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Effect of Fatty Calcium Salts Addition on Digestibility, Milk Yield, Milk Composition and Some Blood Components in Barki Goats and Their Crosses with Damascus Goats

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ABSTRACT

The study was carried out at Borg El-Arab station ,animal production research institute. The experiment carried out through 2008 till 2010 years. The aim of this study was to evaluate the effect of fatty calcium salts supplementation on nutrient digestibility and lactational performance of Barki goats and their crosses with Damascus. Digestion experiments was conducted using three adult Barki bucks (B) and three adult crossbred bucks (Damacus x Barik, (DxB). Thirty multiparous Barki does (B) and thirty multiparous Damascus x Barki crossbred (DxB) does every breed was divided into three groups of ten does each. The first group (Control): fed concentrate mixture and rice straw, the second group fed the same concentrate mixture with fatty calcium salts (FCS), 80 gm/ head/ day and rice straw before kidding by 6 weeks until the end of season. The third group fed concentrate mixture with fatty calcium salts 80g/ head/ day and rice straw, after kidding by 2 weeks until the end of season.

The results indicated that Feed intake (FI) was reduced by (FCS) addition. Also, the does fed FCS after kidding were significantly higher than does treated before kidding in FI. Also feeding goats on diets containing (FCS) had non significant effect on digestibility coefficients of DM, OM, CP, CF and NFE %, but there was significantly increase in the digestibility of EE as compared to the control diets. The nutritive value expressed as TDN % of the experimental diets was significantly (P< 0.01) improved as a result of addition (FCS), while, the digestible crude protein DCP % was almost comparable for the two experimental diets . Feeding does fatty calcium salts before or after parturition, insignificantly increased milk yield at days 7, 15, 30, 60, 90 and day 120 and also total milk yield .The data show no significant changes in milk composition (%) due to addition of fatty calcium salts to diets of does before or after kidding except the milk fat which significant (P<.01) increased with addition FCS . The serum total cholesterol concentrations (mg/dl) were significantly (P< 0.01) affected by addition of (FCS) to the diets before kidding (17, 19, 21 weeks) and after kidding (4, 8, 12 weeks) periods. The serum HDL and serum LDL concentrations (mg/dl) were higher for does fed diets containing (FCS) before kidding (17, 19, 21 weeks) periods and after kidding (4, 8, 12 weeks) periods. Addition of fatty calcium salts to diets of does before or after kidding significant (P<.01) increased serum concentration of aspartate aminotransferase (AST) and serum concentration of alanine aminotransferase (ALT).

Key words: fatty calcium salts, Barki, Damascus, Goats, blood components, nutrients digestibility.

INTRODUCTION

Fat supplements found the way to be included in the diet of ruminants to increase energy density, improve nutrient utilization, enhance milk and meat yields and manipulate fatty acid composition. (Coppock and Wilks, 1991; Ashes *et al.* 1992 and Scott and Ashes, 1993). Using fats in the rations of farm animals has been increased significantly over the last decade. This trend has been fueled by the awareness developed to meet requirements of animal have genetic potential for growth and lactation that exceed their ability to meet their energy need by consuming common feedstuffs.

The most important fats constituents in nutrition include fatty acids, glycerol, mono-di and triglycerides and phospholipids. Most fatty acids in ruminant tissues are straight chained and have even number of carbons and are esterified to glycerol to form triglycerides.

Ruminants and their associated microbial flora evolved only with rather low levels of fat in the feedstuff. Excess fats over 2-3% of dry matter intake

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had inhibitory effects to microbial activity. The Inhibitor effects increase with degree of solubility; so the unsaturated medium-chain and unestrified fatty acids consider more inhibitorier than estrified while the free oils are inhibitorier than those fed on whole seeds (Palmquist, 1984). Thus, fats must be selected for use in the rumen. Inert fat (Fatty Calcium Salts) in simple meaning are not affecting the microbial fermentation. Moreover, the FCS is insoluble at normal rumen pH, to and being satisfactory stable at 6.5 ruminal pH. In abomasum; the FCS converts to free fatty acids and calcium which are absorbed from the small intestine (Sklan *et al.* 1985 and Schneider *et al.* 1988). In the other side, under particular condition, if the rumin pH is less than 6, a relatively high dissociation of Ca-salts followed the bio-hydrogenation of long-chain unsaturated fatty acids. The resistance of Ca-salts to dissociation and bio-hydrogenation may also depend on the degree of fatty acids instauration (Sukhija and Palmquist, 1990). Ruminally inert fats have been developed to avoid the decline in dietary fiber previously associated with fat supplementation (Jenkins and Jenny, 1989). In general, it was found that feeding fat to ruminants at level 5.0- 6.0 % would achieve maximum efficiency of nutrient utilization (Coppock and Wilks, 1991). Also, feeding ewes on diets supplemented with FCS during late pregnancy improved birth weight of lambs (Ghoreishi *et al.,* 2007). The aim of this study was to investigate the effect of supplementing diet with fatty calcium salts during pregnancy and lactation Barki and Barki × Damascus goats' on feed intake and digestibility, blood serum metabolites and lactational performance.

MATERIALS AND METHODS

Animals and management

The study was carried out at Borg El-arab station ,animal production research institute . The experiment carried out through 2008 till 2010 years.. thirty Barki does (B) averaged 27± 0.3 kg body weight and thirty Damascus × Barki crossbred (DB) does averaged about 30.4±0.3 kg body weight where both aged 3-5 years were used in the study. Additionally six adult bucks from both genotype were used in the determination of nutrients digestibility . Animals were kept outdoor with in shelter pens during the day and in semi-open barns at night. The Bucks were dewormed and vaccinated against enter-toxaession before inducting into the experiment. Commercial concentrate diets (13% CP and 65% TDN) was offered to the animals according their requirements .. All animals were free of diseases and did not show behavioral abnormalities throughout the experimental period.

Experimental design

Animals of each genotype were divided randomly into three subgroups. The three subgroups were; control group which received diet without supplementation, the second group received 80 g (FCS)/ head/ day at 6 weeks before kidding until the end of season. and the third group received 80 g FCS/head/day at two weeks after kidding until the end of season. The (FCS) was added daily to the concentrate diet. Concentrate feed mixture consisted of 63 % yellow corn, 10 % cotton seed meal, 10 % flaxseed meal, 15% wheat bran, 0.5 % NaCl, 1.4 % limestone and 0.1 % mineral peremix. The chemical composition of (FCS) is shown in Table (1) and which manufactured in Egypt under commercial of name IBelac.

Digestibility trial

Six adult bucks (three Barki and three (DB)) were used in two digestion trails to study the impact of supplementation with FCS on the digestibility and nutritive value of the experimental diets. The bucks were adapted for two weeks, then after 7-days collection applied.. During the preliminary period the bucks were confined to individual pens 2 x 1 m with facilities for individual feeding and watering. However, during the collection period, feed intake of individual animal was quantified based on feed refusal. Feed samples were collected in separate polyethylene bags daily for each animal. Each twenty-four hours of collection period. Faeces and urine produced every 24 hours were recorded 08;00 am before feeding, then a 0.10 (w/w) samples were collected per individuals and stored frozen at -20°C in a polyethylene bag. An aliquot of 0.05 (v/ v) urine of was collected daily and kept at 4°C after the addition of few drops concentrated HCl. The Frozen a faeces samples were thawed, mixed thoroughly and sub-sampled to be taken for DM determination and chemical analysis .Feed samples, faeces and urine were analyzed for DM, total ash and N using Micro-Kjeldahl method according to the procedures described by **AOAC (1990).** Ether extract was estimated after acid hydrolysis (4NHcl).

Determination of milk yield and composition

Milk yield of the does during the nursing and milking periods was measured at days 7, 15, 30, 60, 90 and 120 from kidding using the double oxytocin injection methods as modified by Peris et al., (1996). Oxytocin was injected into the juglar vein and the does were handed milked with at 4h interval Milk yield was measured by volume (±20ml). Individual milk samples were collected at weeks 4, 8, 12, 16 from kidding for subsequent milk composition analysis.

Table 1. Chemical composition of fatty calcium salts (FCS)* according to producer certificate

Item		%
Fatty calcium salts of palm oil, cotton oil and sunflower oil (1:1:1)		95
Moisture		4.98
Antioxidant (BHT)**		0.02
Fatty acids (%)		
C16:0	**Palmatic acid**	24.30
C16:1	**Palmitoloic acid**	0.37
C18:0	**Stearic acid**	3.70
C18:1	**Oleic acid**	24.36
C18:2	**linoleic acid**	42.10
C18:3	**linolineic**	0.13
	Another fatty acids	0.041
TDN		180
Calcium		10
Free fatty acids		0.5

* FCS: Fatty calcium salts manufactured in Egypt by (trade mark IBelac).
** BHT: Butylated hydroxyl toluene.

Milk samples were chemically analyzed at the dairy services units of APRI (Sakha, Kafr El-Shaeikh) to determine the percentages of protein, fat, lactose and total solids by using Milko-Scan-133B.

Blood serum analysis:

Blood samples were collected biweekly during late pregnancy period and monthly during lactation period from the jugular vein of each doe. Blood were collected in the morning before access to feed and water then placed immediately on ice. Blood samples was collected without using anticoagulant and centrifuged at 3rpm for 20 minutes to collect serum which stored at -20°C till analysis. Serum Triglyceride (TG), Total cholesterol, low density lipoprotein (LDL), high density lipoprotein (HDL), Alanine amino transferase (ALT) and Asparatate amino transferase (AST) were measured using bio-Merioux kits (France).

Statistical analysis:

Data were statistically analyzed using GLM procedure according to SAS (2000). Significant differences between means were detected using Duncan's Multiple Range Test (Duncan ,1955).

$Y_{ijk} = \mu + B_i + T_j + (BT)_{ij} + e_{ijk}$

Where:

Y_{ijk} = An observation on individual k

μ = overall mean

B_i = Fixed effect of genotype (i=2)

T_j = Fixed effect of treatment (j=3)

$(BT)_{ij}$ = interaction between genotype and treatment

e_{ijk} = random error normally distributed with mean = zero and variance = σ^2

RESULTS AND DISCUSSION

Chemical analysis and nutritive value of the experimental feedstuff:

Composition of concentrate, chemical analysis and nutritive values of the experimental feedstuffs are shown in (Table 2). The results indicate that the concentrates mixture (Conc.) either alone or plus fatty calcium salts (Conc. + FCS) were iso-nitrogenous; containing 13.18 and 13.06% crude protein, respectively.However, they differ in EE and CF which reflected on their nutritive value estimates as TDN (60.50 to 64.84%). This improvement may be due to the higher digestibility of EE of diet containing fatty calcium salts (FCS) as compared to the control diet (Table 4). The digestible crude protein (DCP %) was almost comparable for the two experimental diets indicating the absence of influence of fatty calcium salts (FCS) on crude protein (CP) digestibility (Table 4). This result was compatible with the finding of Sanz Sampelayo *et al.* (2002a).

Feed intake:

Data in Table 3 show that crossbred does had higher intake of rice straw, concentrate and total feed than Barki does . This may be due to heavier body weight of crossbred does than Barki does. This result is in agreement with (Turner *et al.* 2005). Dement and Van Soest (1985) suggested that there is a strong relationship between body size and metabolic requirement and that feed requirements of ruminant increase with increasing body weight.

Table 2. Chemical analysis and nutritive values of the experimental feedstuffs, Composition of commercial concentrate mixture

Chemical analysis	Rice straw	Conc.*	Conc. + FCS**
Dry matter,%	91.69	91.8	91.94
Dry matter composition, %			
OM	79.88	92.03	92.16
CP	3.99	13.18	13.06
CF	32.59	11.96	7.18
EE	1.24	3.82	9.2
NFE	42.06	63.07	62.72
Ash	20.12	7.97	7.84
Nutritive value			
TDN	38.06±0.84	60.50±0.84	64.84±0.84
DCP	-	7.10±0.10	6.84±0.10
Item		**%**	
Ingredients,			
Yellow corn		63	
Cotton seed meal		10	
Flaxseed meal		10	
Wheat bran		15	
NaCl		0.5	
Limestone		1.4	
Mineral premix		0.1	

*****= Conc.: Concentrate mixture, ******= FCS: Fatty calcium salts

Mineral premix: Common salt (44.156), bone meal (25%), calcium carbonate (10%), potassium chloride (15%), potassium sulphate (5%), magnesium sulphate (0.39%), ferrous sulphate (0.33%), manganese (0.061), potassium iodide (0.01%), zinc oxide (0.044) and cobalt chloride (0.009%).

Table 3. Feed intake (Kg) as affected by genotype, fatty calcium salts (FCS) and their interactions

Item	Rice straw intake (Kg)	Concentrate intake (Kg)	Total feed intake (Kg)
Genotype			
Barki (B)	0.204± 0.001[b]	0.697± 0.003[b]	0.902± 0.001[b]
DamascusXBarki (DB)	0.215± 0.001[a]	0.748± 0.0002 [a]	0.963± 0.001[a]
Significance	**	**	**
Treatments			
Control	0.220± 0.001[a]	0.725± 0.0001[a]	0.945± 0.002[a]
Before kidding	0.183± 0.001[b]	0.720± 0.002[b]	0.904± 0.003[c]
After kidding	0.216± 0.001[a]	0.721± 0.002[b]	0.937± 0.003[b]
Significance	**	**	**
Genotype X treatment			
Barki control	0.214± 0.001[a]	0.700± 0.001[c]	0.914± 0.001[d]
Barki before	0.178± 0.002[d]	0.693± 0.001[e]	0.872± 0.002[f]
Barki after	0.209± 0.001[b]	0.697± 0.0004[d]	0.906± 0.001[e]
DB control	0.225± 0.001[a]	0.750± 0.001[a]	0.975± 0.001[a]
DB before	0.188± 0.001[c]	0.746± 0.0004[b]	0.935± 0.001[c]
DB after	0.223± 0.001[a]	0.746± 0.0004[b]	0.969± 0.001[b]
Significance	**	**	**

** = highly significant (P<0.01)

Feed intake was affected by adding FCS, where does supplemented with FCS consumed lower rice straw and concentrate and consequently lower total feed intake (P<0.01) than control group(Table 3). The decrease in feed intake by addition of FCS has been attributed to increase energy density (Kadzere and Jingurn, 1993). Also, Wu *et al.* (1993) hypothesized that in early lactation period the fatty acids are released from adipose tissue, which together with those of dietary origin fatty acids, may reduce feed intake to regulate fatty acids concentration in plasma.

All treatments showed highly significant effect on feed intake. In general, Barki does fed treated diet before kidding showed the lowest feed intake.

Digestion coefficient

Data of nutrients digestibilities of the experimental rations are presented in Table (4). Breed had no significant effect on digestibility coefficients of DM, OM, CP, CF, EE and NFE %.. Feeding goats on diets containing FCS had insignificant effect on digestibility coefficients of DM, OM, CP, CF and NFE %, but it had significant (P<0.01) increase in the digestibility of EE compared to the control diet (Table 4). Perez Alba *et al.* (1997) reported that as ether extract content increased in the diet and its digestibility was increased. Modifications in nutrient digestibility produced by adding fat to the diets of ruminants may vary depending on several factors. Inclusion of FCS affected (Table 4) apparent digestibility of DM, OM, CP, CF, EE and NFE % where diet with added fat had higher EE digestibility (P=0.01) than control group diet (79.29 *versus* 57.56). Diet with FCS presented lower digestibility values (P<0.05) regarding CP, CF and NEF %. The present findings that FCS inclusion reduced CP, CF and NEF digestibility is consistent with data published by Appeddu *et al.* (2004) who reported alterations in ruminal degradation of CP, CF and NEF in sheep when calcium soaps of palm oil fatty acids was added to the diet. Also, Nelson *et al.* (2001) noted that CP, CF and NEF % digestibility decreased when tallow was added to fattening ration of calves.

The higher digestibility of EE has been explained by Grummer (1988) as the added fat is probably more digestible than the lipid component of the basal diet. Moreover, Borsting *et al.* (1992) suggested that the added fat would dilute endogenous lipid secretions, resulting in a more accurate estimate of true lipid digestibility. Comparable results were reported by Sanz Sampelayo *et al.* (2002a); and Youssef (2006).

Milk yield

Results of daily and total milk yield for Barki does and crossbred BD fed the experimental diets through different periods are illustrated in figure (1). In comparison to the control groups, feeding does fatty calcium salts before or after parturition, insignificantly increased milk yield at days 7, 15, 30, 60, 90 and day 120 and also total milk yield. This finding is consistent with previous studies dealing with different species fed diets supplemented with fatty calcium salts (Gargouri et al., 2006 and Casals et al., 2006). The importance of use of FCS through lactation periods may be returned to reducing feed intake especially at early lactation which resulted in decreasing energy intake. However, the energy density of the ration was increased due to adding fat which compensate energy reduction through decrease of DM intake in this stage.

Table 4. Nutrients digestibility (%) of the experimental diets as affected by genotype, addition of FCS and their interactions

Item	DM	OM	CP	CF	EE	NFE
Genotype						
Barki (B)	61.04±0.47	64.63±0.42	61.91±0.50	63.38±0.89	68.02±0.38	64.43±0.49
DamascusXBarki(DB)	61.91±0.47	64.24±0.42	62.53±0.50	63.82±0.89	68.83±0.38	65.63±0.44
Significance	NS	NS	NS	NS	NS	NS
Treatment						
Control	61.36±0.47	64.20±0.42	62.54±0.50	61.62±0.89	57.56±0.38^{b}	65.00±0.44
Treated	61.59±0.47	64.35±0.42	60.90±0.50	59.58±0.89	79.29±0.38^{a}	64.80±0.44
Significance	NS	NS	NS	NS	**	NS
Genotype X Treatment						
Barki Control	61.56±1.11	64.62±0.63	63.96±0.79	62.65±2.47	57.74±0.29	64.52±0.75
Barki Treated	60.52±0.57	64.02±0.44	59.86±0.26	60.11±0.11	78.30±0.49	64.35±0.64
DB control	61.16±0.35	63.79±0.43	63.12±1.06	68.58±0.17	57.38±0.94	65.48±0.65
DB treated	62.66±0.27	64.96±0.81	61.94±0.47	59.06±0.52	80.28±0.04	65.78±0.43
Significance	NS	NS	NS	NS	NS	NS

NS: Not significant **: Highly significant at P≤0.01

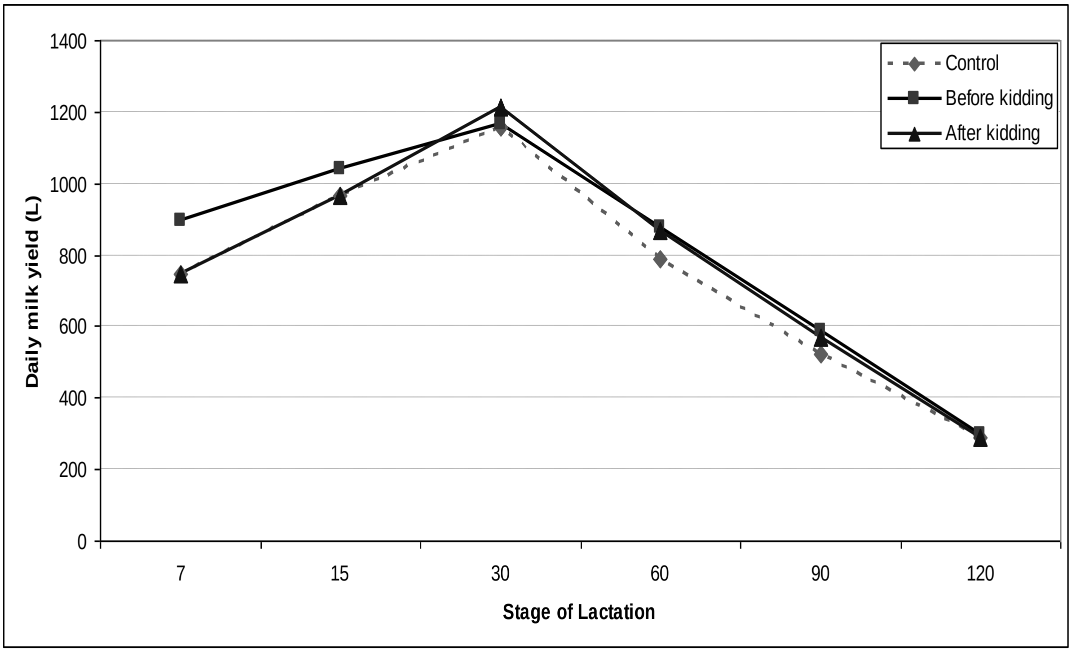


Fig. 1. Lactation curve as affected by FCS supplementation

Youssef (2006) noted that reviewing results obtained from 29 trials showed an increase in milk yield as a result of feeding fatty calcium salts in 34% of the trials, no effect in 59% and decrease in milk yield in 7%.

Data revealed that Barki and DB crossbred does fed diets supplemented by FCS before or after kidding tended to have higher milk yield than those fed unsupplemented diets. These results suggested that supplemented the diets of pregnant does with FCS before kidding was more effective on their milk yield than after kidding for both breeds.

Milk composition (%)

Effect of diet supplementation with fatty calcium salts on the milk fat concentration, percentage of milk protein, percentage of milk lactose and total solids content (%) for Barki and BD crossbred does are presented in table (5). The data show no significant changes in fat and protein % due to addition of fatty calcium salts to diets of does before or after kidding except during the second month of lactation in Barki does received FCS supplemented diets, before or after kidding recorded higher value of milk fat percentage than unsupplemented does. In this respect, Pulina et al., (2006) found that addition of calcium salts of palm oil to the diet caused consistent increases in milk fat concentration. On the other hand, milk protein content of does was not significant affected by supplemented their diets with FCS. The decrease in feed intake normally observed under these conditions could reduce the microbial synthesis of protein in the rumen, which in turn could limit the synthesis of protein in the mammary gland (Sanz Sampelay, et al., 2002b).Additionally ,the present results indicated that milk lactose and total solids percentage were not significant affected by addition fatty calcium salts to the experimental diets. This may be due to the FCS could not spears acetyl COA for synthesis lactose (Sanz Sampelayo et al., 2006).

Blood serum parameters

Serum triglycerides concentrations for does fed the experimental rations are presented in figure (2). The serum triglycerides concentrations were higher ($P<0.01$) for fat supplemented groups before kidding (at 17, 19, 21 weeks) and after kidding (at 4,8,12 weeks). Espinoza *et al.* (1998) and Ghoreishi *et al.*, (2007) found that, triglycerides concentrations in serum significantly ($P<0.05$) increased by fat supplementation. However, West and Hill (1990) and Juchem *et al.*, (2008) reported that, the serum triglycerides concentrations was not significantly affected by feeding fatty calcium salts (FCS) It was reported that, the increase of triglycerides concentrations were reflection of increasing fat absorption through the gut (Jenkins *et al.*, 1989). Also, Murray *et al.*, (1991) postulated that, the long-Chain fatty acids observed in intestinal wall mucosal cell are utilized in reformation of triglycerides.

Concentrations of serum total cholesterol are shown in figure (3).serum total cholesterol concentrations were significantly ($P<0.01$) affected by fatty calcium salts (FCS) addition to the diets before kidding (17,19 and 21 weeks) and after kidding (4,8 and 12 weeks). Similar trend were previously observed by Espinoza, 1998 and Ghoreishi *et al.*, 2007). However, West and Hill (1990) and Juchem *et al.*, (2008) indicated that, the addition of FCS to the diets had no significant effect on serum total cholesterol concentrations.

Table 5. Milk composition (%) of does as affected by dietary supplementation of FCS

Item	Lactation months				
	1st month	2nd month	3 rd month	4th month	Overall mean
Milk fat (%)					
Barki Control	3.22±0.13	3.44±0.21[b]	3.66±0.14	3.65±0.20	3.49±0.17[b]
Barki before	4.70±0.29	4.71±0.33[a]	5.44±0.12	5.29±0.23	5.04±0.24[a]
Barki after	4.48±0.20	4.80±0.24[a]	5.54±0.19	5.20±0.18	5.01±0.20[a]
DB Control	3.07±0.11	3.05±0.04[b]	3.28±0.11	2.32±0.11	2.93±0.11[b]
DB before	4.24±0.30	4.35±0.36a	4.80±0.27	5.16±0.22	4.64±0.29[a]
DB after	3.68±0.10	4.19±0.13[a]	4.58±0.30	5.08±0.59	4.38±0.28[a]
Sign	NS	*	NS	NS	*
Milk protein (%)					
Barki Control	2.42±0.09	2.68±0.11	2.81±0.06	2.73±0.07	2.66±0.08
Barki before	2.46±0.14	2.74±0.07	2.78±0.11	2.95±0.08	2.78±0.10
Barki after	2.27±0.04	2.81±0.13	2.89±0.15	2.79±0.09	2.69±0.10
DB Control	2.39±0.09	2.63±0.04	2.80±0.04	2.64±0.06	2.62±0.06
DB before	2.28±0.09	2.61±0.06	2.77±0.04	3.14±0.17	2.70±0.07
DB after	2.63±0.17	2.83±0.08	3.18±0.29	2.89±0.15	2.88±0.17
Sign	NS	NS	NS	NS	NS
Milk lactose (%)					
Barki Control	4.13±0.08	3.97±0.20	3.98±0.07	4.41±0.06	4.12±0.10
Barki before	3.83±0.15	4.03±0.12	3.92±0.08	3.82±0.23	3.90±0.15
Barki after	3.67±0.06	4.11±0.06	3.90±0.08	3.89±0.14	3.89±0.10
DB Control	4.04±0.11	4.01±0.32	3.99±0.08	4.18±0.08	4.10±0.15
DB before	3.91±0.08	4.09±0.07	3.93±0.05	3.97±0.05	3.98±0.06
DB after	3.73±0.07	3.93±0.16	3.91±0.07	4.04±0.10	3.90±0.1
Sign	NS	NS	NS	NS	NS
Milk total solids (%)					
Barki Control	10.47±0.24	10.83±0.68	10.98±0.25	11.44±0.35	10.93±0.38
Barki before	11.72±0.39	10.67±0.63	13.37±0.44	12.76±0.39	12.13±0.46
Barki after	11.12±0.23	12.30±0.35	12.87±0.24	12.31±0.3	12.15±0.28
DB Control	10.07±0.29	10.28±0.50	10.56±0.17	10.75±0.21	10.42±0.29
DB before	11.06±0.37	11.64±0.49	11.68±0.30	12.51±0.36	11.72±0.38
DB after	10.55±0.35	11.40±0.69	12.00±1.10	12.18±0.74	11.53±0.72
Sign	**NS**	**NS**	**NS**	**NS**	**NS**

* significant at (P<0.05). NS not significant DB=Damascus × Barki

'The previous results showed that the increase in serum total cholesterol concentrations might be attributed to the depression in lipogenic enzyme activates by the liver and adipose tissues associated with feeding supplementary fat. Serum HDL and serum LDL concentrations are presented in figure (4) and figure (5). The serum HDL and serum LDL concentrations were higher (P<.01) for does fed diets containing fatty calcium salts (FCS) before kidding (17,19 and 21 weeks) and after kidding (4,8 and 12 weeks) periods(P<0.01). This finding in-agreement with (Espinoza *et al.* 1998 and Ghoreish *et al.*, 2007) . On the other hand, West and Hill (1990) and Juchem *et al.*, (2008) stated that, the serum HDL and serum LDL concentrations mg/dl was not significantly affected by FCS addition to the diets of does. The increase of serum HDL and serum LDL concentrations in the case of supplemented fat addition to dairy and beef cattle diets probably stimulate lipoprotein cholesterol export by the intestine and therefore increase the circulating serum of HDL and LDL cholesterol concentrations, (Talavera *et al.*, 1985).

The effect of addition fatty calcium salts (FCS) on amino transferase enzymes are presented in figure (6) and figure (7). Blood serum concentrations of AST and ALT were significantly increased (P<0.01) by FCS addition to the diets of does. These findings were in agreement with (Selem, 2008). However, studies by Westerbacka *et al.*, 2005 showed that, consumption of high fat diets increased the liver fat but the liver enzymes (ALT and AST) were not affected.

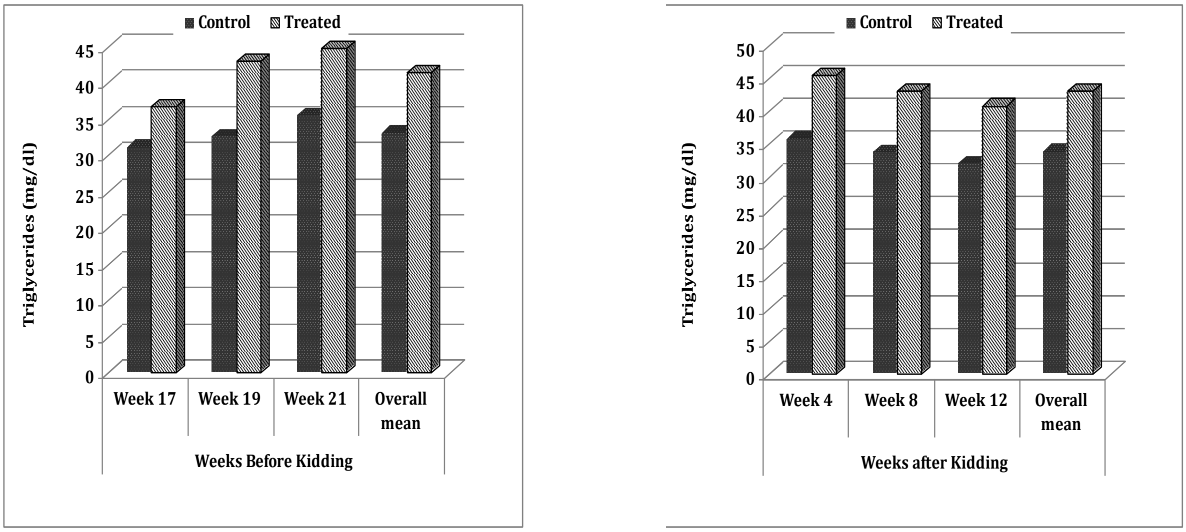


Fig. 2. Effect of dietary supplementation of fatty calcium salts (FCS) on serum triglycerides (mg/dL) for does before and after kidding

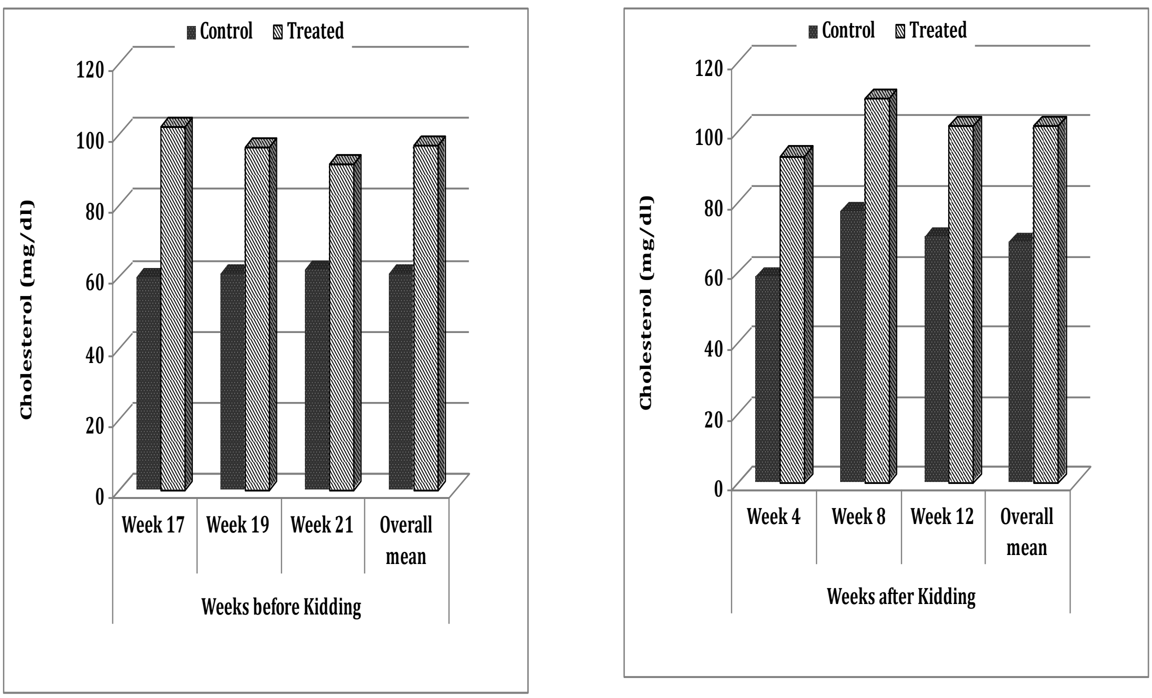


Fig 3. Effect of dietary supplementation of fatty calcium salts (FCS) on serum cholesterol (mg/dL) for does before and after kidding

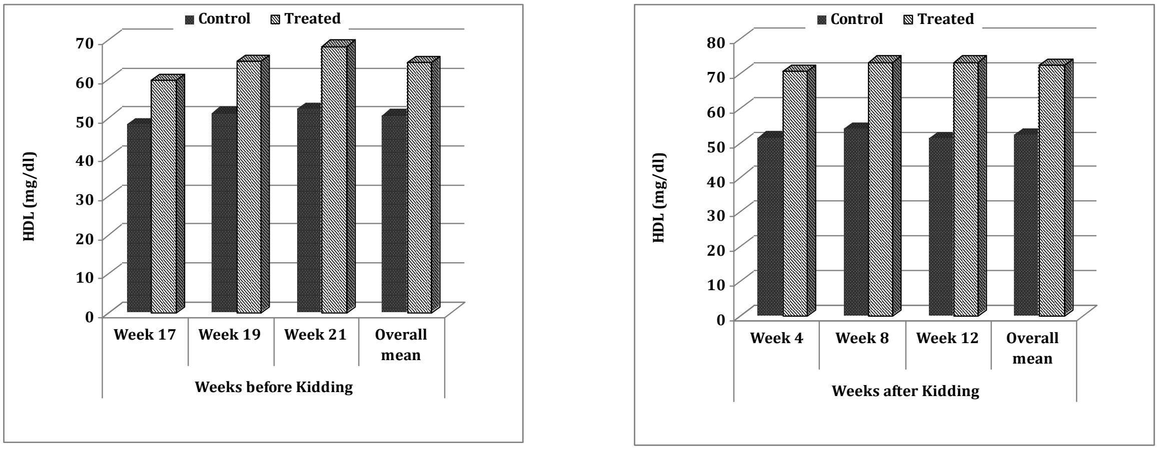


Fig 4. Effect of dietary supplementation of fatty calcium salts (FCS) on serum HDL (mg/dL) for does before and after kidding

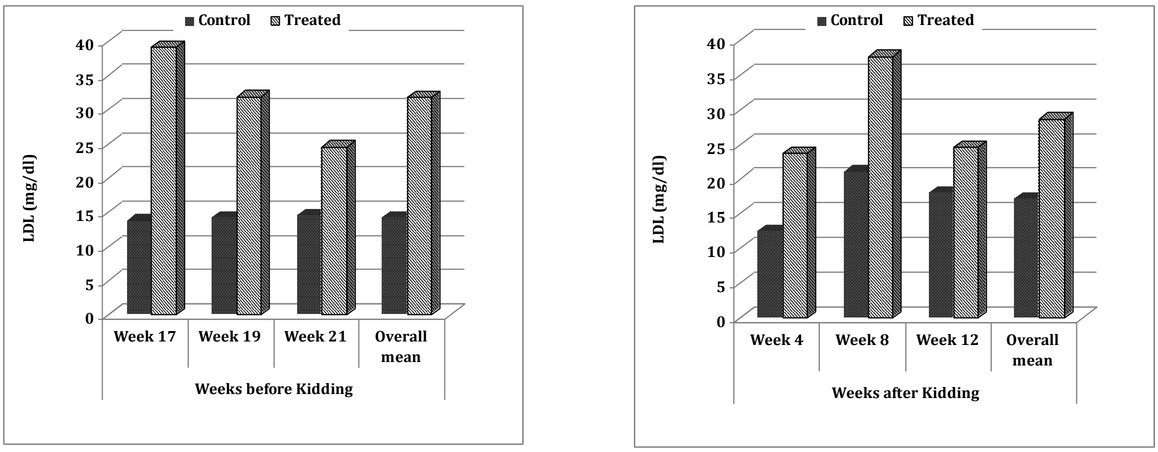


Fig.5. Effect of dietary supplementation of fatty calcium salts (FCS) on serum LDL (mg/dL) for does before and after kidding

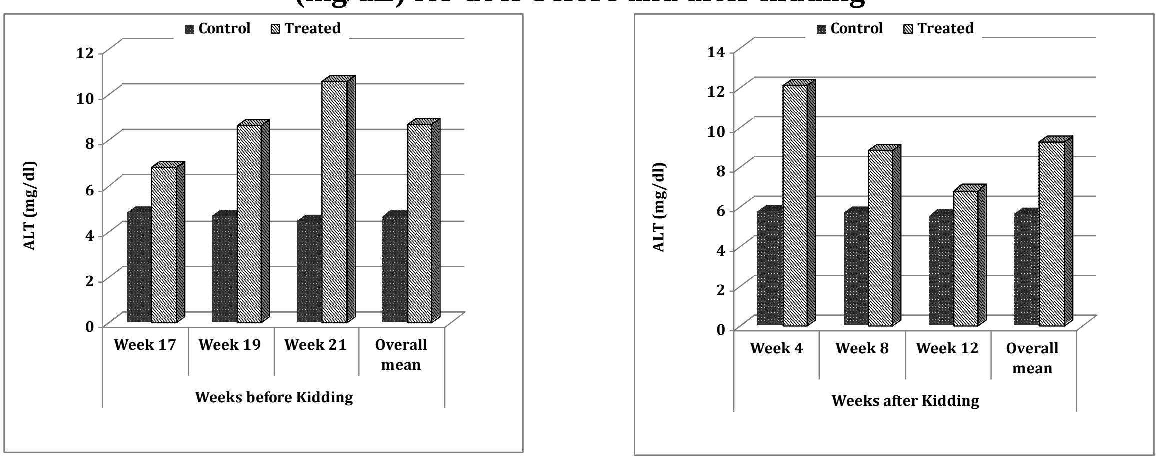
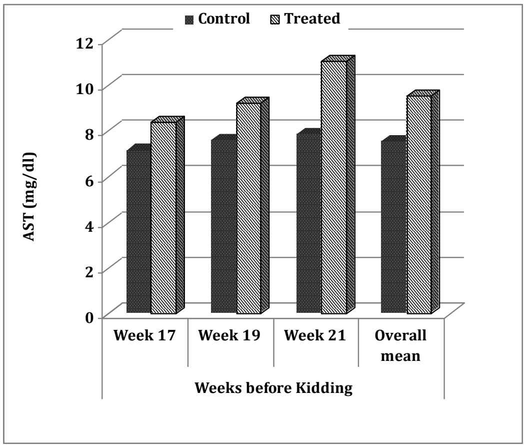


Fig. 6. Effect of dietary supplementation of fatty calcium salts (FCS) on ALT (mg/dL) for does before and after kidding



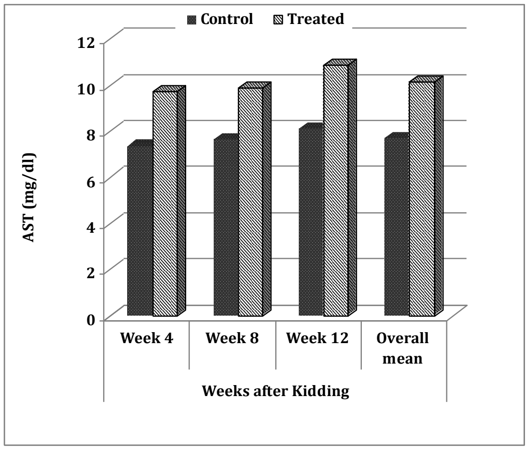


Fig. 7. Effect of dietary supplementation of fatty calcium salts (FCS) on AST (mg/dL) for does before and after kidding

CONCLUSION

From the previous results it could be concluded that feeding dietary supplementation with fatty calcium salts (FCS) resulted in decreasing feed intake and improving nutritive value expressed as TDN% and digestibility coefficients of EE. Also, FCS addition significant (P<.01)increase in milk fat content. The serum triglycerides, total cholesterol, serum HDL and serum LDL concentrations increased by feeding diets containing FCS .

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الملخص العربي

تأثير إضافة أملاح الكالسيوم للاحماض الدهنية على هضم العناصر الغذائية وكمية اللبن وتركيبة الكيماوى وبعض مركبات الدم فى الماعز البرقى وخليطه مع الماعز الدمشقى

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التجربة الأولى: (تجربة الهضم)

تم إستخدام عدد 3 تيس برقى ناضج وعدد 3 تيس خليط(دمشقى × برقى) ناضج فى تجربتين هضم لدراسة تأثير إضافة املاح الكالسيوم الدهنية على معاملات الهضم والقيمة الغذائية لعلائق التجربة.

التجربة الثانية:

–تم إستخدام عدد ثلاثون عنزة برقى يتراوح عمرها ما بين (3-5 سنوات) ومتوسط وزنها حوالى 27 كيلوجرام كما تم إستخدام عدد ثلاثون عنزة خليط (دمشقى × برقى) يتراوح عمرها ما بين (3-5سنوات) ومتوسط وزنها حوالى 30.4 كيلوجرام.

–تم تقسيم كل تركيب وراثى الى ثلاث مجاميع كل مجموعة (10) عنزات كالتالى:

أ. المجموعة الأول: (كنترول)

كانت تتغذى على عليقة مركزة بدون إضافة املاح كالسيوم دهنية مع التغذية على قش الارز.

ب. المجموعة الثانية:

كانت تتغذى على عليقة مركزة مضاف لها اماح كالسيوم دهنية 80جم/رأس/يوم قبل الولادة بـ6 أسابيع بالإضافة الى قش الارز واستمرت الاضافة حتى نهاية الموسم .

ج. المجموعة الثالثة:

كانت تتغذى على عليقة مركزة مضاف لها أملاح الكالسيوم الدهنية 80جم/رأس/يوم بعد الولادة بـ15 يوم مع التغذية على قش الأرز واستمرت الاضافة حتى نهاية الموسم .

وكانت اهم النتائج المتحصل عليها كالتالى:

كانت هناك زيادة فى المأكول الكلى للعنزات الخليطة(دمشقى*برقى)عن العنزات البرقى. كما حدث تأثير على المأكول من الغذاء بإضافة املاح الكالسيوم الدهنية حيث أن العنزات التى تغذت على عليقة مضاف لها أملاح كالسيوم دهنية أنخفض المأكول من قش الأرز والمأكول من العلف المركز والمأكول الكلى عن العنزات الكنترول. أيضاً كانت العنزات التى أضيف لها املاح كالسيوم دهنية بعد الولاده أعلى معنويا فى المأكول الكلى عن العنزات التى اضيف لعليقتها املاح كالسيوم دهنية قبل الولادة. لم يكن هناك تأثير معنوي للتركيب الوراثى على معاملات هضم المادة الجافة والمادة العضوية والبروتين الكلى والالياف الخام والمستخلص الاثيرى والكربوهيدارات الذائبة بينما تغذية العنزات على عليقة مضاف لها املاح كالسيوم دهنية لم تؤثر معنوياً على معاملات هضم المادة العضوية والمادة الجافة والبروتين الكلى والألياف الخام والكربوهيدرات الذائبة ولكن أدت الى زيادة معنوية فى معاملات هضم المستخلص الاثيرى بالمقارنة بالعليقة الكنترول.حدث تحسن معنوى فى القيمة الغذائية للعلائق معبراً عنها بمجموع المواد الغذائية المهضومة(TDN) بإضافة املاح الكالسيوم الدهنية. بينما لم يتأثر البروتين الكلى المهضوم(DCP) . كما زاد انتاج اللبن ولكن زيادة كانت غير معنوية. كما تغيرت نسب مكونات اللبن ولكن تغيير غير معنوى. زاد تركيز الجلسريدات الثلاثية فى السيرم فى المجموعة المعاملة عن الكنترول قبل الولادة فى الاسابيع(17، 19، 20) من الحمل وبعد الولادة فى الاسابيع4، 8، 12 ادت التغذية على عليقة مضاف لها املاح كالسيوم دهنية قبل وبعد الولادة الى زيادة معنوية فى نسبة الدهن للبن ولكن لم تؤثر على نسبة البروتين ونسبة اللاكتوز والمواد الصلبة الدهنية.. ادت اضافة املاح الكالسيوم الدهنية الى زيادة معنوية فى تركيز الكوليسترول الكلى فى السيرم قبل الولادة فى الاسابيع (17، 19، 21) وبعد الولادة فى الاسابيع(4، 8، 12). زاد تركيز الكوليسترول عالى الكثافة والكوليسترول منخفض الكثافة فالسيرم بتغذية العنزات على عليقة مضاف لها املاح الكالسيوم الدهنية قبل الولادة فى الاسابيع(17، 19، 21) وبعد الولادة فى الاسابيع(4، 8، 12). كما كان هناك زيادة معنوية فى تركيز انزيمات الكبد ALT, AST بتغذية العنزات على علائق مضاف لها املاح الكالسيوم الدهنية.