EFFECT OF MILK THISTLE EXTRACT SUPPLEMENTATION ON GROWTH PERFORMANCE, NUTRIENT DIGESTIBILITY, AND BLOOD PARAMETERS OF GROWING SHAMI GOATS

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SUMMARY

The current study was carried out to evaluate the effect of oral administration of milk thistle extract (MTE) as a natural additive on the growth performance, nutrient digestion coefficients, and some blood parameters of growing goats. Twelve male goats aging about four months with an average initial live body weight of 19.04 kg were used in this experiment. Goats were randomly divided into four experimental groups (3 goats each). Experimental animals of each group were kept in a separate shaded pen and adapted for the tested rations for 14 days before starting the trial. Animals were weighed every seven days in the morning before offering feed and water. The growth trial lasted for 120 days. In the last week of the growth experiment, a digestibility trial was carried out in which feces and blood samples were collected. Adding MTE at 10, 20, 30 g/head (G_2, G_3, and G_4) showed a significant ($P<0.05$) improvement in final body weight, total body gain, ADG, and FCR when compared to the control group (G_1). Moreover, adding 20 g of MTE/head/day (G_3) showed the best significant ($P<0.05$) values. The digestion of OM, CP, EE as well as the TDN and DCP values were improved significantly ($P<0.05$) in goats fed diets with MTE addition (G_2, G_3, and G_4) compared with the control group (G_1). There were no significant differences ($P>0.05$) among the three levels of MTE addition (G_2, G_3 and G_4) except for the OM digestibility and TDN values, where adding 20 g of MTE/head/day (G_3) showed the best significant value ($P<0.05$). Results also showed that adding MTE (G_2, G_3, and G_4) made a significant ($P<0.05$) enhancement in glucose values when compared to the control group (G_1). Moreover, adding the MTE at 20 g/head/day (G_3) showed the best significant ($P<0.05$) value of blood glucose when compared to the other two levels of MTE addition (G_2 and G_4) and the control group (G_1). Total protein, urea, and creatinine values were significantly ($P<0.05$) increased, but, ALT and AST values were ($P<0.05$) decreased by MTE addition (G_2; G_3; and G_4) compared to the control group (G_1), with no significant differences ($P>0.05$) between the three levels of MTE addition (G_2, G_3 and G_4). Finally, we concluded that MTE addition as a natural health-beneficial additive to a high-concentrate diet in growing Shami goats might cause changes in blood chemistry that could enhance growth performance and nutrient digestion coefficients. Also, we found that the best MTE addition level was 20 g/head/day (G_3).

***Key words**: Milk thistle supplementation, growth performance, nutrient digestibility, Shami goats*

INTRODUCTION

The quick growth rate of recent animal breeds can lead to metabolic and oxidative stress that can decrease the feed conversion efficiency and affect the growth and the quality of meat (Radko and Cybulski, 2007). Many plants have components that might be beneficial as feed supplements because of their biologically active constituents. Some active components that come from plants like phenolics, flavonoid compounds, and essential oils can be suitable sources of phytonutrients and immunity

enhancers, thus improving the antimicrobial and the antioxidant activity inside animals. Moreover, flavonoid-rich plant extracts were known to affect the microbial population, modulate ruminal fermentation, and improve nutrient utilization of ruminants (Hristov *et al.*, 1999; Davidson *et al.*, 2003; Yun *et al.*, 2003). These improvements in digestibility and immune response reflect positively on animal health, growth performance, and feed efficiency in growing animals.

Milk thistle (*Silybum marianum*) is an important herb that has usually been used for medicinal purposes, most commonly for the treatment of liver disease and liver protection from toxic materials (Rainone, 2005). Traditional milk thistle extract is made from the seeds. This extract consists of about seventy percent silymarin and thirty percent fatty acids, such as linoleic acid (Andrzejewska, 2011). Silymarin is a mixture of polyphenolics, which includes seven related flavonolignans (silydianin, silybin A, silybin B, isosilychristin, silychristin, isosilybin A, isosilybin B) and one flavonoid (taxifolin). besides from its hepatoprotective impact, silymarin also exhibited anti-inflammatory, antifibrotic, and antioxidant effects. It was proven to promote protein biosynthesis, improve lactation, and maintain immune action. Moreover, silymarin reduces cell growth and other mitogenic signals in the human breast and prostate carcinoma cells (Abenavoli *et al.*, 2010; Alishahi *et al.*, 2011; Karimi *et al.*, 2011).

Silymarin extract has been used usually, because of its positive impact on some health indicators. Tedesco *et al.* (2004) illustrated that using silymarin extract as a feed additive to dairy cows leads to a sooner peak of milk production and better milk production during lactation, Stringi *et al.* (2004) observed a higher milk production throughout lactation in lactating ewes when silymarin extract (seed) was fed, with no evidence of toxic effects. Moreover, Mojaddam *et al.* (2015) found that DMI, rumen fermentation, and blood parameters were improved by diets supplemented with *S. marianum*, anchoring its convenience for the small ruminants. Nikzad *et al.* (2017) observed that milk thistle might be added to the buffalo's diet up to 20% without any unfavorable effect on nutrients digestion and fermentation parameters. Furthermore, Karimirad *et al.* (2021) reported that artichoke and milk thistle extracts encouraged feed intake and played affirmative roles as antioxidants as showed by the positive changes in blood serum parameters, some enzyme activities, and liver health score. Also, lycopene and silymarin can help dairy cows to achieve metabolic adaptation during the first phases of lactation. Also, silymarin supplementation did not have side effects, and max milk yields could be obtained sooner with silymarin treatment (Garavaglia *et al.*, 2015). Moreover, Ulger *et al.* (2017) found that silymarin supplementation accelerates animals' metabolic adaptation at the start of the milking season. Therefore, the authors implied that silymarin should be added in the transition phases of dairy cows. However, in some cases no positive results were achieved (Potkanski *et al.*, 1991; Križova *et al.*, 2011). The present study was carried out to evaluate the impact of oral administration of the milk thistle extract (MTE) as a natural additive on the growth performance, nutrients digestibility coefficients and some blood metabolites of growing goats.

MATERIALS AND METHODS

Extract preparation:

Milk thistle seeds were obtained from local market and the extraction was obtained according to the method of Wianowska and Wisniewski (2015). Then the extract was filtered and concentrated under control reduced pressure at 40°C to obtain the crude extract. The dried crude extract was stored at -20°C until further use.

Experimental animals:

Twelve Shami male goats aging about 4 months with average initial live body weight of 19.04 kg were used in this experiment. Goats were randomly divided into four experimental groups (3 goats each). Experimental animals of each group were kept in a separate shaded pen and adapted for the tested rations for 14 days before starting the trial. Animals were weighed every 7 days in the morning before offering feed and water. The growth trial lasted for 120 days. At the last week of the growth experiment, a digestibility trial was carried out in which feces and blood samples were collected.

Experimental ration:

Rations were formulated to meet the animal's nutrient requirements according to the NRC recommendation (NRC, 1985), and offered as a total mixed ration (TMR) twice daily. The experimental groups were: control diet with no supplements (G1), control diet plus 10 g milk thistle extract (MTE)

(G2), control diet plus 20 g MTE (G3) and control diet plus 30 g MTE/head/day (G4). The crude extract was dissolved in water and orally administered to each animal of the G2, G3, and G4 groups. Formulation of the total mixed ration (TMR) and the chemical composition (%, on dry matter basis) of the experimental ration are given in Tables (1 and 2), respectively.

Table (1): Formulation of the total mixed ration (TMR).

Ingredients	Content (%)
Yellow corn	45
Soybean meal	20
Wheat bran	15
Berseem straw	15
Limestone	2
Sodium chloride	1
Vitamins and minerals mixture*	2

** Each 3 kg Vitamins and Minerals mixture contains: Vit. A 12500000 IU, Vit. D3 2500000 IU, Vit. E 10,000 mg, Manganese 80000 mg, Zinc 60,000 mg, Iron 50000 mg, Copper 20000 mg, Iodine 5000mg, Cobalt 1000 mg and carrier (CaCo3) add to 3000g. (Produced by Agri-Vet Company).*

Table (2): The chemical composition (%, on dry matter basis) of the experimental total mixed ration (TMR)

Component (%)	Content (%)
Moisture	9.68
Chemical composition % on DM basis	
OM	90.00
CP	15.90
CF	14.00
EE	3.50
NFE	56.60
Ash	10.00

Feeding management:

Diets were offered twice daily. Both of consumed rations and refusals (if any) were daily recorded. Rations requirements were adjusted every 7 days during the experimental period according to the changes of animal's body weights. Data of live body weights and feed intake (FI) were recorded and used to calculate the average daily gain (ADG) and the feed conversion ratio (FCR). Fresh water was available all the time for all the experimental groups.

Sample collection:

During the collection period feces was collected from the rectum of each individual animal once daily in the morning before offering feed. The collected feces were sprayed with 10% sulfuric acid and 10% formaldehyde solutions and dried in a drying oven at 60 ˚C for 48 hrs. Dried samples for each day of the 5 d collection period were pooled together; representative samples were ground, composite by animal, and stored for later chemical analyses. Composite samples of the experimental diet was ground and stored for further analysis. At the end of the digestibility trial, blood samples were taken from the left jugular vein through a clean dry needle into 10 ml heparinized test tubes. The samples were centrifuged at 4000 r. p. m for 10 minutes, then blood plasma was separated and stored frozen at -20 ˚C for final analysis.

Chemical analyses:

Dry matter (DM), organic matter (OM), ash, crude protein (CP), crude fiber (CF) and ether extract (EE) were determined in feed and feces samples according to the Official Method of Analysis (AOAC, 2000). While nitrogen free extract (NFE) was calculated by difference using the following equation:

$$NFE = 100 - [Ash + CP + CF + EE\ \%]$$

Acid insoluble ash was used as internal marker and the coefficients of digestion were calculated as described by Ferret *et al.*, (1999).

Blood total protein, urea, glucose, total lipids, aspartate aminotransferase (AST), alanine aminotransferase (ALT) and creatinine were determined calorimetrically by using commercial kits according to Gornal *et al.* (1949); Fawcett and Scott (1960); Trinder (1969); Zollner and Kirsch (1962); Reitman and Frankel (1957); Bartles *et al.* (1972). All commercial kits were purchased from Bio-diagnostic, Giza, Egypt.

Statistical analyses:

Obtained data from this study were statistically analyzed by SPSS (2008). One way ANOVA procedure was used to analyze the data of the effect of milk thistle extract addition with different levels on growth performance, nutrients digestibility and blood parameters according to the following model:

$$Y_{ij} = \mu + T_i + e_{ij}$$

Where:

Y_{ij} = any value from the overall population

μ = the overall mean

T_i = effect of the i^{th} milk thistle extract level

e_{ij}= the random error associated with the j^{th} test under the i^{th} treatment

Significant differences among group means were separated by Duncan's multiple range test (Duncan, 1955) with a 5% level of probability.

RESULTS AND DISCUSSION

Growth performance:

Data in Table (3) represents the effect of milk thistle extract (MTE) addition on body gain, nutrients intake and feed conversion ratio of the experimental groups. Adding MTE showed a significant ($P<0.05$) improvement in final body weight, total body gain, ADG, and FCR (32.97, 13.97, 0.116 kg and 6.69 Kg DMI/Kg gain; 36.17, 17.17, 0.143 kg and 5.79 kg DMI/Kg gain; 32.45, 13.38, 0.112 kg and 6.88 kg DMI/Kg gain for G_2; G_3; and G_4, respectively) when compared to the control group (31.13, 12.10, 0.101 kg and 7.55 Kg DMI/Kg gain for G_1). In addition, adding 20 g of MTE/head/day (G_3) showed the highest significant values ($P<0.05$).

Table (3): Daily gain, feed intake and feed conversion ratio of the experimental goat groups.

Item	Experimental groups				±SEM
	G_1	G_2	G_3	G_4	
Number of animals/group	3				
Initial body weight (IBW), Kg	19.03	19.00	19.00	19.07	0.25
Final body weight (FBW), Kg	31.13^{c}	32.97^{b}	36.17^{a}	32.45^{b}	0.59
Total body gain, Kg	12.10^{c}	13.97^{b}	17.17^{a}	13.38^{b}	0.58
Duration of the experiment, days	120				
Average daily gain, Kg/h/day	0.101^{c}	0.116^{b}	0.143^{a}	0.112^{b}	0.005
Total dry matter intake (DMI), Kg/h/day	0.763^{b}	0.776^{b}	0.828^{a}	0.771^{b}	0.01
Feed conversion ratio (Kg DMI/Kg gain)	7.55^{a}	6.69^{b}	5.79^{c}	6.88^{b}	0.22

$^{a, b, and\ c}$ Means in the same row having different superscripts differ ($P<0.05$). SEM: standard error of the means. G_1: 15% berseem straw + 85% CFM (control), G_2: control + 10 g milk thistle extract (MTE)/head/day, G_3: control + 20 g MTE/head/day, and G_4: control + 30 g MTE/head/day.

Total feed intake (TFI) values were not significantly affected (P>0.05) by the MTE addition except for the G_3 group, where adding 20 g of MTE/head/day (G_3) showed the highest significant value (P<0.05) of TFI (0.828 kg/day) when compared to the control (G_1), G_2 and G_4 groups (0.763, 0.776 and 0.771 kg/day, respectively).

These results are in line with the findings of Mojaddam *et al.* (2015), who found that dry matter intake was improved by diets supplemented with *S. marianum*, anchoring its convenience for the small ruminants. Moreover, Karimirad *et al.* (2021) reported that artichoke and milk thistle extracts increased feed intake.

However, the current results are in contrast with the finding of Kim *et al.* (2013) who observed that addition of silymarin had no significant effect (P>0.05) on initial and final body weights, body gain and ADG of Hanwoo steers. An explanation for the enhancement in the growth performance of goats fed a high concentrate diet with MTE addition in the current study may be due to the improved nutrients utilization through promoting digestion, as evidenced by increased nutrients digestion coefficients and nutritive values (Table 4).

Nutrient digestibility:

The effect of adding milk thistle extract (MTE) on nutrients digestibility and nutritive values of growing goats are shown in Table (4). The digestion values of OM, CP, and EE were improved significantly (P<0.05) for goats fed diets with MTE addition (82.04, 77.01 and 84.97%; 82.96, 76.73 and 85.90%; and 81.96, 77.13 and 84.53% for G_2, G_3, and G_4, respectively) compared with the control group (80.94, 73.16 and 81.66% for G_1). There were no significant differences (P>0.05) among the three levels of MTE addition (G_2, G_3 and G_4) except for the OM digestibility, where adding 20 g of MTE/head/day (G_3) showed the best significant value (P<0.05). Nitrogen free extract digestibility was not significantly affected (P>0.05) by the addition of MTE except for the G_3 group, where adding MTE at the level of 20 g/head/day (G_3) significantly (P<0.05) enhanced the NFE digestibility value (89.64% for G_3) compared with the other groups (87.22, 87.64, and 87.11% for G_1, G_2, and G_4, respectively). Furthermore, the digestibility of DM and CF were not significantly changed (P>0.05) among all of the experimental groups (77.80 and 64.20%; 78.21 and 64.34%; 77.65 and 62.29%; 78.06 and 64.15%

for G_1, G_2, G_3 and G_4, respectively).

Table (4): Nutrient digestion coefficients and nutritive values of the experimental goat groups.

Item	Experimental groups				±SEM
	G_1	G_2	G_3	G_4	
Nutrient digestibility coefficients %					
DM	77.80	78.21	77.65	78.06	0.11
OM	80.94^{c}	82.04^{b}	82.96^{a}	81.67^{b}	0.23
CP	73.16^{b}	77.01^{a}	76.73^{a}	77.13^{a}	0.56
CF	64.20	64.34	62.29	64.15	0.43
EE	81.66^{b}	84.97^{a}	85.90^{a}	84.53^{a}	0.60
NFE	87.22^{b}	87.64^{b}	89.64^{a}	87.11^{b}	0.33
Nutritive values %					
TDN	76.42^{c}	77.55^{b}	78.42^{a}	77.21^{b}	0.23
DCP	11.63^{b}	12.24^{a}	12.20^{a}	12.26^{a}	0.09

a, b, and c Means in the same row within each treatment having different super scripts differ (0.05). SEM: standard error of the means.

G_1: 15% berseem straw + 85% CFM (control), G_2: control + 10 g milk thistle extract (MTE)/head/day, G_3: control + 20 g MTE/head/day, and G_4: control + 30 g MTE/head/day.

Results also showed that the MTE addition significantly (P<0.05) improved the TDN and DCP values (77.50 and 12.24; 78.42 and 12.20; and 77.21 and 12.26% for G_2; G_3; and G_4, respectively) compared with the control group (76.42 and 11.63% for G_1). There were no significant differences (P>0.05) among the three levels of MTE addition (G_2, G_3 and G_4) except for the TDN, where adding 20 g of MTE/head/day (G_3) showed the best significant value (P<0.05).

Similar finding were reported by Mojaddam *et al.* (2015) who observed that rumen fermentation parameters were positively affected by diets containing *S. marianum*. Also, Nikzad *et al.* (2017) noticed that milk thistle might be added to the buffalo's diet up to 20% without any unfavorable effect on

nutrients digestion and fermentation parameters. On the other hand, some studies showed no positive results with MTE addition (Potkanski *et al.*, 1991; and Križova *et al.*, 2011).

The current results may be due to the positive effect of MTE as an antioxidant on the microbial activity of the rumen, which leads to enhancing the ruminal fermentation and thus improving nutrient utilization by goats fed a high concentrate diet. These improvements in digestibility and immune response reflect positively on animal health, as evidenced by the enhanced blood parameters (Table 5).

Blood plasma parameters:

Data in Table (5) represents the effect of milk thistle addition on some blood plasma metabolites of the experimental groups. Results showed that adding MTE made a significant ($P<0.05$) improvement in glucose values (68.92, 73.53, and 67.67 mg/dl for G_2, G_3, and G_4, respectively) when compared to the control group (65.30 mg/dl for G_1). However, adding the MTE at 20 g/head/day (G_3) showed the highest significant ($P<0.05$) value of blood glucose when compared to the other two levels of MTE addition (G_2 and G_4) and the control group (G_1).

Total protein, urea, and creatinine values were significantly ($P<0.05$) increased by MTE addition (6.67 g/dl, 13.31 and 0.81 mg/dl; 6.73 g/dl, 13.22 and 0.83 mg/dl; 6.69 g/dl, 13.16 and 0.83 mg/dl for G_2; G_3; and G_4, respectively) compared to the control group (6.22 g/dl, 11.51 and 0.63 mg/dl for G_1), with no significant differences ($P>0.05$) between the three levels of MTE addition (G_2, G_3 and G_4). Moreover, ALT and AST values were significantly ($P<0.05$) decreased by MTE addition (15.23 and 65.18; 14.97 and 64.80; 14.87 and 65.90 U/ml for G_2; G_3; and G_4, respectively) compared to the control group (18.23 and 70.29 U/ml for G_1). Also, There were no significant differences ($P>0.05$) between the three levels of MTE addition (G_2, G_3 and G_4). Total lipids values were insignificantly ($P>0.05$) increased by MTE addition (426.0, 450.5, 453.5, and 456.8 mg/dl for G_1, G_2, G_3, and G_4, respectively).

Table (5): Plasma metabolites recorded for the experimental goat groups.

Item	Experimental groups				±SEM
	G_1	G_2	G_3	G_4	
Glucose (mg/dl)	65.30^{c}	68.92^{b}	73.53^{a}	67.67^{b}	0.94
Total protein (g/dl)	6.22^{b}	6.67^{a}	6.73^{a}	6.69^{a}	0.07
Urea (mg/dl)	11.51^{b}	13.31^{a}	13.22^{a}	13.16^{a}	0.25
Creatinine (mg/dl)	0.63^{b}	0.81^{a}	0.83^{a}	0.83^{a}	0.03
ALT (units/ml)	18.23^{a}	15.23^{b}	14.97^{b}	14.87^{b}	0.46
AST (units/ml)	70.29^{a}	65.18^{b}	64.80^{b}	65.90^{b}	0.71
Total lipids (mg/dl)	426.0	450.5	453.5	456.8	10.9

$^{a, b, and\ c}$ Means in the same row within each treatment having different superscripts differ at ($P<0.05$). SEM: standard error of the means.

G_1: 15% berseem straw + 85% CFM (control), G_2: control + 10 g milk thistle extract (MTE)/head/day, G_3: control + 20 g MTE/head/day, and G_4: control + 30 g MTE/head/day.

Blood analysis data is supposed to be one of the vital measurements for judging the status of the body. Furthermore, it can be a useful sign of the impacts of herb feeding on normal body physiology. The blood metabolites recorded for the current study are similar to the results reported by Kim *et al.* (2013), who noticed that there were a positive effects of silymarin addition on the blood glucose, urea, creatinine and ALT values in Hanwoo steers fed a high-concentrate diet. About 80 percent of absorbed propionate is utilized for glucose synthesis (Steinhour and Bauman, 1988); this could be the reason for the improved values of blood glucose for the G_3 group. Where, the MTE addition may enhance the volatile fatty acids production, especially the propionic acid which is the precursor of glucose synthesis, by improving the ruminal fermentation. Moreover, the higher total protein values for MTE groups (G_2, G_3 and G_4) may be due to the enhancement in ruminal microbial protein synthesis or to the better absorption of dietary protein, where total protein concentration in the blood reflects the availability of dietary protein.

Blood urea is synthesized in the liver from the absorbed ammonia of the rumen or gut (Davidson et al., 2003). Therefore, the changes in urea concentration in the current study with MTE addition (G2, G3, and G4) were possibly happened because of the changes in ruminal ammonia between the MTE groups and the control group (G1). Blood creatinine is supposed to be an indicator of muscle mass because there was a positive correlation found between blood creatinine concentration and carcass weight, and dressing percentage (Istasse et al., 1990). The higher levels of blood urea and creatinine in the present study with

MTE addition (G2, G3, and G4) reflect the improved utilization of dietary protein, which is supported by the results of growth performance and nutrients digestion coefficients as shown in Tables (3 and 4).

Besides its antioxidant impacts, silymarin has anti-inflammatory and pharmacological activities. Also, silymarin has been used to cure many diseases, mostly liver diseases, by boosting liver regeneration. Moreover, silymarin can activate protein synthesis and tissue regeneration in the liver (Gazák et al., 2007). The decreased ALT and AST values with the MTE groups (G2, G3, and G4) in the present study may imply a beneficial effect on liver function.

CONCLUSION

In conclusion, the addition of milk thistle extract (MTE) as a natural health-beneficial additive to a high-concentrate diet in growing Shami goats may cause changes in blood chemistry that could enhance growth performance and nutrients digestibility. Also, we found that the best MTE addition level was 20 g/head/day.

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تأثير اضافة مستخلص شوك الجمل على أداء النمو، هضم العناصر الغذائية وقياسات الدم في الماعز الشامي النامي

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أجريت الدراسة الحالية لتقييم تأثير تناول مستخلص شوك الجمل عن طريق الفم كإضافة طبيعية على أداء النمو، معاملات هضم العناصر الغذائية وبعض قياسات الدم في الماعز الشامي النامي. تم استخدام اثني عشر من ذكور الماعز (عمر 4 أشهر) مع متوسط وزن للجسم حوالي 19.04 كجم. حيث قسمت الحيوانات بشكل عشوائي إلى أربع مجموعات تجريبية (3 ماعز لكل مجموعة) كما تم الاحتفاظ بالحيوانات التجريبية الخاصة بكل مجموعة في حظيرة منفصلة. تمت أقلمت الحيوانات على العلائق التجريبية لمدة 14 يومًا قبل بدء التجربة. استمرت تجربة النمو لمدة 120 يومًا، وفي الأسبوع الأخير من تجربة النمو تم إجراء تجربة هضم تم فيها جمع عينات العلف، الروث و الدم. أظهرت النتائج أن إضافة مستخلص شوك الجمل بمستوى 10، 20، 30 جم/رأس/اليوم (G_2،G_3، و G_4) أدت إلى حدوث تحسن معنوي ($P<0.05$) في وزن الجسم النهائي، إجمالي الزيادة في وزن الجسم، معدل الزيادة اليومي، ومعامل التحويل الغذائي بالمقارنة مع مجموعة الكونترول (G_1). وكذلك فإن إضافة 20 جم من شوك الجمل/الحيوان/اليوم (G_3) ، أظهرت أفضل القيم معنويا ($P<0.05$) بالمقارنة بالمجاميع الأخرى. تم تحسين هضم كل من المادة العضوية و البروتين الخام و الدهن وكذلك قيم المركبات الكلية المهضومة والبروتين الخام المهضوم معنويا ($P<0.05$) في الماعز الذي تم تغذيته على علائق مضاف لها مستخلص شوك الجمل (G_2 ،G_3، وG_4) مقارنة مع مجموعة الكونترول (G_1) . مع عدم وجود فروق معنوية ($P>0.05$) بين المستويات الثلاثة لإضافة المستخلص، باستثناء كل من قيم هضم المادة العضوية وكذلك قيم المركبات الكلية المهضومة. حيث أن إضافة 20 جم من مستخلص شوك الجمل/الحيوان/اليوم (G_3) أظهرت أفضل النتائج معنويا ($P<0.05$) بالمقارنة بالمجاميع الأخرى. بالاضافة لذلك فقد أدى اضافة مستخلص شوك الجمل (G_2 و G_3 و G_4) الى حدوث تحسن معنوي ($P<0.05$) في قيم جلوكوز الدم بالمقارنة مع مجموعة الكونترول (G_1). وأن إضافة مستخلص شوك الجمل عند مستوى 20 جم/الحيوان/اليوم (G3) أظهر أعلى قيمة معنوية ($P<0.05$) لجلوكوز الدم مقارنة بالمستويين الآخرين من الإضافة وبمجموعة الكونترول. كما زادت قيم كل من البروتين الكلي واليوريا والكرياتينين بينما انخفضت قيم الـ ALT وAST في الدم بشكل معنوي ($P<0.05$) بإضافة المستخلص (G_2 و G_3 و G_4) مقارنة بمجموعة الكونترول(G_1) ، مع عدم وجود فروق معنوية ($P>0.05$) بين المستويات الثلاثة للاضافة. نخلص من هذه النتائج أن إضافة مستخلص شوك الجمل كإضافة طبيعية للعلائق المرتفعة في محتواها من المواد المركزة قد يسبب تغييرات في كيمياء الدم والتي من الممكن أن تعزز أداء النمو ومعاملات هضم العناصر الغذائية في الماعز الشامي النامي. كما وجد أن أفضل مستوى لإضافة مستخلص شوك الجمل هو 20 جم/الحيوان/اليوم (G3) .