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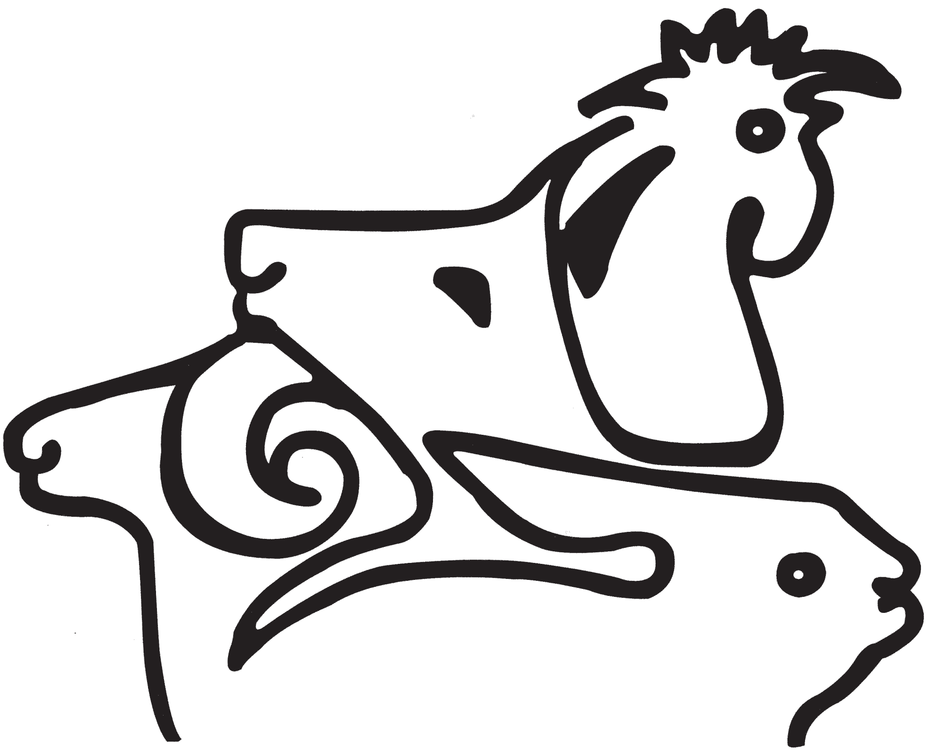

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Effects of Pre-milking Resting on Some Lactation Characteristics in Damascus (Shami) and Kilis Goats

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Şam ve Kilis Keçilerinde Sağım Öncesi Dinlendirmenin Bazı Süt Verim Özellikleri Üzerine Etkileri

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ABSTRACT

Objective: This study was conducted to determine the effects of pre-milking resting on some milk yield characteristics in Damascus (Shami) and Kilis goats.

Material ve Methods: In this study, 20 head of Kilis goats and 20 head of Damascus (Shami) goats aged 2-4 years old were used. The goats in both genotypes were divided into two groups as Control (10 heads) and Treatment (10 heads) group to determine the effect of pre-milking resting on some lactation characteristics. After milking, milk samples were immediately transferred to laboratory using an ice box and some milk characteristics were determined.

Results: At the end of the study, the effects of the pre-milking resting and the breed differences on the milk yield and milk composition were not significant ($p>0.05$), except on lactose content ($p<0.01$). Moreover, the effect of the lactation months on the content of all fatty acids in the milk were also detected statistically important ($p<0.05$).

Conclusion: Shami and Kilis goats produced similar amount of marketable milk yield. Breed affected the content of lactose in the milk. One hour waiting before milking had no effect on milk yield and composition.

Key Words:

Milk yield, milk composition, fatty acids, resting

ÖZ

Amaç: Bu çalışma, Şam ve Kilis keçilerinde sağım öncesi dinlendirmenin bazı süt verim özellikleri üzerine etkilerinin belirlenmesi amacı ile yapılmıştır.

Materyal ve Metot: Çalışmada, 2-4 yaşlı 20 baş Kilis keçisi ve 20 baş Şam keçisi kullanılmıştır. Her genotipteki keçiler, sağım öncesi 1 saat dinlendirmenin laktasyon özelliklerine etkisini belirlemek amacıyla, kontrol ve muamele olmak üzere 10'ar baş olarak iki gruba ayrılmışlardır. Sağımdan hemen sonra süt örnekleri buz kutuları içerisinde laboratuvara getirilmiş ve bazı süt özellikleri tespit edilmiştir.

Bulgular: çalışma sonunda ırklar ve gruplar arasında süt verimi ve kompozisyonu arasında elde edilen farklılıklar laktoz hariç istatistiksel açıdan önemsiz bulunmuştur ($P>0.05$). Bunun yanı sıra sütteki yağ asitlerinin aylara göre farklılık gösterdiği tespit edilmiştir ($P<0.05$).

Sonuç: Şam ve Kilis keçileri benzer süt verimine sahiptirler. Laktoz içeriği ırklardan etkilenmiştir. Sağım öncesi bekleme süt verimi ve kompozisyonunu etkilememiştir.

Anahtar Kelimeler:

Süt verimi, süt kompozisyonu, yağ asitleri, dinlenme

INTROCUTION

Hair goat a dominant goat breed of Turkey has been raised with extensive system similarly to the countries located in tropical and subtropical climate zones. There are almost 10.4 million of goat population and Hair goat is approximately 97% of the goat population in the country (www.tuik.gov.tr). Other goat breeds of the country are Angora goat, Kilis goat, Damascus (Shami) goat and some other local breeds as well as different crossbreds of Saanen and native goats (Keskin, 2000; Gül et. al. 2016). In Turkey, Damascus and Kilis goats known their high milk yield and litter size are raised in the regions near to Syrian border (Keskin and Biçer, 1997; Keskin, 2000; Keskin, 2013; Gül et al., 2016; Keskin et al., 2017). Unlike Hair goat farming, some Kilis and Damascus goat breeders give feed to the animals at morning and/or evening times as addition to the pasture. Some breeders who give additional feed to the goats claim that resting the goat for an hour before milking increases the milk yield. Therefore, after they give concentrated feed to the goats returning from pasture, they were in resting situation one hour before milking.

As reported by Sevi et al. (2009), in most Mediterranean countries, goats are grazed during daytime and housed during night-time. Concentrated feed, straw, hay or different feed raw materials can be offered to the goats at these countries depending on the production system, breed and the product characteristics demanded by the market. In the areas where sheep and goat breeding is more diffused, late spring and summer are characterized not only by poor grass availability and palatability but also by a marked reduction of its protein content (Negrave, 1996). The management of animals in such poor environments may cause imbalances in feeding. Rumen fermentation, protein and fat synthesis may be affected by these situations. It is also known that grazing in poor meadows with excessively fibrous vegetation, under bad weather conditions, and with limited time for herbage ingestion may lead to reduced milk yield in goat (Fedele et al., 1993). Pulina et al. (2006) reported that short-time feed restriction caused a sudden decrease in reduced milk yield and increased milk fat in Sarda dairy ewes. As explained above although there are a number of studies on the relationship between milk yield characteristics and feeding, there has been no study about the relation between these characteristics and resting the goat before milking. In this study, it was aimed to investigate whether one hour resting before milking had effects on milk yield and composition for Kilis and Damascus goats.

MATERIAL and METHODS

In this study, 20 head of Kilis goats and 20 head of Damascus (Shami) goats aged 2-4 years old were used with the approval of the Mustafa Kemal University Ethics Committee (*MKUHADYEK-2015-1/8*).

The goats in both genotypes were divided into two groups as Control (10 heads) and Treatment (10 heads) group to determine the effect of pre-milking resting on some lactation characteristics. All goats grazed at the same pasture during day-time in accordance with traditional breeding system of the region. And, they were offered 1 kg/head/day concentrate containing 16% crude protein and 2600 kcal metabolizable energy in dry matter as reported by NRC (2001) when they returned to the pen. The control group goats were milked by hand while they were feeding the concentrate. The treatment group goats were rested an hour after concentrate feeding and then they milked by hand. All goats could reach to the fresh water all the day. Milk controls were conducted every 28 days and the marketable milk yield was calculated by the AT method of ICAR procedure (given below in 1st equality). The Fleischman method was used for each goat's milk yield calculation as mentioned by Gül et al (2016).

MY= IMY(TMF/TF)………………..(1)*
MY, Milk yield of the goat in control day
IMY, Individual milk yield of the goat in the morning
TF, total milk yield of flock in the morning
TMF, Total milk yield of the flock in the morning and evening

After milking, milk samples were immediately transferred to laboratory using an ice box. Total solids, fat and titratable acidity (as a percentage of lactic acid) were determined by gravimetric, gerber and titrimetric methods, respectively (AOAC, 1990). Total nitrogen was measured by the micro-Kjeldahl method (IDF, 1962), using the Gerhardt KB 40S digestion and Vapotest distillation systems (C. Gerhardt, Bonn, Germany). The pH was determined with a pH meter (Thermo, Beverly, MA, USA). Ash content was quantified by dry ashing the samples in a muffle furnace at 550 °C for 24 h. Lactose analysis was performed according to the procedure described by Güler (2014) with slight modifications. Separations and detections were carried out in an automated high performance liquid chromatography system (HPLC-20 AD Prominence, Shimadzu, Kyoto, Japan) using an ion exchange column

(Aminex HPX-87 H, 300 × 7.8 mm, BIO-RAD, Hercules, CA, USA) and a refractive index detector (RID-10A, Shimadzu, Kyoto, Japan). The concentration of lactose was calculated using linear regression curve-based peak areas. The obtained determination coefficient was 0.999. Extraction and quantification of FFAs, and also GC-MS (Agilent 6890 gas chromatograph and 5973 N mass selective detector; Agilent, Palo Alto, CA, USA) operating conditions were carried out according to the procedure described by Güler et al. (2007). A DB-FFAP-column (30 m × 0.25 mm id × 0.25 µm film thickness) was used for FFA separation. Tridecanoic acid as internal standard was added to all experimental milk samples at the time of extraction. The individual FFA concentration was calculated based on the real value (mg/L) of internal standard added to samples and its relative chromatogram area.

Statistical analyses

Mathematical model of the experiment is;

$Y_{ijk}=\mu+\alpha_i+\beta_j+e_{ijk}$ *; in this model,*

Y_{ijk}, k^{th} yield characteristic of animal in i^{th} treatment group and j^{th} breed
μ = population mean of given trait,
α_i, effect of treatment group
B_j, effect of breed
e_{ijk}, error terms

SPSS package program was used to evaluate the data (Windows version of SPSS release 22). Comparisons between group averages were analysed by using univariate and multiple comparison tests were made by using DUNCAN test in the same software.

RESULTS and DISCUSSION

Marketable milk yield and milk composition of the goats are given in Table 1. Differences between genotype and treatment groups were not statistically significant due to marketable milk yield and milk composition, except to lactose content (P>0.05).

Table 1. Marketable milk yield and milk composition (mean ± standard error) based on the breed and group
Çizelge 1. *Irk ve gruplara göre pazarlanabilir süt verimi ve süt kompozisyonu (ortalama ± standart hata)*

	Damascus goat			Kilis goat		P
Items	**Resting**	**Control**	**P**	**Resting**	**Control**	
MMY	317.0±14.1	293.6±15.1	>0.05	304.8±29.3	285.7±21.2	>0.05
Dry matter	13.3±0.36	13.3±0.26	>0.05	13.1±0.15	12.9±0.21	>0.05
Crude Protein	3.3±0.27	3.1±0.12	>0.05	3.3±0.08	3.0±0.09	>0.05
Crude Fat	4.4±0.17	4.5±0.14	>0.05	4.3±0.12	4.5±0.17	>0.05
Ash	0.8±0.03	0.8±0.03	>0.05	0.8±0.03	0.8±0.03	>0.05
Density	1.0±0.01	1.0±0.01	>0.05	1.0±0.01	1.0±0.01	>0.05
pH	6.7±0.08	6.7±0.04	>0.05	6.7±0.04	6.7±0.04	>0.05
Titratable acidity (as lactic acid)	0.2±0.01	0.2±0.01	>0.05	0.2±0.01	0.2±0.01	>0.05
Lactose	5.8±0.17	6.3±0.15	<0.05	5.6±0.13	5.0±0.08	<0.01
Glucose	0.2±0.01	0.3±0.01	<0.01	0.2±0.01	0.2±0.01	>0.05
Galactose	0.1±0.01	0.1±0.01	>0.05	0.1±0.01	0.1±0.01	>0.05

General

	Damascus goat	**Kilis goat**	**P**
MMY	305.3±10.4	295.2±17.7	>0.05
Dry matter	13.3±0.22	13.0±0.13	>0.05
Crude Protein	3.2±0.15	3.1±0.06	>0.05
Crude Fat	4.4±0.11	4.4±0.10	>0.05
Ash	0.8±0.02	0.8±0.02	>0.05
Density	1.0±0.01	1.0±0.01	>0.05
pH	6.7±0.08	6.7±0.08	>0.05
Titratable acidity (as lactic acid)	0.2±0.01	0.2±0.01	>0.05
Lactose	6.1±0.12	5.3±0.08	<0.05
Glucose	0.3±0.01	0.2±0.01	>0.05
Galactose	0.1±0.01	0.1±0.01	>0.05

MMY, marketable milk yield;

The marketable milk yield calculated from the experimental goats given in Table 1 was found to be similar to the milk yield reported by Keskin (2000) for Damascus (Shami) goats. Milk yield values calculated for Kilis goat were found to be similar with that reported by Gül et al. (2016) and Keskin et al. (2017) for Kilis goats raised under semi-intensive conditions of Hatay and Kilis provinces. The fact that the Damascus (Shami) goat and Kilis goat have similar characteristics in terms of marketable milk yield and milk composition values indicate that Kilis goats can be raised on Shami goat breeding regions. Although not statistically significant, the milk yield values for both breeds were found to be higher in the animals that were rested for 1 hour before milking. Lactose content of milk was significantly ($P<0.01$) influenced by goat breed. It is well known that lactose is synthesized from glucose in blood but the rate of lactose synthesis is dependent upon the α-lactoalbumin to ß-1,4 -galactosyltransferase ratio. High lactose content of milk from Shami breed may be due to the high α-lactoalbumin or glucose contents in mammary epithelial cell since without α-lactalbumin, galactosyltransferase cannot synthesize lactose (Hill, 2006). On the other hand, Kilis breed might have been demanded more energy since glucose could be processed by glycolysis to provide energy instead of lactose synthesis (Khan et al., 2011). The effect of 1 hour-waiting before milking on lactose content was changed depending on the breed. It resulted in an increase for Kilis breed and a decrease for Shami breed. As reported by Ollier et al. (2007), lactose synthesis is mostly dependent on genetic factors rather than feeding. When compared with Kilis breed, Shami breed with high lactose content had a high milk yield since lactose synthesis could be resulted in an increase in milk volume (Lin et al., 2016).

Table 2. The effects of pre-milk waiting period on acetic acid and free fatty acids in milk **(mg/L)** (mean ± standard error) during the milking period in Damascus goats.
Çizelge 2. *Şam keçilerinde laktasyon süresince sütteki serbest yağ asitlerine sağım öncesi beklemenin etkisi (mg/L) (ortalama±standart hata)*

Items	Gr	Months 1	2	3	4	5	6	P
Acetic acid	Wt	2.40±0.14^{a}	2.11±0.21^{a}	4.46±0.20^{c}	1.20±0.16^{a}	1.01±0.07^{a}	1.42±0.21^{a}	0.000
	Ct	3.47±0.42^{b}	2.08±0.15^{a}	8.47±0.92^{c}	1.14±0.16^{a}	1.11±0.20^{a}	1.17±0.14^{a}	0.000
Butanoic acid	Wt	4.07±0.45^{c}	2.27±0.43^{b}	3.87±0.57^{c}	2.01±0.25^{ab}	1.03±0.13^{a}	1.26±0.22^{ab}	0.000
	Ct	3.04±0.75^{c}	2.75±0.39^{c}	3.13±0.60^{c}	2.46±0.23^{bc}	1.07±0.26^{a}	1.31±0.10^{ab}	0.009
Hexanoic acid	Wt	5.85±0.88^{d}	3.17±0.46^{bc}	4.52±0.78^{cd}	2.47±0.34^{ab}	1.35±0.51^{a}	1.12±0.19^{a}	0.000
	Ct	4.08±1.17^{b}	3.52±0.51^{b}	4.64±0.99^{b}	2.77±0.22^{ab}	1.07±0.15^{a}	1.27±0.12^{a}	0.003
Octanoic acid	Wt	6.24±0.61^{d}	2.53±0.38^{bc}	3.71±0.30^{c}	2.32±0.41^{ab}	1.10±0.38^{a}	1.26±0.39^{ab}	0.000
	Ct	3.33±0.14^{cd}	3.39±0.36^{cd}	3.65±0.28^{d}	2.73±0.24^{bc}	2.18±0.42^{b}	1.07±0.10^{a}	0.000
Nanonoic acid	Wt	2.51±0.23^{d}	1.16±0.04^{c}	0.80±0.02^{ab}	0.55±0.03^{a}	0.95±0.12^{bc}	0.59±0.05^{a}	0.000
	Ct	2.24±0.25^{d}	1.21±0.04^{c}	0.76±0.09^{ab}	0.60±0.04^{a}	1.00±0.06^{bc}	0.83±0.06^{ab}	0.000
Decanoic acid	Wt	16.85±1.71^{d}	10.23±0.71^{c}	11.20±0.98^{c}	6.85±0.61^{b}	2.29±0.44^{a}	2.80±0.51^{a}	0.000
	Ct	16.24±1.70^{d}	10.85±0.85^{c}	7.73±1.29^{b}	9.13±0.71^{bc}	2.74±0.38^{a}	3.26±0.24^{a}	0.000
Dodeconoic acid	Wt	6.30±0.46^{c}	3.28±0.32^{b}	3.89±0.39^{b}	2.98±0.42^{b}	1.04±0.26^{a}	1.41±0.29^{a}	0.000
	Ct	3.96±0.63^{b}	3.53±0.54^{b}	3.61±0.84^{b}	3.49±0.16^{b}	1.47±0.14^{a}	1.31±0.12^{a}	0.001
Tetradeconoic acid	Wt	17.45±2.20^{c}	9.41±1.67^{b}	14.38±2.41^{c}	9.45±0.95^{b}	4.23±0.40^{a}	5.35±0.83^{ab}	0.000
	Ct	14.77±1.58^{b}	14.48±1.00^{b}	14.89±0.94^{b}	12.23±0.74^{b}	5.47±0.24^{a}	6.52±0.67^{a}	0.000
Pentadeconoic acid	Wt	1.64±0.13^{c}	0.83±0.13^{ab}	1.09±0.28^{b}	0.81±0.11^{ab}	0.56±0.04^{a}	0.46±0.05^{a}	0.000
	Ct	1.46±0.23^{c}	0.86±0.09^{ab}	1.15±0.21^{bc}	0.91±0.07^{ab}	0.56±0.05^{a}	0.54±0.05^{a}	0.000
Hexadeconoic acid	Wt	79.49±4.97^{d}	62.57±6.03^{bc}	72.64±7.11^{cd}	49.31±3.90^{b}	32.92±2.83^{a}	31.88±2.47^{a}	0.000
	Ct	59.89±4.66^{b}	78.41±4.61^{c}	74.64±7.43^{c}	55.67±3.95^{b}	34.32±2.97^{a}	36.57±3.04^{a}	0.000
Heptadeconoic acid	Wt	1.99±0.19^{b}	1.06±0.21^{a}	1.20±0.34^{a}	0.80±0.09^{a}	0.64±0.07^{a}	0.84±0.09^{a}	0.001
	Ct	1.88±0.39^{b}	1.21±0.29^{ab}	1.78±0.36^{b}	0.79±0.11^{a}	0.52±0.04^{a}	0.44±0.09^{a}	0.001
Octadeconoic acid	Wt	59.07±4.62^{b}	57.66±3.64^{b}	51.01±6.22^{b}	28.78±3.98^{a}	35.43±1.99^{a}	30.44±3.17^{a}	0.000
	Ct	57.66±3.98^{b}	58.13±5.55^{b}	58.75±7.84^{b}	27.19±1.42^{a}	33.32±1.65^{a}	25.15±2.55^{a}	0.000
cis-9- Octadeconoic acid	Wt	43.98±3.83^{c}	22.62±3.94^{ab}	29.76±2.35^{b}	21.82±0.92^{ab}	14.82±2.17^{a}	15.14±2.50^{a}	0.000
	Ct	34.08±3.90^{b}	32.19±2.45^{b}	38.73±3.68^{b}	29.18±3.45^{b}	17.14±2.18^{a}	16.53±2.23^{a}	0.000
trans 9-Octadeconoic acid	Wt	2.54±0.20^{d}	1.02±0.19^{bc}	1.24±0.08^{c}	0.38±0.05^{a}	0.64±0.12^{ab}	0.30±0.03^{a}	0.000
	Ct	1.75±0.20^{b}	1.61±0.23^{b}	1.39±0.04^{b}	0.50±0.08^{a}	0.53±0.09^{a}	0.43±0.10^{a}	0.000
9.12- Octadeconoic acid	Wt	4.77±0.36^{d}	2.85±0.41^{bc}	3.51±0.39c	2.37±0.23^{ab}	1.57±0.31^{a}	2.17±0.32^{ab}	0.000
	Ct	7.81±0.17^{c}	3.92±0.33^{b}	3.56±0.40^{b}	3.16±0.28^{b}	1.72±0.29^{a}	1.94±0.24^{a}	0.000

Gr, groups; Wt, resting group, Ct, Control group; superscripts in same row indicate statistically different months

Table 3. The effects of pre-milk waiting period on acetic acid and free fatty acids in milk **(mg/L)** (mean ± standard error) during the milking period in Kilis goats.
Çizelge 3. *Kilis keçilerinde laktasyon süresince sütteki serbest yağ asitlerine sağım öncesi beklemenin etkisi (mg/L) (ortalama±standart hata)*

Items	Gr	Months 1	2	3	4	5	6	P
Acetic acid	Wt	2.37±0.15^{a}	2.34±0.47^{a}	8.80±1.50^{b}	0.89±0.11^{a}	1.20±0.07^{a}	1.18±0.13^{a}	0.000
	Ct	5.31±0.60^{b}	1.40±0.21^{a}	13.60±0.83^{c}	1.60±0.83^{a}	1.14±0.06^{a}	1.37±0.31^{a}	0.000
Butanoic acid	Wt	3.30±0.58^{b}	2.56±0.35^{ab}	2.70±0.64^{ab}	2.82±0.63^{ab}	1.57±0.28^{a}	1.51±0.27^{a}	0.020
	Ct	5.79±1.24^{a}	3.35±0.30^{c}	2.36±0.33^{abc}	3.08±0.52^{bc}	1.13±0.10^{a}	1.23±0.08^{ab}	0.000
Hexanoic acid	Wt	4.44±0.77^{b}	3.68±0.44^{ab}	4.32±1.17^{b}	3.77±0.83^{ab}	1.89±0.33^{a}	1.71±0.31^{a}	0.000
	Ct	6.87±1.33^{c}	4.14±0.34^{b}	3.02±0.43^{ab}	3.46±0.44^{b}	1.34±0.10^{a}	1.23±0.14^{a}	0.000
Octanoic acid	Wt	3.94±0.34^{b}	3.46±0.36^{b}	2.89±0.42^{b}	3.61±0.38^{b}	1.62±0.23^{a}	1.38±0.27^{a}	0.000
	Ct	4.27±0.32^{c}	3.65±0.30^{c}	2.41±0.40^{b}	3.79±0.27^{c}	1.13±0.06^{a}	1.07±0.02^{a}	0.000
Nanonoic acid	Wt	2.24±0.19^{c}	1.31±0.06^{b}	0.62±0.11^{a}	0.57±0.06^{a}	1.10±0.05^{b}	0.79±0.01^{a}	0.000
	Ct	1.66±0.23^{d}	1.35±0.09^{cd}	0.63±0.05^{a}	0.54±0.05^{a}	1.08±0.08^{bc}	0.89±0.07^{ab}	0.000
Decanoic acid	Wt	15.23±2.57^{b}	11.16±1.56^{ab}	10.03±1.79^{ab}	15.35±2.33^{b}	6.24±0.87^{a}	5.95±0.50^{a}	0.003
	Ct	13.86±1.89^{b}	11.77±0.93^{b}	6.41±0.72^{a}	11.23±1.50^{b}	3.27±0.40^{a}	2.93±0.40^{a}	0.000
Dodeconoic acid	Wt	4.01±0.29^{c}	3.41±0.23^{c}	2.99±0.38^{bc}	3.83±0.37^{c}	2.15±0.39^{ab}	1.58±0.37^{a}	0.000
	Ct	6.30±0.60^{c}	3.69±0.20^{b}	2.14±0.26^{a}	3.61±0.45^{b}	1.38±0.15^{a}	1.22±0.07^{a}	0.000
Tetradeconoic acid	Wt	8.54±1.37^{ab}	9.86±1.13^{b}	5.77±0.64^{a}	10.25±1.34^{b}	6.95±0.74^{ab}	6.36±0.52^{a}	0.024
	Ct	15.21±1.94^{b}	13.57±0.73^{b}	7.54±0.57^{a}	12.26±1.47^{b}	6.35±0.41a	6.07±0.16^{a}	0.000
Pentadeconoic acid	Wt	1.33±0.39^{b}	0.80±0.12^{ab}	0.85±0.13^{ab}	0.73±0.10^{ab}	0.73±0.05^{ab}	0.59±0.07^{a}	0.050
	Ct	2.04±0.31^{b}	1.11±0.12^{a}	0.84±0.12^{a}	0.85±0.10^{a}	0.68±0.07^{a}	0.61±0.07^{a}	0.000
Hexadeconoic acid	Wt	58.82±4.43^{b}	59.18±3.92^{b}	58.77±5.58^{b}	55.19±6.10^{ab}	44.11±4.10^{ab}	41.08±2.47^{a}	0.040
	Ct	82.66±5.90^{e}	76.07±1.93^{d}	54.30±2.52^{bc}	63.60±6.75^{cd}	45.53±2.40^{ab}	39.65±3.72^{ae}	0.000
Heptadeconoic acid	Wt	1.31±0.15^{c}	1.20±0.15^{bc}	0.96±0.17^{abc}	0.88±0.13^{ab}	0.73±0.05^{a}	0.59±0.07^{a}	0.008
	Ct	1.83±0.23^{c}	1.64±0.10^{c}	1.04±0.10^{ab}	1.41±0.25^{bc}	1.06±0.10^{ab}	0.70±0.14^{a}	0.001
Octadeconoic acid	Wt	56.62±2.11^{bc}	60.24±3.25^{c}	54.44±7.98^{bc}	33.66±3.69^{a}	44.92±2.54^{ab}	34.51±4.08^{a}	0.001
	Ct	59.00±2.86^{c}	75.52±1.46^{d}	49.76±2.45^{b}	42.10±4.58^{ab}	48.86±3.29^{b}	38.04±2.69^{a}	0.000
cis-9- Octadeconoic acid	Wt	25.24±2.43^{ab}	22.88±3.14^{ab}	28.45±3.19^{ab}	31.78±3.05^{b}	24.67±2.53^{ab}	19.87±3.15^{a}	0.024
	Ct	55.69±3.24^{e}	31.51±3.31^{c}	28.19±3.45^{bc}	41.96±4.01^{d}	20.60±1.93^{ab}	18.49±1.76^{a}	0.000
trans 9-Octadeconoic acid	Wt	2.24±0.40^{d}	1.14±0.24^{bc}	1.50±0.05^{c}	0.64±0.13^{ab}	0.33±0.05^{a}	0.26±0.01^{a}	0.000
	Ct	1.90±0.13^{cd}	1.51±0.25^{cd}	1.39±0.08^{d}	0.50±0.12^{ab}	1.01±0.31^{bc}	0.34±0.07^{a}	0.000
9.12- Octadeconoic acid	Wt	5.09±0.36^{c}	3.77±0.31^{b}	2.00±0.26^{a}	2.87±0.36^{ab}	3.14±0.47^{b}	3.02±0.26^{ab}	0.000
	Ct	5.71±0.44^{d}	3.98±0.36^{c}	3.55±0.44^{bc}	5.56±0.23d	2.72±0.14^{ab}	2.04±0.33^{a}	0.000

Gr, groups; Wt, resting group, Ct, Control group; superscripts in same row indicate statistically different months

As shown in Table 2 and 3, where the effect of pre-milk waiting on acetic acid and free fatty acids (FFAs) in the milk during the lactation period of Shami and Kilis goats was presented, fatty acids were changed depending on the lactation period. This situation is consistent with the report made by Güler et al. (2007) that informed significant changes in the fatty acids except of short-chain fatty acids during lactation for the German Fawn x Hair goat crossbreds and Shami goats. Similarly, Tudisco et al. (2014) reported that fatty acids of goats' milk were changed as a function of sampling month. Fatty acids up to partly C16 are de novo synthesized within the mammary gland from acetate and butanoate produced by rumen bacteria. A part of C16 and fatty acids with more carbons originate mainly from plasma uptake depending on feeding. In milk free fatty acids can originate from three sources: from blood; by passive loss of unesterified fatty acids in epithelial cells of the mammary gland; or by hydrolysis of milk triglycerides (Walstra and Touters, 2006; Chilliard et al., 2003).

Acetic acid and the FFAs in all the milk samples analysed showed changing tendency during lactation period. This could be attributed to the variations in feeding regime and goats' physiological status as progressing lactation. Throughout the end of lactation, the decrease in all free fatty acids may be related to their converting to triglyceride form, as a result of which results in an increase in fat concentration in milk. This is confirmed by an increase in fat content in milk of all groups throughout lactation (data not shown). On the other hand, at the beginning of lactation is corresponding summer months, the high levels of FFA indicates that the fat present in goats' milk may be more susceptible to lipolysis caused by lipoprotein lipase naturally present in raw milk or the freer fatty acids may be de novo synthesized in mammary gland and their without unterrified transferring to milk and also the high long chain fatty acid content of pasture depending on the lactation month (Samkova et al., 2018). As seen in Table 4, one hour waiting before milking had no effect on acetic acid and the free fatty acid contents in milk for the both breeds except of cis-9-Octadecanoic acid. Fatty acids most commonly identified in the milk of all groups during the trial were hexadecanoic, octadecanoic, 9-octadecenoic, tetradecanoic and decanoic acids. This finding is consistent with the reports by Zan et al. (2006) on milk produced from Alpine and Saanen goats that are grazed on pasture. In contrast to the previous study for Shami breed (Güler et al., 2007) octadecanoic acid in milk of all groups during the trial was significantly higher than its unsaturated isomers such as 9-octadecenoic and 9,12-octadecadienoic acids. Tudisco et al. (2014) and Sanz-Sampelayo et al., (2007) reported that predominant FFA with 18 carbons was octadodecanoic acid in goat milk and its unsaturated isomers could be dependent mostly on the pasture and also the activity of desaturase enzyme in mammary cells of ruminants since this enzyme could be converted saturated C18 to unsaturated C18 isomers. However, cyclopropene acids found in some plants are inhibited to enzyme activity (Wastra, et.al., 2006). Therefore, the changes in pasture composition depending on lactation stages and also rumen microbial flora of each breed and also the enzyme activity in mammary cell may affect the concentrations of unsaturated C18 FFAs having the beneficial effects on health.

Among free fatty acids short chain FFAs (butanoic, hexanoic, octanoic and decanoic) are important for the flavour of goat's milk. The variation of this type of fatty acids with respect to the breeds and treatments are given in Table 5.

While C4 FFA is responsible for ‘fatty’ and ‘sweaty’ flavour notes, C6 to C10 contribute characteristic ’pungent’ ‘medicanal’ and ‘goaty’ flavour notes, which characterize to flavour of goat milk (Siefarth and Buettner, 2014). As seen in Table 5, the higher contents of hexanoic and octanoic acids detected for Kilis goats indicates that milk from this breed has relatively more marked flavour compared to Shami breed and also is relatively readly digested due to high short chain fatty acids (Strzalkowska et al., 2009). Pre-weaning waiting has no influence on these types of fatty acids’ concentration. However, decanoic acid is responsible for characteristic ‘goaty’ flavour has shown the most marked decrease during lactation (Table 2 and 3). This finding is important for the desirable flavour quality of goat milk since some consumers unlike goat milk and its products due to ‘goaty’ flavour (Siefarth and Buettner, 2014). Both breed and trial had no an effect on decanoic acid.

In this study, odd-numbered free fatty acids (OFFA) such as nonanoic, pentadecanoic and heptadecanoic acids were identified in milk. They are either derived directly from diet or synthesized by cellulolytic rumen bacteria (Civico et al., 2017). One hour-waiting before milking caused relatively an increase in odd-FFAs, but it was not significant (P>0.05). This may be important to the palatability of milk since high concentrations of odd-FFAs result in a softer fat due to their low melting points (Civico et al., 2017; Vlaeminck et al., 2006).

Table 4. The effects of pre-milk waiting period on acetic acid and some fatty acids in the breeds.
Çizelge 4. *Irklarda sağım öncesi beklemenin asetik asit ve bazı yağ asitleri üzerine etkisi*

Items	Groups					
	Damascus			Kilis		
	Waiting	Control	P	Waiting	Control	P
Acetic acid	2.10±0.23	2.91±0.51	0.157	2.85±0.58	4.16±0.88	0.218
Butanoic acid	2.42±0.26	2.29±0.22	0.712	2.44±0.22	2.88±0.37	0.319
Pentanoic acid	1.03±0.15	1.09±0.39	0.887	1.19±0.43	0.69±0.21	0.324
Hexanoic acid	3.08±0.38	2.89±0.35	0.719	3.36±0.34	3.42±0.43	0.911
Octanoic acid	2.86±0.36	2.72±0.19	0.744	2.87±0.22	2.78±0.26	0.792
Nanonoic acid	1.09±0.13	1.11±0.11	0.928	1.12±0.12	1.03±0.09	0.556
decanoic acid	8.37±1.00	8.33±0.93	0.975	10.82±0.98	8.43±0.91	0.078
Dodeconoic acid	3.15±0.35	2.90±0.27	0.568	3.04±0.20	3.12±0.35	0.850
Tetradeconoic acid	10.04±1.05	11.39±0.81	0.312	8.01±0.50	10.31±0.80	0.18
pentadeconoic acid	0.90±0.09	0.91±0.08	0.909	0.85±0.08	1.04±0.11	0.174
Hexadeconoic acid	54.80±3.85	56.58±3.59	0.736	53.26±2.22	61.01±3.30	0.056
Heptadeconoic acid	1.09±0.11	1.10±0.14	0.944	0.96±0.07	1.30±0.09	0.005
Octadeconoic acid	43.73±2.80	43.37±3.24	0.932	47.82±2.55	52.70±2.58	0.184
cis-9- Octadeconoic acid	24.69±2.13	27.97±1.93	0.257	25.67±1.29	33.23±2.67	0.014
trans 9-Octadeconoic acid	1.02±0.15	1.04±0.12	0.933	1.05±0.15	1.13±0.12	0.659
9.12 Octadeconoic acid	2.87±0.23	3.69±0.39	0.078	3.32±0.22	3.99±0.28	0.068

Table 5. Different fatty acids concentrations (mean ± standard error) in milk with respect to the breeds and treatment (mg/L)
Çizelge 5. *Irklara ve uygulamalara göre farklı yağ asit konsantrasyonları (mg/L) (ortalama±standart hata)*

Fatty acids	Breed			Group		
	Shami (60)	Kilis (58)	P	Waiting (59)	Control (59)	P
Butanoic	1.66±0.118	2.15±0.144	<0.01	1.80±0.124	1.99±0.144	>0.05
Hexanoic	1.99±0.157	2.77±0.205	<0.01	2.32±0.172	2.42±0.205	>0.05
Octanoic	1.74±0.138	2.34±0.215	<0.05	2.01±0.163	2.05±0.201	>0.05
Decanoic	7.19±0.606	7.86±0.588	>0.05	7.46±0.586	4.58±0.614	>0.05

CONCLUSION

The results obtained in the study can be concluded as following;

(a) Shami and Kilis goats produced similar amount of marketable milk yield. For this reason, both breeds can be raised in this region which is located in the subtropical climate zone.

(b) Breed affected the content of lactose in the milk.

(c) Milk yield and composition were influenced by lactation months.

(d) Kilis goats, the locally goat breed of the region, are richer in terms of some fatty acids such as butanoic acid, hexanoic acid and octanoic acid affecting the milk flavour and its palatability.

(e) One hour waiting before milking had no effect on milk yield and composition.

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