periods wk0 and wk6 respectively, also G3 compared with wk0. Albumine level in G1 was significantly increased at wk6 compared with G2, G3 and G4, while at the same week, G2 and G3 were significantly increased compared with other two periods. There was significant increase ($P \leq 0.05$) in serum Globuline in G1 compared with G2 at wk0. But, G1 showed a significant decrease ($P \leq 0.05$) at wk6 in comparison with wk0 and wk12. Also, G3 decreased significantly ($P \leq 0.05$) at wk6 in contrast with wk12, while G4 increased significantly ($P \leq 0.05$) at wk12 compared with wk0.

4-The results of the Lipids profile showed that Cholesterol was significantly ($P \leq 0.05$) increased in G3 at wk0 compared with G1, G2 and G4 respectively. Also, in G3 was significantly ($P \leq 0.05$) increased at wk0 compared with wk6, while in G4 was significantly ($P \leq 0.05$) increased at wk12 compared with wk0. However, Triacylglycerol, LDL concentration of the animals in treated groups was significantly ($P \leq 0.05$) decreased compared with control group. While, The serum HDL for treated groups was significantly higher than G1.

In conclusion, adding of the feed with Lycopene powder and vitamins A, D₃, E to growing Awassi Male Lambs improved blood traits.

INTRODUCTION

Feed additives are important materials that can improve the efficiency of feed utilization and animal performance. However, the use of chemical products especially those of antibiotics and hormones may cause unfavorable effects. Many attempts in the field of animal nutrition had been done to achieve an increase in animal production and thereby its profit (Abdou., 2001).

Sheep are an important animal in many countries because they can be successfully raised under harsh conditions and cost relatively little to maintain, Awassi breed is the most numerous and widespread breed of sheep and has admirably adapted to the

rigorous conditions in Iraq, Awassi also resistant to diseases and parasites as well has growth abilities (Galalet *al.*, 2008).

Lycopene, a carotenoid phytonutrient, is the most potent antioxidant naturally present in many fruits and vegetables. However, tomatoes and processed tomato products constitute the major source of dietary lycopene accounting for up to 85% of the daily intake. Tomatoes and products from tomatoes are the main source of lycopene while the tomato skin is a rich source of lycopene (Rao and Agarwal., 2000; Takeoka *et al.*, 2001). There is considerable scientific interest in the role of lycopene in the prevention of several degenerative diseases (Rao *et al.*, 2003; Rao A.V. and Rao, L. G. 2004). Antioxidants provide an effective means to combat the deleterious effects of reactive oxygen species (ROS) and are increasingly being considered as strategic chemo preventive agents in the management of human diseases (Rao and Agarwal., 2000).

Vitamins are classified on the basis of their solubility as fat-soluble like the vitamins A, D, E and K and water-soluble (other vitamins). For ruminants, it is necessary to introduce only fat soluble vitamins A, D₃ and E with the feedstuffs, as vitamins or in the form of precursors, because in the rumen the vitamins of group B and K are synthesized by the microorganisms, while vitamin C is produced in the same cells of the organism (Federico., 2005).

Therefore, this study was designed to evaluate the effect of using Lycopene powder and /or vitamins AD₃E on productive and some blood traits of Awassi Male Lambs.

MATERIALS AND METHODS:

1- Experimental design

After adaptation period, lambs were randomly divided equally into four groups (body weight was considered) animals were fed as a groups.

The first group (G1) used as a control with no treatment, the second group (G2) (AD₃E) received orally vitamin A 20,000 IU, vitamin D₃ 10,000 IU and vitamin E 60 mg /lamb biweekly, the third group (G3), used Lycopene powder (adding 2% of concentrate diet and (AD₃E) received the same dose) and the fourth group (G4), used Lycopene powder (adding 2% of concentrate diet), (Table 1).

Table (1) **Type and amount of diet used in the experiment.**

Diet	Type	Amount	Dry matter
Concentrate	pellets contain [a mixture of (barley20% , bran 40%), soybean20%,corn 10% ,plant protein 10%]	2.5% of live B.W.	89%
Hay	Alfalfa	1 kg /lamb /day	25%

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(1998)

2-Measurements and samples collection:.

2-1-Blood samples:

Blood samples were collected on day zero and thereafter every 45 days interval via sterilized jugular vein puncture, blood samples were distributed into two kinds of tubes:

1. EDTA (Ethylene Diamine Tetra Acetic Acid) tubes for of Hb, PCV and WBC count and its differential (Neutrophiles%, Lymphocytes%, Monocytes%, Eosinophiles%, Basophiles%).
2. Tubes (5ml) sterile free of anticoagulant for serum isolation.

Serum was obtained from whole blood samples after incubated at 37°C for 2 h, subsequently centrifuged at 2500 rpm for 10 min and were stored in the deep freeze (-18 °C) until analyses of TSP, Albumin and Globulin, Also Lipid profile (Cholesterol concentration, Triglycerides concentration, HDL concentration, LDL concentration). (Young., D1999).

2-1-1-packed cell volume (PCV) and hemoglobin (Hb) were measured by using Auto-analyzer (Ruby –USA).

2-1-2-Total Serum Protein (Albumin and Globulin) concentrations and Lipid profile (Cholesterol concentration, Triglycerides concentration, HDL concentration, LDL concentration) were determined by using the ARCHITECT c Systems and the AEROSSET System.

2-2- Statistical Analysis

Statistical analysis of data was performed using SAS (Statistical Analysis System - version 9.1). Two way ANOVA and Least significant differences (LSD) post hoc test

were performed to assess significant differences among means. $P \leq 0.05$ is considered statistically significant SAS.(2010).

3-RESULTS AND DISCUSSION:

3-1- Blood parameter

3-1-1-Packed cells volume(PCV %)

Table (1) showed that there was no significant difference between groups of lambs in PCV% throughout the experimental periods; however, G4 was the highest among other groups during wk12.

Period Treatment	Week0	Week6	Week12
G1	27.60±2.65	27.40±2.80	27.20±1.49
G2	26.20±0.37	25.40±0.81	27.40±1.16
G3	25.40±0.87	28.80±1.15	28.00±1.61
G4	26.40±0.67	28.80±0.58	28.20±0.48

Period Treatment	Wk0	Wk6	Wk12
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Table (1): Effect of Lycopene powder and vitamins AD₃E on blood PCV% (mean ± SE) (n = 5).

3-1-2-Hemoglobin concentration (Hb)

Table (2) showed that there was significant increase ($P \leq 0.05$) in Hb concentration of G4 (9.30±0.18) at Wk6 compared with G2 (8.22±0.31), and, there was significant difference ($P \leq 0.05$) in Hb concentration of G3 at Wk6 (9.25±0.38) compared with Wk0 (8.11±0.30).

Table (2): Effect of Lycopene powder and vitamins AD₃E on Hb concentration (gm/dl) (mean±SE) (n = 5).

G1	9.02±0.86	8.74±0.89 AB	8.66±0.52
G2	8.81±5.70	8.22±0.31 B	8.77±0.37
G3	8.11±0.30 b	9.25±0.38 A B a	9.04±0.53 a b
G4	9.03±.1319	9.30±0.18 A	9.15±0.16

Different letters vertically denote significant ($P \leq 0.05$) differences among groups mean and horizontally between periods.

The results of PCV were in agreement with (Mulei, 1991), who indicated that the low number of red blood cells because of metabolic disturbance in the body and which interfere with the processes of digestion and absorption of nutrients necessary for the manufacture of red blood cells.

The results were in disagreement with those outcomes by Dawood, (2005) who observed that high level of PCV% in ewes treated with vitamin E.

The Hb level of G4 and G3 of lambs increased in wk6 period of the experiment, may be indicate that the lambs were in a good health, in addition to, well fed and good husbandry, these results were in agreement with those by (Takeoka *et al.*, 2001; Ahmad *et al.*, 2012), who indicated that Lycopene, anti-oxidation inhibitor, added to the diet lead to an increase in (Hb), this may be due to its content of Lycopene which is similar to others antioxidants such as vitamin E and coenzyme Q10. Also in agreement with those by (Nadide and Ebru, 2005), who concluded that may be due to the effect of vitamin E, to protect and maintain the blood cells from the crash.

The results of Hb concentration were also in agreement with those outcome by (Dawood, 2005) who observed that high level of Hb in ewes treated with vitamin E may be due to stimulation of the production centers of red blood cells in the bone marrow. While the results were agreed with the finding by (Al-Taie, 2009; Yang *et al.*, 2010) who's pointed that the level of (Hb) increase with addition of vitamin A to the diets of goat milk.

3-1-3-White blood cells count (WBC)

There was a significant increase ($P \leq 0.05$) of WBCs count in the lambs of the treated groups G4, G3, G2 (10.38 ± 0.49 , 10.97 ± 0.25 , 11.26 ± 0.24) respectively at wk12 compared with G1 (9.13 ± 0.45) and there was a significant increase ($P \leq 0.05$) in G2 at wk12 (11.26 ± 0.24) compared with wk0 and wk6 (9.06 ± 0.78 , 10.57 ± 0.34) respectively. Also, G3 was significantly increased ($P \leq 0.05$) at wk12 and wk6 compared with wk0.

Table (3): Effect of Lycopene powder and vitamins A D₃ E on WBCs count (Cell/mm³)(mean \pm SE) (n=5).

Period Treatment	Wk0	Wk 6	Wk12
G1	9.07±0.64	10.02± 0.24	9.13± 0.45 B
G2	9.06± 0.78 ab	10.57± 0.34 b	11.26±0.24 A a
G3	9.06 ± 0.65 b	10.54± 0.29 a	10.97± 0.25 A a
G4	9.98± 0.14	10.56± 0.29	10.38± 0.49 A

Different letters vertically denote significant ($P \leq 0.05$) differences among groups mean and horizontally between periods.

3-1-3-1-Neutrophile cells %:

Table (4) showed that there was significant increase ($P \leq 0.05$) in G4 at wk6 (48.32±0.47) compared with G3 (44.86±1.32) and G2 at wk12 (49.68± 0.90) compared with G3 (46.04± 1.59). While, G3 was significantly increased ($P \leq 0.05$) at wk0 (47.15± 0.79) compared with Wk6 (44.86± 1.32).

Table (4): Effect of Lycopene powder and vitamins AD₃E on Neutrophils % of lambs (mean ± SE) (n=5).

Period Treatment	Wk0	Wk 6	Wk12
G1	47.46± 0.86	46.48± 0.70 AB	48.28± 1.45 AB
G2	49.42± 0.90	47.16± 1.36 AB	49.68± 0.90 A
G3	47.15± 0.79 a	44.86± 1.32 Bb	46.04± 1.59 Bab
G4	48.65± 1.18	48.32± 0.47 A	48.26±0.37 AB

Different letters vertically denote significant ($P \leq 0.05$) differences among groups mean and horizontally between periods.

3-2-3-2-Lymphocyte cells%:

Table (5) indicated that there was significant increase ($P \leq 0.05$) in G3 at wk12 (46.06± 0.74) compared with G2 (42.72± 1.02), while there were no significant differences

($P \leq 0.05$) between groups during wk0 and wk6. Also there were no significant differences between the three periods in all groups.

Table (5): Effect of Lycopene powder and vitamins AD₃E on Lymphocytes % of lambs (mean \pm SE) (n=5).

Period Treatment	Wk0	Wk 6	Wk12
G1	44.26 \pm 1.12	44.28 \pm 1.01	44.76 \pm 1.64 AB
G2	43.24 \pm 1.08	42.68 \pm 1.98	42.72 \pm 1.02 B
G3	45.22 \pm 0.78	45.06 \pm 1.80	46.06 \pm 0.74 A
G4	44.60 \pm 0.93	42.94 \pm 1,32	45.20 \pm 0.81 AB

Different letters vertically denote significant ($P \leq 0.05$) differences among groups mean.

3-1-3-3-Monocytecels%:

Table (6) indicated that there was no significant difference in the Monocytes between all groups of Kids during the three periods of the experiment.

Table (6): Effect of Lycopene powder and vitamins AD₃E on Monocytes % of lambs (mean \pm SE) (n=5).

Period Treatment	Wk0	Wk 6	Wk12
G1	5.72 \pm 0.55	5.34 \pm 0.31	4.78 \pm 0.78
G2	4.97 \pm 0.23	4.99 \pm 0.11	5.00 \pm 0.31
G3	5.41 \pm 0.17	4.51 \pm 0.16	5.07 \pm 0.27
G4	4.95 \pm 0.23	5.64 \pm 0.54	5.41 \pm 0.14

3-1-3-4-Esinophilecells %:

Table (7) showed that the Eosinophiles% of G3 significantly increased ($P \leq 0.05$) at wk12 (2.12 ± 10.25) compared with G2 (0.56 ± 0.20) and G4 (0.92 ± 0.14), also at wk6 (4.57 ± 1.19) compared with G4 (0.99 ± 0.29). In addition, at wk6, G2 was increased significantly (3.72 ± 1.43) compared with wk0 (1.52 ± 0.99) and wk12 (0.56 ± 0.20), also G3 was significantly increased (4.57 ± 1.19) compared with wk0 (1.10 ± 0.54).

Table (7): Effect of Lycopene powder and vitamins AD₃E on Eosinophiles % of lambs (mean \pm SE) (n=5).

Period Treatment	Wk0	Wk 6	Wk12
G1	1.50 \pm 0.57	2.83 \pm 0.58 AB	1.17 \pm 0.57 AB
G2	1.52 \pm 0.99 b	3.72 \pm 1.43 ABa	0.56 \pm 0.20 Bb
G3	1.10 \pm 0.54 b	4.57 \pm 1.19 Aa	2.12 \pm 10.25 Aab
G4	0.98 \pm 0.33	0.99 \pm 0.29 B	0.92 \pm 0.14 Bb

Different letters vertically denote significant ($P \leq 0.05$) differences among groups mean and horizontally between periods.

3-5-Basophile cells%:

Table (8) indicated that the Basophiles% was significantly increased ($P \leq 0.05$) in G2 at wk12 (1.24 ± 0.15) compared with G3 (0.69 ± 0.10) and G4 (0.43 ± 5.77). While, G4 was significantly increased ($P \leq 0.05$) at wk6 (1.12 ± 0.21) compared with wk12 (0.43 ± 5.77).

Table (8): Effect of Lycopene powder and vitamins AD₃E on Basophiles % of lambs (mean \pm SE) (n=5).

Period Treatment	Wk0	Wk 6	Wk12
G1	1.04 \pm 0.26	1.08 \pm 0.23	0.98 \pm 0.15 AB
G2	1.11 \pm 0.29	1.43 \pm 0.13	1.24 \pm 0.15 A
G3	1.11 \pm 0.30	0.98 \pm 0.18	0.69 \pm 0.10 B
G4	0.88 \pm 0.18 ab	1.12 \pm 0.21 a	0.43 \pm 5.77 Bb

Different letters vertically denote significant ($P \leq 0.05$) differences among groups mean and horizontally between periods.

The results of WBCs count showed a significant increase ($P \leq 0.05$) in G4, G3, G2 respectively at wk12 compared with G1. These results were in agreement with (Englmaierová *et al.*, 2001), who used feed additive, as antioxidant e.g. vitamin E and Lycopene which stimulate the animals' immune system as well as improve immune response to vaccination and thereby protect the animals against stress.

The results of this study were in agreement with Zikri., (2005) who observed that giving vitamin E to Awassi rams led to increase in the differential leukocyte during the experiment, also was in agreement with Dawood., (2005) who noted an increase in the number of WBCs in Vitamin E and Vitamin E+HCG group compared with control group of Awassi ewes.

The result of Lymphocytes indicated that the significant increase ($P \leq 0.05$) in G3 (Lycopene & AD₃E) may be due to synergistic effect of vitamin E with Lycopene (North., 1984; Englmaierová *et al.*, 2001; Feenecy *et al.*, 2004; Strazzullo *et al.*, 2007). The high proportion of lymphocytes in this group may be due to the effect of vitamin A, which plays an important role in the process of the formation and differentiation of lymphocytes type T & B (Semba., 1998), and in agreement with (Yang *et al.*, 2010), who pointed that an increase in lymphocytes cell in goat milk when adding vitamin A to diets, or may be due to the effect of vitamin D₃ in direct proliferation and differentiation of lymphocytes (Daniel, 2009).

3-4-Total Serum proteins (TSP):

Table (9) showed that there were no significant differences ($P \leq 0.05$) in TSP concentrations throughout the experimental period except that of G4 (7.62 ± 0.16) at wk12 compared with G2 (6.94 ± 0.15). While, at wk12, G4 increased significantly ($P < 0.05$) compared with other periods wk0 and wk6 (6.58 ± 8.00 , 6.96 ± 0.11) respectively, also G3 (7.42 ± 0.18) compared with wk0 (6.88 ± 0.18)

Table (9): Effect of Lycopene powder and vitamins AD₃E on Total Serum protein of lambs g/dl (mean \pm SE) (n=5).

Period Treatment	Wk0	Wk 6	Wk12
G1	6.86 \pm 0.34	6.82 \pm 0.19	7.22 \pm 0.35 AB
G2	6.60 \pm 7.07	6.72 \pm 0.14	6.94 \pm 0.15 B
G3	6.88 \pm 0.18 b	7.12 \pm 0.23 ab	7.42 \pm 0.18 ABa

G4	6.58±8.00 b	6.96±0.11 b	7.62±0.16 Aa
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Different letters vertically denote significant ($P \leq 0.05$) differences among groups mean and horizontally between periods.

3-4-1-Albumin level (Alb)

Table (10) showed that the Albumin level in G1 significantly increased at wk6 (3.02 ± 5.83) compared with G2 (2.84 ± 0.10), G3 (2.86 ± 5.09) and G4 (2.76 ± 0.12). While G2 significantly increased at wk6 (2.84 ± 0.10) compared with other periods wk0 (2.58 ± 9.16), and wk12 (2.64 ± 6.78), also G3 significantly increased at wk6 (2.86 ± 5.09) compared with other periods wk0 and wk12 (2.48 ± 3.74 , 2.48 ± 3.74) respectively.

Table (10): Effect of Lycopene powder and vitamins AD₃E on Albumin level of lambs (g/dl) (mean \pm SE) (n=5).

Period Treatment	Wk0	Wk6	Wk12
G1	2.52± 3.74	3.02±5.83 A	2.50± 3.16
G2	2.58± 9.16b	2.84± 0.10 Ba	2.64± 6.78 b
G3	2.48± 3.74 b	2.86± 5.09 B a	2.48± 3.74 b
G4	2.64± 9.27	2.76± 0.12 B	2.66± 4.00

Different letters vertically denote significant ($P \leq 0.05$) differences among groups mean and horizontally between periods.

3-4-2-Globulin level

Table (11) indicated that there was significant increase ($P \leq 0.05$) in serum Globulin in G1 (4.74 ± 0.74) compared with G2 (3.90 ± 0.21) at wk0. But, G1 showed a significant decrease (3.80 ± 0.17) at wk6 in comparison with wk0 (4.74 ± 0.74) and wk12 (4.72 ± 0.36). Also, G3 decreased significantly ($P \leq 0.05$) at wk6 (3.86 ± 0.26) in contrast with wk12 (4.90 ± 0.21), while G4 increased significantly ($P < 0.05$) at wk12 (4.96 ± 0.14) compared with wk0 (4.10 ± 0.16).

Table (11): Effect of Lycopene powder and vitamins AD₃E on Globulin level of lambs (g/dl) (mean \pm SE) (n=5).

Period Treatment	Wk0	Wk 6	Wk12
G1	4.74±0.74 Aa	3.80±0.17 b	4.72±0.36 a
G2	3.90±0.21 B	3.88±0.17	4.30±0.20
G3	4.40±0.17 ABab	3.86±0.26 b	4.90±0.21 a
G4	4.10±0.16 ABb	4.20±0.15 ab	4.96±0.14 a

Different letters vertically denote significant ($P \leq 0.05$) differences among groups mean and horizontally between periods.

The results of serum proteins indicated that there was a significant increase ($P \leq 0.05$) of TSP G4 in the wk12 compared with G1. These results were in agreement with those by (Naviglio *et al.*, 2008). Obtained data showed that Lycopene supplementations increase total proteins and globulin.

It was pointed out that improving of Lycopene powder nutritive value may be supplemented by proteins (Patterson *et al.*, 1967) (Aerts *et al.*, 1999; Silanikove *et al.*, 2001), which may limit nutrient availability, due to their capacity to bind proteins and carbohydrates (Silanikove *et al.*, 1996). Also in agreement with (El-damrawy, 2011) (Imiki *et al.*, 2009) when feeding diets contained Lycopene was significantly increased albumin to globulin (ALB:GLB) ratios.

4-3-Serum lipids profile

4-3-1-Cholesterol

The mean values of serum Cholesterol of lambs for the four different treatments at different periods of the study are shown in Table (12). Results indicated that there was a significant ($P \leq 0.05$) increase of the serum Cholesterol in G3 at wk0 (46.00±6.20) compared with G1, G2 and G4 (35.60±5.03, 31.20±2.05, 34.20±5.18) respectively. Moreover, the serum Cholesterol was significantly ($P \leq 0.05$) decreased in G3 at wk6 compared with wk0, while was significantly ($P \leq 0.05$) increased in G4 at wk12 compared with wk0.

Table (12): Effect of Lycopene powder and vitamins AD₃E on serum Cholesterol of lambs (mg/dl) (mean ± SE) (n=5).

Period Treatment	Wk0	Wk 6	Wk12
G1	35.60±5.03 B	41.20±6.55	37.20±0.80
G2	31.20±2.05 B	36.80±4.65	39.60±5.68
G3	46.00±6.20 Aa	35.80±1.39 b	36.60±3.40 ab
G4	34.20±5.18 Bb	44.40±4.17 ab	46.40±3.31 a

-Different capital letters vertically denote significant ($P \leq 0.05$) differences among groups mean.

-Different small letters horizontally denote significant ($P \leq 0.05$) differences between periods.

4-3-2-Triacylglycerol(TAG)

The mean values of serum triacylglycerol concentration of the animals in G4 was significantly ($P \leq 0.05$) decreased at wk6 (19.60±1.53) compared with G1 and G2 (31.00±5.08, 34.60±4.67) respectively (table, 13). Also the triacylglycerol concentration of G2 and G4 at wk12 (24.40±1.96, 17.00±1.76) was significantly ($P \leq 0.05$) decreased compared with G1 (37.80±6.88). The fourth group (G4) was significantly ($P \leq 0.05$) decreased compared with G3 (32.20±2.9) at the wk12. . G4 was significantly ($P \leq 0.05$) decreased compared with G2 and G1. While the differences between periods, revealed that G1 and G3 decreased significantly ($P \leq 0.05$) in the wk0 compared with other periods. Also, G2 group at wk0 (18.80±6.11) were significantly ($P \leq 0.05$) decreased compared with wk6 (34.60±4.67)

Table (13): Effect of Lycopene powder and vitamins AD₃E on serum triacylglycerol of lams (mg/dl) (mean ± S) (n=5).

Period Treatment	Wk0	Wk6	Wk12
G1	14.40±0.40Ab	31.00±5.08Aa	37.80±6.88Aa
G2	18.80±6.11Ab	34.60±4.67Aa	24.40±1.96BCab
G3	14.80±3.24Ab	28.40±2.08ABa	32.20±2.93ABa
G4	20.20±3.80Aa	19.60±1.53Ba	17.00±1.76Ca

- Different capital letters vertically denote significant ($P \leq 0.05$) differences among groups mean.
- Different small letters horizontally denote significant ($P \leq 0.05$) differences between periods.

4-3-3-Low density lipoprotein cholesterol (LDL-C)

The results of low-density lipoprotein cholesterol concentration of the animals of G3 showed significantly ($P \leq 0.05$) reduction in at wk0 (6.44 ± 0.85) compared with group G4 (15.16 ± 3.6). Also, serum LDL was significantly ($P \leq 0.05$) reduction in G2, G3 and G4 at wk6 compared with control group G1, also G4 (5.60 ± 1.50) was significantly ($P \leq 0.05$) reduction at wk12 compare with G1 (11.52 ± 1.95) (table, 14). The fourth group G4 showed significant decrease ($P \leq 0.05$) at wk6, wk12 (5.60 ± 0.97 , 5.60 ± 1.50) respectively compared with wk0 (15.16 ± 3.6).

Table (14): Effect of Lycopene powder and vitamins AD₃E on serum LDL of lambs (mg/dl) (mean \pm SE) (n=5).

Period Treatment	Wk0	Wk6	Wk12
G1	11.64 \pm 2.51ABa	13.24 \pm 2.61Aa	11.52 \pm 1.95Aa
G2	10.96 \pm 2.96ABa	7.56 \pm 1.18Bab	6.04 \pm 0.79ABab
G3	6.44 \pm 0.85Ba	7.12 \pm 0.85Ba	8.16 \pm 2.91ABa
G4	15.16 \pm 3.65Aa	5.60 \pm 0.97Bb	5.60 \pm 1.50Bb

- Different capital letters vertically denote significant ($P \leq 0.05$) differences among groups mean.
- Different small letters horizontally denote significant ($P \leq 0.05$) differences between periods

4-3-4-High density lipoprotein cholesterol (HDL-C)

Table (15) showed that there were significant ($P \leq 0.05$) differences in the serum HDL between the different groups. The results showed that the G4 group was significantly higher ($P \leq 0.05$) than G1 in the wk0. Also, G3 increased significantly ($P \leq 0.05$) when compared with G1 in the wk6. While G3 and G4 there were a significant ($P \leq 0.05$) increased at wk12 compared with G1. On the other hand, There were a significant ($P \leq 0.05$) increased differences in the serum HDL among periods of all groups at wk6, wk12 respectively compare with wk0.

Table (15): Effect of Lycopene powder and vitamins AD₃E on serum HDL of lambs (mg/dl) (mean ± SE) (n=5).

Period Treatment	Wk0	Wk6	Wk12
G1	19.80±3.12Bb	29.40±1.28Ba	27.60±2.03Ca
G2	21.40±3.78ABb	30.00±2.38ABa	31.80±2.26BCa
G3	21.80±0.80ABb	36.00±2.30Aa	37.40±1.63ABa
G4	26.80±2.85Ab	35.20±2.88ABa	38.20±1.62Aa

-Different capital letters vertically denote significant ($P \leq 0.05$) differences among groups mean.

-Different small letters horizontally denote significant ($P \leq 0.05$) differences between periods

According to the results of lipids profile, where the treatments caused a reduction in the harmful lipids like Cholesterol, TAG and LDL, while the useful lipid such as (HDL) was increased in comparison with other groups. These results could be attributed to the synergistic effect of Lycopene powder with mix vitamins. Particularly the mean values of serum triacylglycerol concentration of the animals in G4 was significantly ($P \leq 0.05$) decreased compared with G1, Also, serum LDL was significantly ($P \leq 0.05$) reduction in G3 showed significantly ($P \leq 0.05$) reduction in at wk0 (6.44 ± 0.85) compared with group G4 (15.16 ± 3.6). Also, serum LDL was significantly ($P \leq 0.05$) reduction in G2, G3 and G4 at second month compared with control group G1. G4 (5.60 ± 1.50) was significantly ($P \leq 0.05$) reduction at wk12 compare with G1 (11.52 ± 1.95). The results of serum HDL showed that the G4 group was significantly higher ($P \leq 0.05$) than G1 in the wk0. Also, G3 increased significantly ($P \leq 0.05$) when compared with G1 in the wk6. While in the wk12 G3 and G4 respectively were significantly higher than control group, These results are in agreement with (Napolitano *et al.*, 2007) who's show when depend on regime rich by tomato (rich lycopene) these case increased HDL and decreased TAG and LDL. found that tomato-rich diet increased the HDL-cholesterol level (Blum *et al.*, 2006). The lycopene supplement had a positive effect on the lipid profile of blood plasma of broiler chickens (Ševčíková *et al.*, 2008).

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