USING DIFFERENT LEVELS AND SOURCES OF FATS AND ROUGHAGES IN FEEDING GOATS. 1- EFFECT ON PRODUCTIVE AND REPRODUCTIVE PERFORMANCE

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SUMMARY

This study was conducted to investigate the effect of dry fat supplementation on digestion coefficients, rumen fermentation, some reproductive parameters, some blood components and milk yield, of Damascus goats. Forty five Damascus goats, 3-4 years of age, 57 Kg average body weight (BW) and 2-3 parities were randomly selected and divided into 3 similar groups (15 goats each) with a completely randomized design .The trial started 45 days before kidding and 90 days after kidding. Experimental rations were offered to animals with rate of 0, 3 and 5% dry or protected fat (DF) (based on DM intake). The basal rations composed of concentrate feed mixture (CFM): roughage {berseem 3rd cuts+ rice straw (RS) (60:40%)}. Digestibility trial was carried out using nine Damascus bucks with 60 kg average BW. Data showed that higher ($P<0.05$) digestibility coefficients of DM, OM, EE and NFE than for control. Rumen parameters (pH, total VFA and ammonia-N) were higher in supplemented groups than control. Concentrations of blood plasma total protein, glucose, total lipids and total cholesterol of does were higher in supplemented groups than the control one. Dry fat supplementation had no effect on conception rate but it had effect on litter size and twining rate as well as kids' birth and weaning weight. Milk yield was higher in supplemented groups than control as well as its composition (fat, total solids and solids not fat %). Generally, it concluded that dry fat supplementation in ration of Damascus goats improved , daily gain, feed efficiency and digestibility as well as higher some traits of reproductive performance.

Keywords: Dry fat, Damascus goats, performance and reproductive parameters, blood, milk yield, digestibility, rumen fermentation

INTRODUCTION

The Damascus goat breed is a seasonal polyestrous breed that is considered to be the most important goat breed in the Middle East due to their milk production and prolificacy.

Onset of estrous cycles occurs from May to November and become more consistent during September to November (Hassan and Shaker, 1990 and Papachristoforou *et al.*, 2000). Sklan *et. al.* (1991) reported that greater energy deficiency might explain the delay in resumption of ovarian cyclicity and appearance of behavioral estrus. Fertility of Damascus goats is impaired by increased production (twining and milk), long lactation period with drought seasons, poor pastures and changes to lower-quality feedstuffs that results in energy deficiency in goats and delays the onset of estrus activity and ovulation (Van Horn *et al.*, 1992).

Energy (fiber and fat) is the main nutritional factor which limits the amount of milk production. Use of dietary fat may increase milk production as the genetic potential for milk production increases. Fats and oils have the same chemical structure but they have different physical characteristics such as melting point, as fats are solid in room temperatures, but oils are liquid. Rouse (1988) divided fat into five classes i.e., (1) Animal fat: includes rendered fat from beef or pork by-products which are identified as tallow if titer is over 40° C or higher or grease if under 40° C. A lower titer indicates higher unsaturated and/or polyunsaturated levels. (2) Poultry fat: includes 100 % poultry offal. (3) Blended feed grade animal fat: includes blends of tallow, grease, poultry and restaurant grease. (4) Feed grade vegetable fat: includes vegetable oil, acidulated vegetable soap stocks and other refinery by products. (5) Blended animal and vegetable fats: includes blends of feed grade animals, poultry, vegetable fat and or restaurant grease.

The addition of fat to the diets of buffalo calves could be fattened on diets supplemented with dietary fats especially in the form of the Ca-soap , as an energy source to replace part of dietary corn without any adverse effects on productive performance, digestibility, rumen fermentation, blood parameters or ingestive behavior (Zeedan, 2003). It is well known that the energy density of fat is greater than other feed ingredients (Coppock and Wilks, 1991 and White *et al.*, 1992). Simas *et al.* (1998) found that adding fat to the diets of ruminants can help provide for the high energy requirements for high milk yield and / or faster growth rate without causing metabolic disorders that often associated with a high intake of grain. Grummer (1993) reported that problems caused by feeding high grain diets (bloat and liver abscesses) could be eliminated by feeding fat supplemented rations. Protected fat supplementation had significantly increase on CP and EE digestibility and no effect on OM and NFE digestibility (Bendary *et al.*, 1994). Chan *et al.* (1997) showed that supplementation of ruminal inert fat to ruminant rations increases the energy density in diets and avoided the adverse effects on ruminal fermentation. Casals *et al.*, (1999) found that milk yield was increased with dietary fat supplementation.

Staples and Thatcher (2001) indicated that prolonged and intense negative energy status delayed resumption of estrous cycles and increased the number of days open in dairy cows flushing highly prolific breeds and knowledge of nutritional and reproductive strategies could help maximize overall production efficiency (Sormunen-Cristian and Jauhiainen, 2002). Staples *et al.* (1998) reported that fat supplementation increased energy intake and has improved fertility. Many studies showed that addition fat to rations improved the reproductive performance parameters of beef and dairy cows by altering both ovarian follicle and corpus luteum function (Staples *et al.*, 1998 and William and Stanko, 1999) .Improved parameters included conception rate (Son *et al.* 1996), the onset of parturition, and the time of fetal expulsion (Baguma-Nibasheka *et al.*, 1999).De Fries *et al.* (1998) reported that fat supplementation may enhance follicular development by stimulating a greater number of smaller follicles to grow to larger sizes. Improved conception rate at first AI was reported for dairy cows fed tallow (Son *et al.*, 1996) and unprilled fatty acids (Ferguson *et al.*, 1990). Some studies showed that there were positive increases in dam pregnancy rates following feeding different fat types (saturated, unsaturated and protected) with different amounts of fat supplementation for lactating ewes (Hegazy *et al.*, 1999), dairy cows (Ferguson *et al.*, 1990; Son *et al.*, 1996; De Fries *et al.*, 1998 and Garcia-Bojalil *et al.*, 1998) and primiparous heifers (Bellows *et al.*, 1999). Improvement in fertility as a result of improving energy status, suggests that fat supplementation mediates its positive effect through other physiological mechanism such as: progesterone concentrations in plasma which enhanced by fat supplementation and may enhance embryo survival. Certain poly unsaturated fatty acid (PUFA) such as linoleic acid may reduce uterine secretion of prostaglandin (William and Charles, 2003). Litter weight for ewes not different, but it was higher ($P < 0.05$) for treated does without differences between 3% and 5% dry fat (Titi *et al.*, 2008).

The main objective of this study was to investigate the influence of dry fat on productive and reproductive parameters, rumen parameter and milk yield of Damascus goats during late pregnancy and suckling period and their kids performance from birth until weaning.

MATERIALS AND METHODS

This study was carried out at El-Gemmiza Experimental Station, Animal Production Research Institute (APRI), Agricultural Research Center (ARC), Ministry of Agriculture, Egypt.

Forty five Damascus does (2-3parities), with 57kg average BW and aged 3-4 years of age (in the last 45 days of pregnancy) were chosen and divided into three similar groups (15 does each) according to their body weight and allowance to fed experimental rations as follows: 1) The control group fed the basal ration without any supplementation. 2) The 1st treated group fed the control ration supplemented with 3% dry fat. 3) The 2nd treated group supplemented with 5% dry fat on basis of DM intake. Dry fat was added to a part of the ground concentrate feed mixture of the three experimental diets before introducing to the animals . Dry fat was produced by IBEX International Co., Egypt.

Dry fat composed of (calcium salt for fatty acids, plant origin 95%, moisture 4.98%, antioxidant BHT .02%,crude fat 80%, gross energy7600 kal/kg, TDN 180%, digestion coefficient 95%, constancy degree 96% and stearic acid < 5%). The experiment began 45 days before kidding and lasted for 90 days post kidding (suckling period). Animals were free from diseases and parasites. Does were fed on the basis of their body weight according to NRC (1981). The basal ration composed of 60% concentrate feed mixture (CFM)) plus 40% roughage {berseem 3rd cuts and rice straw(RS)}. Concentrate feed mixture offered to the animals at 8.30 a.m. and berseem plus rice straw at 11.30 a.m. Fresh drinking water was offered twice daily at 12 and 16 hr. The experimental rations were chemically analyzed according to A.O.A.C. (1990).

Animals in the digestibility trial were kept and fed individually in metabolic cages allowing separate collection of urine and feces as described by Maynard *et al.* (1979). The experimental animals were adapted to the cages for 14 days as a preliminary period followed by a 6-days collection period. Animals received their nutrient requirements according to NRC (1981). Feed residues if any, were collected, weighed and subtracted from the amount offered to calculate the actual feed intake. Feed and feces samples were quantitatively collected for each animal, weighed and a 10% aliquot was taken and the composite samples were dried. The dry samples were ground to pass through 1 mm. screen sieve and analyzed for proximate components according to A.O.A.C. (1990). At the end of the digestibility trial, rumen samples were collected by a stomach tube at zero and 3 hours post-feeding. The rumen samples were strained through four layers of cheesecloth into a plastic containers and pH was immediately measured using a pH meter with glass electrode. Ammonia-N was estimated as described by Horn *et al.* (1981). Total volatile fatty acids were determined according to the technique described by Warner (1964).

Blood samples were collected at 0, 15, 30 and 45 days during late pregnancy period (pre kidding) and 15, 30, 60 and 90 days post kidding (suckling period). Blood samples were collected in dried clean tubes by jugular vein puncture from 5 does from each group in the morning just before feeding and drinking and immediately centrifuged at 4000 rpm for 15 minutes. The plasma was carefully taken (by adding ethylene diamine tetra acetic acid EDTA) and stored at -20° C until analysis. Total protein was determined according to Armstrong and Carr (1964), albumin concentration according to Doumas *et al.* (1971) and globulin concentration was calculated by the difference between total protein and albumin concentrations. Albumin / globulin ratio was also calculated. Glucose was determined according to Hyvarinen and Nikkla (1962). Liver function was assessed by measuring the activities of alanine aminotrandferase (AST), aspartate aminotrandferase (ALT) as described by Reitman and Frankel (1957). Total cholesterol determined according to Wastson, (1962), triglycerides (Schalm *et al.*, 1975) and total lipids Zollner and Kirch,(1962). Some reproductive parameters were estimated such as: conception rate and percentage of does conceived of does joined, fertility percentage of does kidded of does joined, kidding rate (prolificacy) percentage of kids born (alive or dead) / does kidded and fecundity percentage of kids born / does joined. Reproductive ability percentage of kids weaned / does joined, percentage of kids weaned / does kidded, kilograms of kids born / does joined, kilograms of kids weaned /does joined, kilograms of kids born /does kidded twining rate, birth and weaning weights for kids, total gain and daily gain from birth to weaning. Mortality percentage of dead kids from birth to weaning and livability percentage of alive kids from birth to weaning were determined.

Daily milk yield was recorded for the first 3 months of lactation (suckling period) until kids weaning. Representative milk samples (about 0.5% of total milk produced) were taken at 7, 15, 30, 60 and 90 days post kidding from each doe at both milking time, record and using milk suckling technique) Moawd (2003), twice daily at 7 a.m. and 5 p.m. The kids were separated from their dams at 5 p.m. the before. Body weight of kids were recorded at 7 a.m., then and left they for suckling from their dams for 30 minutes and body weight was recorded again. The residual milk was hand milked and recorded. Similar procedure was repeated at the evening suckling at 5 p.m. The differences in the weight of kids before and after suckling were added to the hand milking in order to give daily milk yield. The same Shahin (2000) and Saleh (2004). Milk samples were kept at -20° C for late chemical analysis. Total solids, ash and total protein were determined by

(Ling, 1963) and lactose (Barnett and Abd El-Tawab, 1957) while Solids- not –fat (SNF) was calculated by difference.

Data were analyzed using GLM procedures of the SAS (SAS, 1996). Means were separated by using Duncan's multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

Chemical composition of feedstuffs:

The chemical composition values of CFM, Berseem 3rd cut and RS present in found to be (Table 1) are within the normal ranges reported in Egypt by several workers (Saleh, *et al.* 2005 ,El–Hosseiny, *et al.*, 2008 and Zeedan, *et al.*,2008).

Table (1): Chemical composition of ingredients and experimental rations (on DM basis).

	Chemical composition on DM basis (%)						
Items	DM	OM	CP	EE	CF	NFE	Ash
CFM*	88.70	91.20	15.70	3.02	12.90	59.58	8.80
Berseem 3rd cut	19.30	88.80	14.70	3.10	22.60	48.40	11.20
Rice straw	91.21	84.38	3.63	0.99	37.54	42.22	15.62
Calculated chemical composition of tested rations:							
control	75.32	89.36	13.09	2.63	19.77	53.87	10.64
3%DF	75.25	89.56	13.45	5.69	19.03	54.39	10.44
5%DF	76.31	89.71	13.67	7.72	18.45	54.87	10.29

*CFM; concentrate feed mix fore contained in percentage ; %yellow corn ,37; undecortecated cotton seed ,30;wheat bran,20; rice bran,6.5 ; molasses ,3 ; limestone,2.5; common salt,1. RS, Rice straw . Dry fat (DF): composed of (calcium salt for fatty acids, plant origin 95%, moisture 4.98% antioxidant BHT .02%,crude fat 80%, gross energy7600 kal/kg, TDN 180%, digestion coefficient 95%, constancy degree 96% and stearic acid < 5%).

Nutrients digestibility and nutritive values:

Data in Table (2) indicated that dry fat supplementation significantly increased (P<0.05) digestibility coefficient of DM, OM, EE and NFE in DF groups than the control one. On the other hand, there were no significant effects of DF on CP and CF digestibility coefficient. Bayourthe *et al.* (1993) found that sheep fed ryegrass hay supplemented with prolip (a mixture of animal fat and vegetable oil coated with heated-treated blood meal protein) had more (P<0.05) digestibility coefficient of DM, EE, OM, and CP. Protected fat did not affect fiber digestibility at 5% supplementation, while at 7.5% caused a significant depression (P<0.01). Similar results were obtained by Zeedan (2003), who found that adding protected fat in the form of Ca-soap in buffalo calves diets increased digestibility of DM, OM, CP, EE, NFE and CF than control during fattening stages. However, these results are in agreement with those obtained by El-Bedawy *et al.* (1994b), Gabr *et al.* (2008) and Wachira *et al.* (2000).In this study the increased in EE digestibility could be due to the higher digestibility of fatty acids in supplementary fat (El-Bedawey *et al.*, 1994 a,b and Khattabe *et a*t. 2001).Palmquist (1984) reported that, calcium soap was significantly solubilized as fatty acids, which increase solubility of the acid-soap complex in the bile salt. Crude fiber was not affected by added fat, which could indicate that added dry fat was protected and did not affect cellulotic activity and other microbial activity in the rumen. On the other hand, Talha (1996) found that nutrients digestibility tended to decrease with added back oil. While, El-Ashry *et al.*(1997) reported that no significant effect of the different oil types at 6% level on digestibility of DM, OM and starch.

Table (2): Effect of dry fat supplementation on nutrients digestibility and nutritive value of the experimental rations.

Item,%	Treatments			SE
	0	3% DF	5% DF	
Digestbility				
DM	62.33 [b]	63.45 [b]	65.50 [a]	0.36
OM	65.42 [c]	66.75 [b]	68.35 [a]	0.29
CP	72.31	72.52	73.15	0.11
CF	63.11	63.51	63.95	0.11
EE	70.51 [b]	72.21 [a]	73.31 [a]	0.36
NFE	65.81 [b]	67.91 [a]	69.09 [a]	0.32
Nutritive value				
TDN	61.57 [c]	68.02[b]	72.44 [a]	0.14
DCP	9.47	9.75	10.00	0.05

[a, b, c] values in the same row not sharing the same superscripts are significantly different ($P<0.05$).

It is obvious (Table 2) that DF supplementation improved significantly ($P<0.05$) the nutritive value as TDN but it had no significant effect on DCP in both supplemented groups and control group. The improvement of TDN might be due to the higher values of digestibility values of most nutrients by supplementation especially EE digestibility. This finding agreed with the results of El-Bedawy (1995), El- Bedawy *et al.*(1996), Omer (1999) , Bendary *et al.*(1994) and Zeedan (2003) .

Rumen fermentation:

Ruminal pH value is one of the most important factors, which affect microbial fermentation in the rumen and influenced its functions. However, data presented in Table (3) illustrated that pH values were not significantly different among the experimental groups. These results are in agreement with the range 6.33 - 6.50 of supplemented groups with different fat sources reported by Elliott *et al.* (1997). Omer (1999) reported that no significant differences in the mean values of ruminal pH due to fat addition.

Table (3): Effect of dry fat supplementation on some rumen liquor parameters of Damascus bucks.

Item	Time	Treatments			
		0	3%DF	5%DF	SE
pH value	0	6.69	6.75	6.78	0.05
	3	6.29	6.35	6.39	0.06
Ammonia-N (mg/dl)	0	22.51	23.35	23.49	0.35
	3	25.62	25.82	26.12	0.19
Total VFA (meq/dl)	0	9.12	9.91	10.41	0.22
	3	11.35 [b]	12.92 [a]	13.09 [a]	0.12

[a, b] values in the same row not sharing the same superscripts are significantly different (P<0.05).

Ammonia-N concentration was increased for supplemented groups, but it not reached the significant differences. These results are in accordance with those obtained by Tjardes *et al.* (1998) .They showed that the addition of 4% fat to lactating beef cow diets did not affect ruminal ammonia-N compared with un- supplementation.

Table (3) showed that there were high significant differences at (P<0.05) among the tested groups for total VFA at 3 hr post feeding being 11.35, 12.92 and 13.09 meq/100ml for control, 3 and 5%DF groups, respectively. While, not significant effect at zero time between treatments. Total VFA was increased with the advancement of sampling time. In the present study, higher VFA's concentration with DF groups may be due to the increase in all, OM, OM, EE and NFE digestibilities than the control group These results are in accordance with those obtained by Basiony (1998), Shafie and Ashour (1997) and Khattab *et al.* (2001).

Blood components:

Late pregnancy period:

Data in Table (4) illustrated that concentration of plasma total protein, albumin and glucose of does in supplemented groups was significantly higher (P<0.05) than those of control group during late gestation period. No significant effect of DF on globulin and albumin/globulin ratio, which they are in the normal range reported by Salem *et al.* (2000), Komonna, (2007) and Gabr *et al.* (2008). This may be means that DF supplementation did not damage or affect the liver function (AST and ALT). These results are in agreement with that reported by Abo- Donia (2003).

Liver function as (AST and ALT activities) did not significantly affect by diet supplementation with dry fat. Values AST and ALT were within the normal range and indicated that the animals were generally in a good nutritional status and their livers were in a normal health condition. Supplemented groups had significantly higher concentrations of total cholesterol, triglycerides and total lipids than those of control one during late pregnancy period. The level of 5% DF had more effect than 3% level. These results are in agreement with those obtained by Palmquist and Conrad (1978), El-Bedawy (1995), Avila *et al.* (2000), Petit *et al.* (2001) and Zeedan *et al.* (2003). Zeedan (2003) found that the final stage of fattening total serum protein was increased but due to the inclusion of either oil or fat in the diets. Abo-Donia *et al.* (2009) reported that total lipids and Triglycerides were significantly (P<0.05) increased with feeding a ration containing fat compared to control.

Table (4): Effect of dry fat supplementation on blood constituents of Damascus goats during late pregnancy period.

Item	Treatments			SE
	0	3%DF	5%DF	
Total protein (g / dl)	6.89 [b]	7.29 [a]	7.51 [a]	0.11
Albumin (g / dl)	3.52[b]	3.96[a]	4.09[a]	0.12
Globulin (g / dl)	3.37	3.33	3.42	0.14
A / G ratio	1.04	1.19	1.20	0.10
Glucose (mg / dl)	52.11[b]	56.71 [a]	59.82 [a]	0.81
AST(IU / dl)	31.11	31.25	31.85	0.07
ALT (IU / dl)	29.11	29.45	29.80	0.12
Total Cholesterol (mg / dl)	89.11[c]	92.97[b]	98.65[a]	0.48
Triglycerides (mg / dl)	75.81[c]	84.95[b]	93.12[a]	0.54
Total lipids (mg / dl)	462.1[c]	486.5[b]	502.3 [a]	0.77

[a, b, c] values in the same row not sharing the same superscripts are significantly different (P<0.05).

Suckling period:

Data in Table (5) showed that, blood constituents in the suckling period were followed the same trend as in the gestation period. But the supplementation with DF had more pronounced effect, especially with the values of fat parameters and glucose. These results also probably attributed to the higher of blood serum glucose and albumin concentration of animals fed dry fat supplemented ration as shown in Table (5). It led to an increase in milk lactose synthesis and a consequent increase in milk production. These results are in accordance with Nestel *et al.* (1978), Deborah *et al.* (1981), El-Bedawy *et al.* (1994 b), Zeedan (2003) and Gabr *et al.* (2008).

It is interesting to note from data in Tables (4 and 5) that most of blood plasma constituents were decreased during late pregnancy and increased post kidding (suckling period) except for protein fractions. Abdel-Hafez (2002) reported that blood glucose for Suffolk x Ossimi ewes was higher at 90 days after mating and decreased at the last week of pregnancy. This results may be due to the high demand for energy especially glucose as a main source of energy during late pregnancy. Manston and Allen (1981) reported that reduction in blood sugar level in the late pregnancy and 1 - 2 days after parturition indicates a heavy demand for glucose in late gestation and early lactation. Similar results were reported by El-Malky (2007) who found that Egyptian buffaloes blood glucose was decreased during late pregnancy and increased in the 3 months of postpartum. Salem *et al.*

(2002) reported that blood cholesterol concentration was increased till the 2nd month of postpartum for lactating buffaloes.

Table (5): Effect of dry fat supplementation on blood constituents of Damascus goats during suckling period.

Item	Treatments			SE
	0	3%DF	5%DF	
Total protein (g / dl)	6.78 ^{b}	7.14^{a}	7.37 ^{a}	0.08
Albumin (g / dl)	3.86^{b}	4.12^{a}	4.31^{a}	0.05
Globulin (g / dl)	2.92	3.02	3.06	0.07
A / G ratio	1.32	1.36	1.41	0.07
Glucose (mg / dl)	55.49^{b}	60.81^{a}	62.38 ^{a}	0.48
AST(IU / dl)	31.39	31.78	32.04	0.08
ALT (IU / dl)	28.91	29.04	29.16	0.14
Total Cholesterol (mg / dl)	92.31^{c}	97.13 ^{b}	103.09^{a}	0.45
Triglycerides (mg / dl)	76.31^{c}	86.71^{b}	95.71^{a}	0.33
Total lipids (mg / dl)	464.2 ^{c}	489.8^{b}	511.2 ^{a}	0.81

$^{a, b, c}$ values in the same row not sharing the same superscripts are significantly different (P<0.05).

However, blood parameters estimated in this study were found to be within the normal range for small ruminants.

Milk yield and composition:

Milk yield expressed as daily milk yield and milk composition are shown in Table (7). Daily milk yield was significantly higher (P<0.05) for supplemented groups (3 or 5%) without significant differences between themselves. Fat supplementation (3 or 5%) improved daily milk yield by 12.77 and 9.93%, respectively compared to control group. These results could be attributed to increased energy content of the supplemented fat in these diets and their improvement in the nutritive value. These results are in agreement with those recorded by Alba *et al.* (1997), Gabr *et al.* (2008) and Titi *et al.* (2008) for sheep fed diets supplemented with fats.

The highest (P<0.05) total solids, milk fat, solids not fat and lactose (%) were obtained by 5% DF-supplemented group followed by 3%DF. In the same trend, ewes had higher TS, fat (%), SNF (%) and lactose (%) when they fed diet supplemented with fish oil Gabr *et al.* (2008) and Titi *et al.* (2008) ewes fed diet supplemented with protected fat at level 3 or 5%. More greater yields of fat, protein and lactose were found to be with DF-supplemented groups, this may be attributed to the more milk yield for does fed protected fat. It could be probably also attributed to the higher concentration of blood serum glucose and albumin for animals fed dry fat supplementation (Table 5). It could lead to an increase in milk lactose synthesis and a consequent in milk production. Adding fat to the diet increases digested energy of the diet and this increase in energy increases milk production. The fat may be directly absorbed in the lower tract and efficiently transferred to milk fat, accounting for increased milk fat.

Table (7): Effect of dry fat supplementation on milk yield and composition for Damascus goats during suckling period.

Item	Treatments			SE
	0	3%DF	5%DF	
Daily milk yield, kg	1.41^{b}	1.59^{a}	1.55^{a}	0.01
Improvement,%	-	12.77	9.93	-
Total solids,%	11.81^{C}	12.76^{b}	13.41^{a}	0.02
Fat,%	3.56^{c}	4.41^{b}	4.61^{a}	0.04
Solids not fat,%	8.25^{b}	8.35^{b}	8.80^{a}	0.05
Protein,%	2.97	2.87	3.19	0.11
Lactose,%	4.54^{c}	4.72^{b}	4.83^{a}	0.03
Ash,%	0.74	0.76	0.78	0.01
Av. fat yield, g/d	50.14^{b}	70.17^{a}	71.45^{a}	0.87
Av. Protein yield, g/d	41.92^{b}	45.62^{ab}	49.39^{a}	0.82
Av. Lactose yield, g/d	64.07^{b}	75.02^{a}	74.87^{a}	0.66

a, b, c values in the same row not sharing the same superscripts are significantly different (P<0.05).

Kids growth performance:

Data in Table (8) showed that higher (P<0.05) birth weight values kids born from of does fed DF rations compared with control group. This was in consistent with the results of Toteda *et al.* (2004) and Gabr *et al.* (2008) who pointed that lambs born from ewes offered diets supplemented with fish oil had higher (P<0.05) birth weight than control diet. Baguma-Nibasheka *et al.* (1999) reported a positive correlation between prolonged intake of a high fat diet in sheep in late pregnancy, gestation length and birth weight, possibly due to the alteration of the balance between stimulatory and inhibitory prostaglandins in the parturition process. It is possible that decreased estradiol -17*β* concentration in one side and the decreased progesterone clearance rate and its conversion to estrogen at the end of gestation from other side.

Table (8): Effect of feeding the experimental diets on productive performance of kids during suckling period (90 days).

Item	Treatments			SE
	0	3%DF	5%DF	
Birth weight (kg)	3.43^{b}	3.91^{a}	3.59^{b}	0.08
Weaning weight (kg)	14.65^{c}	16.21^{a}	15.60^{b}	0.05
Total gain (kg)	11.22^{c}	12.30^{a}	12.01^{b}	0.08
Daily gain (g/day)	124.7^{c}	136.7^{a}	133.4^{b}	0.98

a, b, c values in the same row not sharing the same superscripts are significantly different (P<0.05).

Similarly, weaning weight was higher in DF groups. The highest (P<0.05) significantly total gain and average daily gain were achieved with 3%DF-supplemented group followed by 5%DF- supplemented group. These results are in accordance with those reported by Dawson and Edger (2005), El-Saidy *et al.* (2008) and Gabr *et al.* (2008) who found that addition of fish oil for ewes diets during nursing resulted in improving its feed utilization and resulted in satisfactory ewe live weight and lamb growth rate.

On the other hand, Titi *et al.* (2008) reported that weaning weight and average daily gain of the new born kids from Shami does and Awassi ewes were not affected by fat supplementation. Also, Abo-Donia *et al.*(2009) reported that birth weight was significantly ($P<0.05$) increased with feeding a ration containing fat compared to the control one .

Feed intake and feed efficiency

Data in Table (9) showed that dry mater intake (DMI) decreased with group supplemented with dry fat compared with the control group but without significant effect. Bendary *et al.* (1994) noted that dry matter intake tended to decrease as dietary fat increased without significant effect. Hussein *et al.* (1995) found that the addition of Ca-soap resulted in a significant reduction of dry matter intake. Omer (1999) found that rice straw intake (Kg/h/d) and roughage percentage decreased with increasing level of added Ca-SFA while concentrate mixture intake were almost similar. Energy intake expressed as TDN was more for the fat supplemented groups than the control group. These results

Table (9): Effect of dry fat supplementation on feed intake and feed efficiency for Damascus goats.

	Treatments			
Items	0	3%DF	5%DF	SE
Daily feed DM intake (kg /h/d) :				
CFM	1.26	1.26	1.26	-
Berseem 3rd cut	.42	.40	.35	-
R.S.	.42	.34	.29	-
Total DMI	2.10	2.00	1.90	0.02
Total TDNI	1.29	1. 36	1. 38	0.03
Total DCPI	0.20	0.20	0.19	0.01
Daily milk yield, kg	1.41^b	1.59^a	1.55^a	0.01
Feed efficiency :				
milk yield / DMI	0.67	0.80	0.82	-
milk yield / TDNI	1.09	1.17	1.12	-
Feed conversion :				
DMI / Daily milk yield	1.49	1.26	1.23	-
TDNI / Daily milk yield	0.78	0.86	0.89	-
Improvement (%)	-	15.43	17.45	-

a, b,...etc. means within the same row with different superscripts are significantly different ($P < 0.05$).

compatible with the conclusion reported by El-Bedawy *et al.* (2005). Calculated feed efficiency as milk yield / DMI or milk yield / TDNI were higher with 3% and 5%dry fat than the control group. Feed conversion values calculated as kg DMI/kg daily milk and kg

TDNI / kg daily milk was tended to be less with increasing level of dry fat than control group. These results came to the same results cited by Gabr *et al.* (2008).

Reproductive parameters:

Data in Table (10) showed that conception rate was similar in the three tested groups and it did not affected by DF supplementation. Litter size was higher in DF-supplemented groups than those of control group. These results are in accordance with the results obtained by El-Saidy et al.(2008). They reported that litter size tended to be gradually increased with increasing fish oil level in the experimental diets without significant differences among groups in sheep. Also it was in consistent with those reported by Yoel-Zeron *et al.* (2002), where they found that ewes fed a diet supplemented with fish oil had more numbers of follicles and oocytes found on the ovaries of ewes supplemented with PUFA or compared those in control group. Ewes in DF-supplemented groups had higher twining rate than those in control group. It could be observed that percentage of does kidded/does joined (fertility) was lower in 5%DF-supplemented group than those of 3%PF-supplemented and control groups. Percent of kids born / does joined (fecundity), percent of kids weaned / does joined (reproductive ability) and percent of kids born / does kidded (prolificacy) followed an opposite trend being the highest value was achieved with group supplemented with 3%DF followed by 5%DF-supplemented group and then control group may be due to the increase in all, OM, OM, EE and NFE digestibilities than the control group. These results are in accordance with results reported by Gabr et al. (2008) who found that calculated litter size tended to be gradually increased with increasing fish oil level without significant differences. Also it was in consistent with those reported by Yoel-Zeron *et al.* (2002,) who found that fed diet supplemented with fish oil increased numbers of follicles and oocytes in the ovaries of ewes compared to the control ewes. Hegazy et al. (1999) found that feeding ewes different types of supplemental fat to ewes during late and early lactation improved their prolificacy rate.

Lucy *et al.* (1993) and De Fries *et al.* (1998) reported that dairy cows fed supplemented fat had larger and more mature preovulatory follicles than non-fed cows. Moreover, De Fries *et al.* (1998) stated that this effect may be beneficial due to the presence of substantial increase in the number of potential ovulatory follicles. Dietary fat may enhance follicular development through metabolites and metabolic hormones that influence GmRH (De Fries *et al.*, 1998) and thereby improve litter size and twining rate.

On the other hand, feeding supplementary fat sources was associated with increasing basal LH concentration and pulse amplitude and increasing diameter of the largest follicle (Hightshoe *et al.*, 1991;Lucy *et al.*, 1991 and De Fries *et al.*, 1998). Both mechanisms could result in the increase of litter size and twining rate observed in the present study.

Data in Table (10) indicated that kg. of kids born / doe joined, kg. of kids weaned / doe joined, percent of kids weaned / does kidded, kg. of kids born / doe kidded and kg of kids weaned /doe kidded found to be values in group supplemented with (3%) protected fat followed by 5% DF-supplemented group, then control group. This may be related to

Table (10): Effect of dry fat supplementation on reproductive traits of goats.

Item	Treatments		
	0	3% DF	5% DF
No. of does joined with bucks	15	15	15
No. of does conceived	15	15	15
No. of does kidded	15	15	14
Conception rate, %	100	100	100
No. of does aborted	0	0	1
Percent of does aborted / does conceived	0	0	6.67
Percent of does aborted / does kidded	0	0	7.14
No. of kids dropped at full term:	26	30	27
Male	16	16	14
Female	10	14	13
No. of kids born alive	26	30	27
Litter size (No. of kids born/does kidded)	1.73	2.00	1.93
No. of neonatal mortalities	2	0	1
No. of viable kids (weaned):	24	30	26
Male	15	16	13
Female	9	14	13
Type of birth: single (No)	5	3	3
(% /does kidded)	33.33	20.00	21.43
Twin (No)	9	9	9
(% /does kidded)	60.00	60.00	64.28
triplet (No)	1	3	2
(% /does kidded)	6.67	20.00	14.29
Twining rate,%	66.67	80.00	78.57
Percent of does kidded / does joined (fertility)	100.00	100.00	93.33
Percent of kids born / does joined (fecundity)	173.33	200.00	180.00
Percent of kids weaned / does joined (reproductive ability).	160.00	200.00	173.33
Kg. of kids born / doe joined	5.94	7.82	6.46
Kg. of kids weaned / doe joined	23.44	32.42	27.04
Percent of kids born / does kidded (prolificacy)	173.33	200.00	192.86
Percent of kids weaned / does kidded	160.00	200.00	185.71
Kg. of kids born / doe kidded	5.94	7.82	6.93
Kg. of kids weaned /doe kidded	23.44	32.42	28.97
Livability of kids at birth, %	100.00	100.00	100.00
Mortality of kids from birth to weaning , %	7.69	0	3.70
Livability of kids from birth to weaning , %	92.31	100.00	96.3

sufficient metabolizable energy provided by the supplemented fat which could stimulate greater fetal growth and consequently increase birth weight as well as weaning weight.

These results are in accordance with those reported by Titi and Awad (2007) they indicated that birth weight for Shami kids was higher due to dietary fat addition than those of control. Data showed that percent of does aborted / does conceived and percent of does aborted / does kidded was higher in 5%DF-supplemnted group than in the other groups. It is interesting to note that percentage livability of kids at birth, did not affected by protected fat supplementation, while, mortality of kids from birth to weaning, was higher in control group than other groups. Livability of kids from birth to weaning, followed an opposite trend, this was in consistent with the results of William and Charles (2003), who found that fat addition had positive effect through other physiological mechanism such as progesterone concentrations in plasma which are enhanced by fat and may enhance embryo survival; certain (PUFA), such as linoleic acid may reduce uterine secretion of prostaglandin.

CONCLUSION

The findings of this study revealed that, supplementation of dry fat to diets of Damascus goats at different levels (3 or 5%) had positive and beneficial effects on enhance digestion, nutritive values, rumen fermentation, milk production consequently does productive performance. Using fat can avoid some problem such as ruminal acidosis and liver abscess.

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تأثير استخدام مستويات ومصادر مختلفة من الدهون والمواد الخشنة على الأداء الانتاجى وتخمرات الكرش وبعض مكونات الدم في المجترات . ١- تأثير إضافة الدهن الجاف على الصفات الإنتاجية و التناسلية للماعز الدمشقي.

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أجريت هذه التجربة في محطة بحوث الإنتاج الحيواني بالجميزة وكان الهدف من الدراسة معرفة تأثير إضافة الدهن الجاف على الهضم و تخمرات الكرش والصفات التناسلية وبعض مكونات الدم وإنتاج اللبن للماعز الدمشقي. تم استخدام ٤٥ أنثى ماعز دمشقي يبلغ عمرها من ٣-٤ سنوات ومتوسط وزنها ٥٧ كجم وذو مواسم ٢-٣ من إنتاج اللبن و قسمت عشوائياً إلى ثلاث مجموعات متساوية (١٥ عنزة لكل مجموعة). بدأت التجربة عند عمر ٤٥ يوماً قبل الولادة و ٩٠ يوماً بعد الولادة. غذيت حيوانات التجربة على عليقه مضاف إليها دهن جاف بمستويات هي صفر،٣ ، ٥% (على أساس المادة الجافة المأكولة). تكونت العليقة الأساسية من مخلوط علف مركز ومواد خشنة (برسيم حشة ثالثة + قش أرز) بنسبة ٦٠:٤٠ %. وقد أجريت تجربة الهضم على ٩ ذكور ماعز دمشقي متوسط وزنها ٦٠ كجم وعمرها ٢,٥ سنة. و قد أوضحت النتائج أن معامل الهضم كلا من المادة الجافة ، المادة العضوية ، مستخلص الإيثير والمستخلص الخالي من الأزوت معنويا في مجموعات الإضافة بالمقارنة بالكنترول. وكانت قياسات سائل الكرش (درجة الحموضة ، تركيز الأحماض الدهنية الطيارة الكلية والأمونيا) كانت عالية في مجموعات الإضافة عن الكنترول. كما أن تركيز كلا من البروتين الكلى ، الجلوكوز، الليبيدات الكلية والكولسترول في الدم كان عاليا في مجموعات الإضافة عن الكنترول. ليس لإضافة الدهن الجاف أي تأثير على معدل الحمل ولكن كان له تأثير على حجم الولدة ومعدل التو أمية كذلك وزن الجديان عند الميلاد وعند الفطام. وكان إنتاج اللبن عاليا في مجموعات الإضافة مقارنة بالكنترول و كذلك تركيبة الكيماوي (النسبة المنوية للدهن، الجوامد الكلية و الجوامد غير الدهنية).

وبصفة عامة يمكن استنتاج أن إضافة الدهن المحمي في علائق الماعز الدمشقي يُحسن من الزيادة اليومية في إنتاج اللبن وتحسين مواصفاته، والهضم و بالمثل التحسن في بعض صفات الأداء التناسلي ويتضح باستخدام بنسبة ٣% على الأقل.