

Effect of the use of exogenous fibrolytic enzymes in blood parameters in local goats

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Abstract

The study was carried out in the ruminant researches station / department of livestock research section / office of agricultural research in the district of Abu Ghraib / Baghdad to assess the effect of exogenous fibrolytic enzyme (EFE) (Safizym - France) in blood characters of local male kids. The experiment was conducted during the period from 21 May 2017 to 17 July 2017 (57) day. Eighteen males of domestic goats aged 4-5 months were used in this study. The animals were randomly assigned to three treatments (6 animals for each treatment) a control treatment was fed on basal ration without enzyme (Tc), a treated groups were supplemented with the EFE of 500 g / ton of concentrate feed (T1) and a treatment with the EFE of 1000 g / ton of concentrate feed (T2). The results showed no significant effect of the adding with EFE in the total protein, albumin and globulin, while there was an effect of the period of the weeks in the T1, where the superiority ($P \leq 0.05$) of the eighth week. The results showed a significant differences ($P \leq 0.05$) in the serum urea concentration. The second treatment decreased during the second and sixth weeks compared to the T1 and the control Tc. There was an effect of the period of the weeks within the same treatment, where all means in all treatments were reduced with progress the time of the experiment. The results showed no significant effect of the adding with EFE in both glucose and cholesterol. The means were within the normal range and the triglycerides were not affected but there were differences between the weeks within the treatment. Concentrations of HDL, LDL and VLDL were not affected by the addition of EFE, but significant differences ($P \leq 0.05$) were observed between the weeks within the treatments. The results showed that T2 treatment was superior during the zero time in the concentration of the ALP enzyme for T1 and Tc, and significant differences between the weeks within the treatments. T1 treatment ($P \leq 0.05$) exceeded T2 and Tc in the concentration of the ALT enzyme during the zero time and the fourth and sixth weeks with no effect for the period of the weeks within the same treatment. The treatment and period of the weeks did not affect the concentration of AST enzyme in the serum.

تأثير استخدام الانزيمات المحللة للألياف في صفات الدم في الماعز المحلي

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الخلاصة

أجريت الدراسة في محطة أبحاث المجترات التابعة لقسم بحوث الثروة الحيوانية / دائرة البحوث الزراعية الواقعة في قضاء أبي غريب / بغداد ، لتقييم تأثير الأنزيمات الخارجية المحللة للألياف (Safizym®- France) في صفات الدم للماعز المحلي . أجريت التجربة للمدة من 2017/5/22 ولغاية 2017/7/17 (57) يوم . استخدم في هذه التجربة 18 ثمانية عشر ذكراً من جداء الماعز المحلي بعمر (4-5) أشهر ، وزعت عشوائياً على ثلاث معاملات (بواقع 6 حيوانات لكل معاملة) : معاملة السيطرة Tc بدون انزيم ، مجموعة المعاملة بالأنزيمات المحللة للألياف بنسبة 500 غم / طن من العلف المركز T1 ومجموعة المعاملة بالأنزيمات المحللة للألياف بنسبة 1000 غم / طن من العلف المركز . T2 بينت نتائج التجربة عدم وجود تأثير معنوي للمعاملة بالأنزيمات الخارجية المحللة للألياف في البروتين الكلي وأجزائه ، في حين كان هنالك تأثير للمدة بالأسابيع ضمن T1 حيث تفوق الاسبوع الثامن معنوياً ($P \leq 0.05$) على بقية الأسابيع . وأوضحت النتائج وجود فروقات

معنوية ($P \leq 0.05$) في تركيز يوريا مصلى الدم حيث انخفضت في T2 خلال الاسبوعين الثاني والسادس مقارنةً بـ T1 و Tc . وكان هنالك تأثير للمدة بالاسبوع ضمن المعاملة الواحدة حيث انخفضت جميع المتوسطات في كل المعاملات بتقدم مدة التجربة . أظهرت النتائج عدم وجود تأثير معنوي للمعاملة في كل من الكلوكون والكولسترول وكانت المتوسطات ضمن المعدل الطبيعي كما لم تتأثر الكليسيريدات الثلاثية ولكن كانت هناك اختلافات بين الاسبوع ضمن المعاملة. لم تتأثر تركيزات HDL و LDL و VLDL عند المعاملة ولكن لوحظت فروقات معنوية ($P \leq 0.05$) بين الاسبوع ضمن المعاملات . أوضحت النتائج تفوق T2 خلال اليوم الأول في تركيز أنزيم ALP على T1 و Tc ، وكذلك فروقات معنوية بين الاسبوع ضمن المعاملات . وتفوقت T1 معنوياً ($P \leq 0.05$) على T2 و Tc في تركيز أنزيم ALT خلال اليوم الأول والإسبوعين الرابع والسادس في حين لم يكن للمعاملة والمدة بالاسبوع تأثير على تركيز أنزيم AST في مصلى الدم .

الكلمات المفتاحية : الانزيمات المليفية ، صفات الدم ، الماعز

Keywords: exogenous fibrolytic enzymes, blood parametrs , goats

Introduction

Worldwide demand for animal based products is increasing and hence the importance or necessity of applying strategies to improve animal productivity. The major constraints in the livestock sector today are the high feed costs and the low quality of available feed resources, especially in tropical developing countries (1). In some ruminant production systems, forages constitute the major portion of all available feed resources, and any improvement in the nutritive value of these feeds with high fiber content and low digestibility may increase the productivity of the animals (2). In addition, nutrition costs are the largest in production systems and profitability are depend on the proportionality between production costs and the nutritive value of the feeds available (3). The ability of ruminants to convert plant biomass unsuitable for human consumption into meat and milk is of great importance, especially the efficiency of this process is largely dependent on the digestibility of plant cell walls (4). It has been largely confirmed that nutritive value could be improved substantially by different methods, including chemical, physical and microbiological treatments (5). In this respect, exogenous enzymes have shown promise by analyzing plant cell walls (6). The addition of exogenous fibrolytic enzymes as food additives has recently attracted researchers' attention. It has been

shown that exogenous fibrolytic enzymes are working synergistically with microbial enzymes in the rumen to enhance the digestibility and nutritive value of high-fiber feeds (7). (8) also noted that exogenous fibrolytic enzymes may enhance the adhesion of rumen microbes or improve their access to the tissue of cell walls, thus accelerating the rate of fiber digestion. Studies have shown that goats have been used to confirm the effect of exogenous fibrolytic enzymes and that the results are weak due to the ability of goats to benefit from fibers that exceed the capacity of large ruminants (9). In addition, information on the impact of rumen fermentation is rare (10). Therefore, this study was conducted to evaluate the effect of exogenous fibrolytic enzymes on some blood parameters in local goat males.

Materials And Methods

Design of experiment: The experiment was conducted in the ruminant researches station / department of livestock research section / office of agricultural research in the district of Abu Ghraib / Baghdad and for the period from 22/5/2017 to 17/7/2017 (57) day. In this experiment, eighteen male goats from local goats aged 4-5 months were obtained from the same station. The animals were randomly assigned to three treatments (6 animals for each treatment); a control treatment was fed on basal ration without enzyme Tc, a treated groups were

supplemented with the EFE of 500 g / ton of concentrate feed T1 and a treatment with the EFE of 1000 g / ton of concentrate feed T2. The average animal weights at the beginning of the experiment were 16.50, 16.08 and 15.17 kg for the three treatments above respectively.

Management and feeding system: The animals were subjected to a preliminary period of 12 days before the experiment was started and the group was fed within the shaded section of the cowshed where forages (alfalfa hay) was provided *ad libitum* and concentrate feed (without enzyme) was calculated for each animal 100g daily with clean water provided freely. After the preliminary period, the animals were introduced into the experiment program. The animals were introduced to the individual cages in the same cowshed and the cages were provided with two feeders and a water bucket. The forage was provided with 2% body weight and the concentrate feed at 150 g / day. The amounts of feed were divided into two meals at morning (8:00 am) and at evening (3:00 pm) with clean water provided *ad libitum*. The amount of forage feed provided was adjusted according to the change of body weight. The animals are weighed every two weeks. Also, the amount of concentrated feed is increased by 50 g every week depending on the animal consumption of the forage. The exogenous fibrolytic enzymes were added to the concentrated diet, and the components of the concentrate meal were mixed and the enzyme was added to it weekly. The Premix was added to the feed by 2 kg / ton.

Table-1 proportions and components of the concentrate diet.

Feed material	%
Grinded barley	59
Wheat bran	30
Grinded corn	10
Salt	1
Total	100

Table-2 Chemical analysis of feed materials used in the study

Nutrients	Alfalfa hay	Concentrat
Dry matter	89.34	93.61
Crud fiber	20.90	10.62
Crud protein	16.64	14.32
Ether extract	3.24	4.89
Ash	8.19	5.81
Nitrogen free extract	51.03	64.36

Components of Exogenous Fibrolytic Enzymes (EFE) used in the experiment:

Brand name: Xylanase powder for animal feed.

Company: SAFIZYM®

Main activity: Xylanase (EC 3.2.1.8): 1400,000 units of Xylanase / kg.

Additional Activities:

B-glucanase (EC 3.2.1.6): 1,250,000 units of glucanase / kg.

Cellulase (F. pases-EC 3.2.1.4) 5000 units

F. pases / kg.

Collection of blood samples: Blood samples were withdrawn at the beginning of the experiment and then every two weeks until the end of experiment by the jugular vein. 8 ml of blood were collected for each animal placed in tubes without anticoagulation, left at room temperature for an hour and then placed in the refrigerator. The tubes were then placed in the centrifuge (3000 cycles / min) for 20 minutes to obtain serum. Serum were preserved at -20°C until the chemical analysis, that is concentration of glucose, urea, cholesterol, triglyceride, total protein, albumin, ALP, ALT, AST and lipoproteins.

Biochemical blood serum analysis:

Biochemical serum measurement were performed automatically using KENZA 240 TX for pathological analysis and manufactured by BIOLABO and using the Kits manufactured in the same company to measure glucose, urea, cholesterol, triglycerides, total protein, albumin, ALP, ALT, AST and lipoproteins. While the concentrations of globulin, LDL and VLDL

were calculated arithmetically as follows: globulin was calculated as indicated in (11) as follows:

Concentration of total protein - concentration of albumin.

Very low density lipoproteins (VLDL) were extracted by dividing the value of triglyceride by number 5, according to (12). As for Low Density Lipoproteins, they were calculated from the equation below, according to (13): $LDL = \text{Cholesterol} - (\text{HDL} + \text{VLDL})$

Statistical analysis: Complete randomize design (CRD) was followed as a one way analysis. The trend included the effect of experiment parameters once, experiment intervals for each transaction another time, following the general linear model and using the SAS statistical program the version 9.1 (14). Differences between mean values were tested using the Duncan multidimensional test (15) at a significant level ($P \leq 0.05$) according to the mathematical model: $Y_{ij} = \mu + T_i + E_{ij}$

Results and Discussion

Effect of exogenous fibrolytic enzymes and period of weeks on total protein of blood serum: Table 3 showed that there is no effect of the adding with EFE in the concentration of serum protein. treatment T1 and Tc were higher significantly ($P \leq 0.05$) on treatment T2 during the second week of the experiment. Also notes the superiority ($P \leq 0.05$) of the Tc on T2 during the sixth and eighth weeks of the experiment and there were no significant differences between T1 and T2 during the same period. This is consistent with the result reported by (16), where the treatment had no effect on the concentrate of blood serum protein, this result is consistent with (17) in an experiment to study the effect of the addition of enzymes at different levels on the Shami goat and Awassi lambs, noting that there is no effect of the enzyme treatment on the total protein of the serum. The result is also consistent with (18). As

for the periods, there was no effect of the period of use the EFE on animals where the differences were not significant between weeks within the treatment.

Effect of exogenous fibrolytic enzymes and period in weeks on albumin concentration of blood serum: Table 4 showed that there is no effect of the adding with EFE on the albumin concentration of blood serum. The Tc and the T1 treatment exceeded significantly ($P \leq 0.05$) on T2 treatment in the zero time, second week and sixth week. Blood serum albumin in this study was within the normal range (2.3 - 3.6 g / 100 ml), as reported from (19). The result is also consistent with (20) and (18). As for the effect of the weeks, the eighth week was significantly higher ($P \leq 0.05$) in both treatments of EFE on the rest weeks except the zero time of T2, where it did not differ significantly for the eighth week in the T2 treatment.

Effect of exogenous fibrolytic enzymes and period in weeks on globulin concentration of blood serum: Table 5 indicates that there is no significant difference between treatments due to the use of EFE in the concentration of blood serum globulin. This is consistent with (20) and (18). While the results did not agree with (21), where there was a significant superiority of all treatments on the control Tc during the second period between 15 - 28 days from the start of the experiment. As for the effect of the weeks, the second week was significantly higher ($P \leq 0.05$) on the zero time and the last week in treatment T1. Effect of exogenous fibrolytic enzymes and period in weeks on urea concentration of blood serum: Table 6 showed a significant decrease ($P \leq 0.05$) in T2 compared to T1 during the second and sixth weeks. The values in the T2 treatment from the second week until the end of the experiment were the closest to the normal values of urea concentrations in blood serum 13- 26 mg / 100 ml as (19) explained. This result is not consistent with both (22) and (17). As for the effect of the weeks, all treatments were affected by the period of

the experiment with a significant decrease ($P \leq 0.05$) for all weeks compared to the zero time of the experiment. The decrease in urea values during the period of the experiment means increased utilization of digested protein. When comparing the control Tc with T1 and T2, it is observed that the efficiency of utilization was better with the use of EFE.

Effect of exogenous fibrolytic enzymes and period in weeks on glucose concentration of blood serum: Table 7 showed that there is no effect of the adding with EFE on glucose concentration of blood serum. There is no significant difference between the

While this result is not consistent with (21), where she noted that all treatments superior on the control treatment during the third treatments throughout the experiment. This is consistent with (17).period between 29 - 42 days from the beginning of the experiment.

It is noted from table 6 that there is an effect of the period of the weeks within treatment where the sixth week significantly higher ($P \leq 0.05$) in all treatments on the second and eighth weeks of control and T1 treatment, and on the second and fourth weeks of the treatment T2, the values were within the normal range 48.2 - 76 mg / 100 ml referred to by (19).

Table 3 Effect of treatment with exogenous fibrolytic enzymes and period of weeks on total protein of blood serum (mean \pm standard error) g/100 ml

period in weeks	Treatments			Moral level
	Tc	T1	T2	
Zero time	A *0.235 \pm 5.52 a	A 0.242 \pm 5.18 a	A 0.169 \pm 4.77 a	N.S.**
Second week	A 0.114 \pm 5.35 a	A 0.203 \pm 5.48 a	A 0.195 \pm 4.62 b	0.0072
Fourth week	A 0.240 \pm 5.44 a	A 0.081 \pm 5.36 a	A 0.299 \pm 4.99 a	N.S.
Sixth week	A 0.198 \pm 5.63 a	A 0.161 \pm 5.19 ab	A 0.182 \pm 4.86 b	0.0301
Eighth week	A 0.103 \pm 5.54 a	A 0.022 \pm 5.27 ab	A 0.209 \pm 5.00 b	0.0411
Moral level	N.S.	N.S.	N.S.	

*Values represent the average \pm standard error.

**N.S: means that there are no significant differences between the averages at a significant level ($P \leq 0.05$)

The different small letters a, b, c within one row indicate significant differences between the treatments. The different capital letters A, B, C within the same column indicate significant differences between the periods within the single treatment at a significant level ($P \leq 0.05$)

Table 4 Effect of treatment with exogenous fibrolytic enzymes and period of weeks on albumin concentration of blood serum (mean \pm standard error) g/100 ml

period in weeks	Treatments			Moral level
	Tc	T1	T2	
Zero time	A *0.122 \pm 2.81 a	B 0.095 \pm 2.67 a	AB 0.038 \pm 2.36 b	0.0116
Second week	A 0.066 \pm 2.57 a	B 0.047 \pm 2.50 a	B 0.090 \pm 2.20 b	0.0044
Fourth week	A 0.039 \pm 2.60 a	B 0.070 \pm 2.46 a	B 0.134 \pm 2.31 a	N.S.**
Sixth week	A 0.085 \pm 2.77 a	B 0.025 \pm 2.58 a	B 0.069 \pm 2.38 b	0.0031
Eighth week	A 0.113 \pm 2.85 a	A 0.087 \pm 2.92 a	A 0.092 \pm 2.62 a	N.S.
Moral level	N.S.	0.0008	0.0436	

*Values represent the average \pm standard error.

**N.S: means that there are no significant differences between the averages at a significant level ($P \leq 0.05$)

Table 5 Effect of treatment with exogenous fibrolytic enzymes and period of weeks on globulin concentration of blood serum (mean \pm standard error) g/100 ml

period in weeks	Treatments			Moral level
	Tc	T1	T2	
Zero time	A *0.125 \pm 2.71 a	BC 0.174 \pm 2.51 a	A 0.159 \pm 2.41 a	N.S.**
Second week	A 0.137 \pm 2.78 a	A 0.211 \pm 2.98 a	A 0.153 \pm 2.42 a	N.S.
Fourth week	A 0.218 \pm 2.84 a	AB 0.059 \pm 2.90 a	A 0.211 \pm 2.68 a	N.S.
Sixth week	A 0.166 \pm 2.86 a	ABC 0.156 \pm 2.60 a	A 0.153 \pm 2.48 a	N.S.
Eighth week	A 0.095 \pm 2.69 a	C 0.083 \pm 2.35 a	A 0.163 \pm 2.38 a	N.S.
Moral level	N.S.	0.0319	N.S.	

*Values represent the average \pm standard error.

**N.S: means that there are no significant differences between the averages at a significant level ($P \leq 0.05$)

Table 6 Effect of treatment with exogenous fibrolytic enzymes and period of weeks on urea concentration of blood serum (mean \pm standard error) mg/100 ml

period in weeks	Treatments			Moral level
	Tc	T1	T2	
Zero time	A *3.56 \pm 45.30 a	A 2.62 \pm 41.40 a	A 1.72 \pm 38.20 a	N.S.**
Second week	B 1.80 \pm 33.00 a	B 2.15 \pm 34.10 a	B 1.35 \pm 26.30 b	0.0161
Fourth week	B 0.789 \pm 31.20 a	B 1.53 \pm 31.10 a	B 1.18 \pm 28.00 a	N.S.
Sixth week	B 1.78 \pm 34.80 a	B 1.57 \pm 32.30 a	B 1.54 \pm 25.20 b	0.0024
Eighth week	B 3.21 \pm 33.10 a	B 1.53 \pm 29.10 a	B 2.58 \pm 28.10 a	N.S.
Moral level	0.0032	0.0017	0.0001	

*Values represent the average \pm standard error.

**N.S: means that there are no significant differences between the averages at a significant level. The different small letters a, b, c within one row indicate significant differences between the treatments. The different capital letters A, B, C within the same column indicate significant differences between the periods within the single treatment at a significant level ($P \leq 0.05$)

Effect of exogenous fibrolytic enzymes and period in weeks on cholesterol concentration of blood serum: Table 8 indicates that there were no significant differences between the treatments due to the treatment with EFE on the blood serum cholesterol level throughout the period of the experiment. This is consistent with (18). The results of this study were not consistent with (21) where all treatments were significant high on the control treatment ($P \leq 0.01$) during the first period 1-14 days of the experiment. The results showed that there was a significant effect of the period in weeks on the treatments. A significant decrease ($P \leq 0.05$) was observed in the cholesterol concentration level in all treatments. The mean of the zero time was within the normal value of the cholesterol in goats 65-136 mg / 100 ml referred to by (19) and then the averages gradually decreased with extending the period of the experiment.

Effect of exogenous fibrolytic enzymes and period in weeks on triglycerides

concentration of blood serum:

Table 9 showed that there is no effect to the adding with EFE on the blood serum triglycerides level in all treatments throughout the period of the experiment. This is consistent with what (18) found. The table showed significant differences between the weeks within the single treatment. The zero time and the second week were superior significantly ($P \leq 0.05$) on the fourth and sixth weeks of the treatment T2 and the second week was superior significantly ($P \leq 0.05$) on the fourth and sixth weeks in the treatment T1. The eighth week was superior significantly ($P \leq 0.05$) on the fourth and sixth weeks, and did not differ significantly from the zero time and the second week of the trial period.

Effect of exogenous fibrolytic enzymes and period in weeks on HDL level of blood serum: Table 10 showed no significant differences between treatments due to the adding with EFE on the blood serum HDL level throughout the trial period.

Table 8 Effect of treatment with exogenous fibrolytic enzymes and period of weeks on cholesterol concentration of blood serum (mean \pm standard error) mg/100 ml

period in weeks	Treatments			Moral level
	Tc	T1	T2	
Zero time	*5.41 \pm 65.14 a	3.34 \pm 65.92 a	7.47 \pm 73.52 a	N.S.**
Second week	B 6.17 \pm 50.76 a	AB 6.08 \pm 53.92 a	B 2.01 \pm 47.28 a	N.S.
Fourth week	C 3.58 \pm 29.34 a	BC 7.75 \pm 40.63 a	C 2.91 \pm 29.28 a	N.S.
Sixth week	C 1.07 \pm 25.73 a	C 2.75 \pm 30.18 a	C 1.96 \pm 26.44 a	N.S.
Eighth week	C 1.52 \pm 28.64 a	C 1.68 \pm 33.09 a	C 3.54 \pm 34.37 a	N.S.
Moral level	0.0001	0.0001	0.0001	

*Values represent the average \pm standard error.

**N.S: means that there are no significant differences between the averages at a significant level ($P \leq 0.05$)

Table 9 Effect of treatment with exogenous fibrolytic enzymes and period of weeks on triglycerides concentration of blood serum (mean \pm standard error) mg/100 ml

period in weeks	Treatments			Moral level
	Tc	T1	T2	
Zero time	ABC *2.51 \pm 17.48 a	AB 1.98 \pm 15.81 a	A 1.36 \pm 17.06 a	N.S.**
Second week	AB 2.66 \pm 20.12 a	A 2.44 \pm 18.70 a	A 1.28 \pm 16.94 a	N.S.
Fourth week	C 1.32 \pm 9.96 a	B 1.44 \pm 12.80 a	B 1.53 \pm 9.66 a	N.S.
Sixth week	BC 1.65 \pm 10.70 a	B 1.22 \pm 12.30 a	B 1.19 \pm 10.54 a	N.S.
Eighth week	A 5.46 \pm 21.12 a	A 2.13 \pm 20.08 a	A 1.20 \pm 14.80 a	N.S.
Moral level	0.0438	0.0261	0.0006	

*Values represent the average \pm standard error.

**N.S: means that there are no significant differences between the averages at a significant level ($P \leq 0.05$)

The different small letters a, b, c within one row indicate significant differences between the treatments. The different capital letters A, B, C within the same column indicate significant differences between the periods within the single treatment at a significant level ($P \leq 0.05$)

This finding is not consistent with what (18) found. He observed the superiority of the treatment of fungal enzymes significantly ($P < 0.05$) on the control treatment during the tenth week of the experiment. As for the effect of period of weeks in the current study, there was a significant decrease ($P \leq 0.05$) with extending the period of the experiment in all treatments.

Effect of exogenous fibrolytic enzymes and period in weeks on LDL level of blood serum: Table 11 showed that there is no effect to the adding with EFE on the blood serum LDL level in all treatments throughout the period of the experiment. This finding is not consistent with what (18) found where he observed a significant decrease ($P < 0.05$) in the concentration of LDL for the treatment of fungal enzymes on the control treatment during the fourth week of the experiment. As for the effect of period in the weeks in this study, we notice a significant decrease ($P \leq 0.05$) with extends the period of the experiment in all transactions.

Effect of exogenous fibrolytic enzymes and period in weeks on VLDL level of blood serum: Table 12 indicates that there is no significant difference between the treatments due to the addition of EFE on the blood serum VLDL level throughout the experiment. This result is consistent with what (18) found. As for the effect of the period in weeks of the current study, the zero time and the second week of the experiment were significantly higher ($P \leq 0.05$) than the fourth and sixth weeks in T2 treatment, and no difference with the eighth week, whereas T1 treatment and the control Tc were in the same direction with extends the period of the experiment where superiority was observed in the eighth week compared with the fourth and sixth weeks.

Effect of exogenous fibrolytic enzymes and period in weeks on ALP level of blood serum: Table 13 showed a significant decrease ($P \leq 0.05$) in T2 compared to control TC and T1 on the zero time of the experiment and no differences were observed between the treatments. This finding was not consistent with (18) where he observed a significant

superiority ($P < 0.05$) for the treatment of fungal enzymes compared with the control treatment during the fourth week of the experiment. As for the effect of the period in weeks in the current study, the averages in treatment T2 were stable. There were no differences between the weeks within T2 treatment, while the sixth week and eighth week superior significantly ($P \leq 0.05$) on the zero time and the second week in T1 treatment and superiority of the eighth week on the rest weeks in the control Tc. All averages for all treatments were within the normal range mentioned by (19) and ranged from 61 - 283 IU/L.

Effect of exogenous fibrolytic enzymes and period in weeks on ALT level of blood serum: Table 14 showed that superiority of T1 treatment significantly ($P \leq 0.05$) compared to the control Tc and T2 treatment on the zero time and the fourth and sixth week of the experiment while there were no significant differences between the treatments in the second and eighth weeks, taking into account that all averages were among the normal value of the ALT level in goats referred to by (19) which ranges from 15 to 52 IU/L, this result is not consistent with what (18) found where he observed a significant decrease ($P < 0.05$) in fungal enzymes treatment compared with the control treatment during the second week. This result is not consistent with (17) Where he found no effect to adding different levels of enzymes at the level of ALT enzyme in both the Shami goats and Awassi lambs, while the effect of period in weeks in the current study showed no significant differences between the weeks in the treatments.

Effect of exogenous fibrolytic enzymes and period in weeks on AST level of blood serum: Table 15 showed that there is no effect to the adding with EFE on the blood serum AST level in all treatments over the period of the experiment. This is consistent with (18) and (17). As for the effect of the weeks, there was no effect of the period in weeks on the level of AST enzyme in all treatments. All averages were within the normal ranges of the AST enzyme level in goats referred to by (19) which ranges between 66 - 230 IU / L.

Table 10 Effect of treatment with exogenous fibrolytic enzymes and period of weeks on HDL level of blood serum (mean \pm standard error) mg/100 ml

period in weeks	Treatments			Moral level
	Tc	T1	T2	
Zero time	A *3.54 \pm 20.44 a	AB 3.35 \pm 20.06 a	A 3.26 \pm 25.21 a	N.S.**
Second week	A 2.61 \pm 18.12 a	A 2.67 \pm 22.71 a	B 1.42 \pm 18.57 a	N.S.
Fourth week	B 2.29 \pm 7.74 a	BC 2.57 \pm 12.96 a	C 1.55 \pm 9.48 a	N.S.
Sixth week	B 0.971 \pm 5.93 a	C 2.05 \pm 10.38 a	C 1.27 \pm 6.70 a	N.S.
Eighth week	B 0.805 \pm 10.06 a	C 1.38 \pm 10.19 a	C 1.27 \pm 10.64 a	N.S.
Moral level	0.0003	0.0030	0.0001	

*Values represent the average \pm standard error.

**N.S: means that there are no significant differences between the averages at a significant level ($P \leq 0.05$)
The different small letters a, b, c within one row indicate significant differences between the treatments. The different capital letters A, B, C within the same column indicate significant differences between the periods within the single treatment at a significant level ($P \leq 0.05$)

Table 11 Effect of treatment with exogenous fibrolytic enzymes and period of weeks on LDL level of blood serum (mean \pm standard error) mg/100 ml

period in weeks	Treatments			Moral level
	Tc	T1	T2	
Zero time	A *5.02 \pm 41.20 a	A 1.37 \pm 42.69 a	A 5.48 \pm 44.89 a	N.S.**
Second week	B 5.18 \pm 28.61 a	B 4.73 \pm 27.47 a	B 1.97 \pm 25.31 a	N.S.
Fourth week	BC 1.57 \pm 19.61 a	B 5.15 \pm 25.11 a	B 1.68 \pm 17.87 a	N.S.
Sixth week	C 1.13 \pm 17.66 a	B 2.39 \pm 17.34 a	B 0.692 \pm 17.62 a	N.S.
Eighth week	C 2.26 \pm 14.35 a	B 1.57 \pm 18.88 a	B 2.26 \pm 20.77 a	N.S.
Moral level	0.0001	0.0002	0.0001	

*Values represent the average \pm standard error.

**N.S: means that there are no significant differences between the averages at a significant level ($P \leq 0.05$)
The different small letters a, b, c within one row indicate significant differences between the treatments. The different capital letters A, B, C within the same column indicate significant differences between the periods within the single treatment at a significant level ($P \leq 0.05$).

Table 12 Effect of treatment with exogenous fibrolytic enzymes and period of weeks on VLDL level of blood serum (mean \pm standard error) mg/100 ml

period in weeks	Treatments			Moral level
	Tc	T1	T2	
Zero time	ABC *0.503 \pm 3.49 a	AB 0.396 \pm 3.16 a	A 0.274 \pm 3.41 a	N.S.**
Second week	AB 0.532 \pm 4.02 a	A 0.489 \pm 3.73 a	A 0.257 \pm 3.38 a	N.S.
Fourth week	C 0.264 \pm 1.99 a	B 0.287 \pm 2.56 a	B 0.306 \pm 1.93 a	N.S.
Sixth week	BC 0.330 \pm 2.14 a	B 0.243 \pm 2.46 a	B 0.238 \pm 2.11 a	N.S.
Eighth week	A 1.09 \pm 4.22 a	A 0.427 \pm 4.01 a	A 0.242 \pm 2.96 a	N.S.
Moral level	0.0438	0.0259	0.0006	

*Values represent the average \pm standard error.

**N.S: means that there are no significant differences between the averages at a significant level ($P \leq 0.05$)
The different small letters a, b, c within one row indicate significant differences between the treatments. The different capital letters A, B, C within the same column indicate significant differences between the periods within the single treatment at a significant level ($P \leq 0.05$)

Table 13 Effect of treatment with exogenous fibrolytic enzymes and period of weeks on ALP level of blood serum (mean \pm standard error) IU / L

period in weeks	Treatments			Moral level
	Tc	T1	T2	
Zero time	B *12.1 \pm 145.8 a	C 19.0 \pm 141.0 a	A 18.3 \pm 88.3 b	0.0525
Second week	B 14.5 \pm 105.0 a	C 9.84 \pm 112.8 a	A 20.6 \pm 90.3 a	N.S.**
Fourth week	B 19.9 \pm 143.6 a	BC 10.6 \pm 155.5 a	A 37.2 \pm 134.5 a	N.S.
Sixth week	B 12.4 \pm 151.3 a	A 10.4 \pm 212.1 a	A 36.9 \pm 133.8 a	N.S.
Eighth week	A 20.6 \pm 208.1 a	AB 26.1 \pm 199.5 a	A 41.7 \pm 166.6 a	N.S.
Moral level	0.0038	0.0013	N.S.	

*Values represent the average \pm standard error.

**N.S: means that there are no significant differences between the averages at a significant level ($P \leq 0.05$)

The different small letters a, b, c within one row indicate significant differences between the treatments. The different capital letters A, B, C within the same column indicate significant differences between the periods within the single treatment at a significant level ($P \leq 0.05$)

Table 14 Effect of treatment with exogenous fibrolytic enzymes and period of weeks on ALT level of blood serum (mean \pm standard error) IU / L

period in weeks	Treatments			Moral level
	Tc	T1	T2	
Zero time	A *1.45 \pm 17.50 b	A 1.16 \pm 24.16 a	A 1.81 \pm 18.16 b	0.0124
Second week	A 2.27 \pm 16.16 a	A \pm 21.66 0.714 a	A 2.51 \pm 18.66 a	N.S.**
Fourth week	A 1.80 \pm 15.66 b	A 1.77 \pm 22.83 a	A 1.81 \pm 16.33 b	0.0239
Sixth week	A 1.56 \pm 14.50 b	A 1.81 \pm 22.33 a	A 1.75 \pm 15.00 b	0.0091
Eighth week	A 2.21 \pm 16.66 a	A 2.51 \pm 23.33 a	A 2.60 \pm 17.66 a	N.S.
Moral level	N.S.	N.S.	N.S.	

*Values represent the average \pm standard error.

**N.S: means that there are no significant differences between the averages at a significant level ($P \leq 0.05$)

The different small letters a, b, c within one row indicate significant differences between the treatments. The different capital letters A, B, C within the same column indicate significant differences between the periods within the single treatment at a significant level ($P \leq 0.05$)

Table 15 Effect of treatment with exogenous fibrolytic enzymes and period of weeks on AST level of blood serum (mean \pm standard error) IU / L

period in weeks	Treatments			Moral level
	Tc	T1	T2	
Zero time	A *3.74 \pm 80.66 a	A 5.89 \pm 84.50 a	A 6.23 \pm 80.50 a	N.S.**
Second week	A 13.1 \pm 99.33 a	A 7.73 \pm 83.83 a	A 9.06 \pm 83.50 a	N.S.
Fourth week	A 6.20 \pm 81.66 a	A 5.01 \pm 81.16 a	A 6.74 \pm 80.33 a	N.S.
Sixth week	A 6.41 \pm 80.00 a	A 5.51 \pm 73.66 a	A 6.43 \pm 74.66 a	N.S.
Eighth week	A 5.64 \pm 84.33 a	A 7.78 \pm 83.50 a	A 5.30 \pm 78.33 a	N.S.
Moral level	N.S.	N.S.	N.S.	

*Values represent the average \pm standard error.

**N.S: means that there are no significant differences between the averages at a significant level ($P \leq 0.05$)

The different small letters a, b, c within one row indicate significant differences between the treatments. The different capital letters A, B, C within the same column indicate significant differences between the periods within the single treatment at a significant level ($P \leq 0.05$)

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