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RESEARCH ARTICLE

Some lactation traits, somatic cell count and udder characteristics of Pırlak Sheep

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Pırlak Koyunlarda bazı süt verimi ve meme özellikleri ile somatik hücre sayısı

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Öz

Amaç: Bu çalışma Pırlak koyunların süt verimi, meme özellikleri ve somatik hücre sayısı ile bu özellikler arasındaki korelasyonları belirlemek amacıyla yapıldı.

Gereç ve Yöntem: Bu araştırma 2009 yılında Afyon Kocatepe Üniversitesi Hayvancılık Uygulama ve Araştırma Merkezi' nde bulunan 4 ve 5 yaş ve üzeri 70 baş Pırlak koyun üzerinde yürütüldü.

Bulgular: Pırlak koyunlarda süt verimi ve laktasyon süresine ait en küçük kareler ortalamaları 76.98 ± 4.12 kg ve 120.79 ± 2.52 gün hesaplandı. Günlük ortalama süt verimi, yağ oranı ve somatik hücre sayısı laktasyonun 60 ve 90. günlerinde sırasıyla; 680.28 ± 40.01 ve 431.94 ± 27.37 g, % 4.97±0.16 ve 7.88±0.27, 4.66 ± 0.11 ve 5.66 ±0.13 bulundu. Meme derinliği, meme çevresi, sağ meme başı uzunluğu ve sağ meme başı çapı laktasyonun 60. gününde sırasıyla; 15.25 ± 0.26, 40.94 ± 0.77, 2.77 ± 0.07 ve 1.58 ± 0.04 cm, 90.günde aynı sıra ile; 14.76 ± 0.29, 34.79 ± 0.66, 2.66 ± 0.07 ve 1.44 ± 0.03 cm tespit edildi. Laktasyon süt verimi ile sağ ve sol meme sistern derinliği arasında önemli pozitif fenotipik korelasyonlar (0.49, 0.43) tespit edildi.

Öneri: Sonuç olarak Pırlak koyunlarda süt veriminin yerli koyun ırklarının verimleri düzeyinde ve makineli sağıma uygun olduğu kanatine varılmıştır. Süt verimi, meme özellikleri ve somatik hücre sayısı arasındaki korelasyonlar istenilen yöndedir. Bu nedenle incelenen süt verimi ve meme özelliklerinin bir seleksiyon programında uygulanabilir olduğu görüşüne varılmıştır.

Anahtar kelimeler: Pırlak, süt verimi, meme özellikleri, somatic hücre sayısı, korelasyon

Abstract

Aim: Aim of the study was to determine milk yield, somatic cell count, udder traits and correlations among these traits in Pırlak sheep.

Materials and Methods: This research has been carried out on 4 and 5+ years old aged 70 Pırlak ewes maintained Afyon Kocatepe University Livestock Research and Application Center, sheep breeding unit in 2009.

Results: The least squares means of milk yield and lactation length were 76.98 ± 4.12 kg and 120.79 ± 2.52 days. Average daily milk yield, fat percentage and log somatic cell counts at 60 and 90 days of lactation were 680.28 ± 40.01 and 431.94 ± 27.37 g, 4.97±0.16 % and 7.88±0.27 %, 4.66± 0.11 and 5.66±0.13 respectively. Udder depth, udder circumference, right teat length, and right teat diameter were 15.25±0.26, 40.94±0.77, 2.77±0.07 and 1.58±0.04 cm for 60 days of lactation and 14.76±0.29, 34.79±0.66, 2.66±0.07 and 1.44±0.03 cm for 90 days of lactation, respectively. The significant coefficients of phenotypic correlations between milk yield and right and left udder cistern depths (0.49, 0.43) were positive and in desired way.

Conclusion: It was concluded that the lactation milk yield was similar with other Turkish native sheep breeds and Pırlak ewes were suitable to machine milking. The correlations among milk yield, somatic cell counts and udder traits were in desired ways. Therefore mentioned milk yield and udder traits could be used in an advanced selection program.

Keywords: Pırlak, milk yield, udder traits, somatic cell count, correlation.

Introduction

The sheep breeding in Turkey is being done with native sheep breeds of rural areas intensively. According to data for 2016 there were 30983933 head sheep in Turkey and the average milk yield per milked sheep was 76.6 kg (Anonymous 2017). A majority of the sheep in Turkey are comprised of native breeds and crosses. Pırlak sheep have been developed as a crossbred from Dağlıç and Kıvırcık sheep (Akçapınar 2000). Due to high adaptation ability to the region Pırlak sheep are preferred by breeders in Inner-West Anatolia.

Studies on Turkish native sheep breeds indicated that the milk yield and lactation length were 67.1 - 76.0 kg and 137.4 - 150.0 days for Dağlıç, 79.1 - 92.6 kg and 133.7 - 173.3 days for Kıvırcık, 43.7-120.9 kg and 124.3 - 155.8 days for Akkaraman, 150.6 - 195.0 kg and 135.3 - 171.0 days for İvesi (Sönmez et al 1975, Tekerli et al 2001, Yılmaz and Altınel 2003, Mundan and Özbeyaz 2004). Some other researches were also reported for udder and teat characteristics of Turkish native sheep breeds (Odabaşıoğlu 1983, Dağ 2000, Mundan and Özbeyaz 2004, Kırmızıbayrak et al 2005, Ünal et al 2008). However, no study regarding the milk yield, udder characteristics and the relevant associations in Pırlak sheep has been encountered. The milk fat, protein, lactose percentage and log somatic cell counts (log SCC) reported for different sheep breeds are between 4.68 - 9.9, 5.1 - 6.6, 4.0 - 5.5% and 2.61 - 6.32, respectively (Baro et al 1994, Gonzalo et al 1994, De La Fuente et al 1997, Fernandez et al 1997, Sevi et al 2000, Scharch et al 2000, Leitner et al 2003, Molik et al 2008, Kominakis et al 2009).

It has been reported that there were significant positive correlations among milk yield and some udder characteristics such as circumference, width, depth and volume (Odabaşıoğlu 1983, Izadifard and Zamiri 1997, Dzidic et al 2004, Mundan and Özbeyaz 2004, Emediato et al 2008, Ünal et al 2008, Iniguez et al 2009).

This study has been carried out to determine the lactation milk yield, milk contents, lactation length, somatic cell counts, udder characteristics and calculate the phenotypic correlations between the examined characteristics of Pırlak sheep.

Material and Methods

This research has been carried out on 70 Pırlak ewes of 4 and 5+ years old at Afyon Kocatepe University Livestock Research and Application Center, sheep breeding unit, Afyonkarahisar province in Turkey, situated at latitude 38°42'09''N, longitude 30°40'06''E, in 2009. This study was approved (04. 05. 2009, B.30.2.AKÜ.0.8Z.00.00/35, AKUHADYEK-24-09) by the Animal Research Ethics Committee of Afyon Kocatepe University in Afyonkarahisar, Turkey

In addition to pasture based grazing, the Pırlak sheep were fed 200-300 g of concentrated feed starting 14 days before breeding season which continued during the procces. The breeding season was between October and November. The lambing season was between March and May. The lambs were weaned when they were around 120 days old. At lambing sheep were kept in pens and fed with roughage and concentrate. Sheep continued to be milked after lambs were weaned. Sheep with a daily milk yield of less than 50 g were considered to have finished their lactation.

Daily milk yield (g) and percentages of milk fat, protein and lactose were determined at test day controls beweekly. Fleischmann method was used to calculate the lactation milk yield (Tangorra et al 2008). Premilking udder and teat characteristics and postmilking SCC were measured with monthly intervals. Values for the 60th and 90th days related with these traits were calculated with linear interpolation.

Fat, protein and lactose contents were determined using the precalibrated Funke Gerber-Lactostar milk analyser. De Laval Cell Counter was used to determine the SCC. A solution consisted of Phosphate Buffered Saline (PBS) + Ethidium bromide (0.025 mg / ml) + TritonX 100 (0.2%) were mixed with the milk samples at a rate of 1:1 and then somatic cell counts were measured (Gonzalo et al 2006). Test day values for SCC were converted to log 10 SCC before statistical analysis to obtain a near normal distribution (Ali and Shook 1980).

Measuring strip and caliper were used to determine the udder and teat measurements. Udder volume was calculated with formula 'Π x R2 x Udder depth' as reported by Emediato et al. (2008). where R is udder circumference / 2Π. Udder cistern depth has been detected with Medelkom SLE 301 MS 5-7.5 MHz, Real-Time B-mode linear probe ultrasonography.

For udder types the following were considered:

Type-I : Udder lobes are non-segmented and teats are horizontal.
Type-II: Udder lobes are slightly segmented and teats are horizontal.
Type-III: Udder lobes are segmented and teats are between horizontal-vertical.
Type IV: Udder lobes are segmented, teats are vertical (Mills 1982).
The traits were analyzed with a statistical model that including age, lambing type and udder type as fixed effects. Ages were grouped into two (4 and 5+), lambing type were classified to single and twin, udder type grouped into I, II, III and IV. Milk yield, milk contents, lactation length, log SCC, udder and teats traits were analyzed by the model. The Duncan test was used for multiple comparisons. Phenotypic correlation coefficients among milk yield, log SCC, udder and teat measurements were also calculated. Data analyses were performed by SPSS software (Anonymous 1993).

Table 1. Least square means and standard errors for milk yield, lactation length, milk content and log somatic cell count in Pırlak sheep

		Lactation milk yield	Lactation length	Daily milk yield (g)		Fat percentage (%)		Protein percentage (%)		Log somatic cell count	
Factors	n	(kg)	(days)	60 days	90 days	60 days	90 days	60 days	90 days	60 days	90 days
μ	70	76.98±4.12	120.79±2.52	680.28±40.01	431.94±27.37	4.97±0.16	7.88±0.27	4.44±0.03	4.93±0.08	4.66±0.11	5.66±0.13
Age		-	-	-	-	-	-	-	-	-	-
4	42	74.47±5.45	120.23±3.34	661.08±52.93	411.67±36.21	4.85±0.21	7.91±0.36	4.42±0.03	4.94±0.11	4.59±0.14	5.59±0.17
5 +	28	79.49±6.24	121.35±3.83	699.48±60.68	452.21±41.51	5.09±0.24	7.84±0.41	4.46±0.04	4.92±0.12	4.73±0.16	5.74±0.20
Lambing Type		-	-	-	-	-	-	-	-	-	-
Single	29	73.48±6.12	121.88±3.75	624.58±59.47	418.69±40.68	5.06±0.24	7.80±0.40	4.48±0.04	4.88±0.12	4.55±0.16	5.64±0.20
Twin	41	80.48±5.51	119.70±3.38	735.99±53.55	445.19±36.63	4.88±0.21	7.95±0.36	4.41±0.03	4.98±0.11	4.78±0.14	5.69±0.18
Udder Type		-	-	-	-	-	-	-	-	-	-
I	12	66.10±9.53	117.14±5.84	571.12±92.61	398.44±63.35	5.70±0.37	8.38±0.63	4.46±0.06	5.19±0.19	5.07±0.25	6.16±0.31
II	18	83.37±7.94	117.99±4.87	813.71±77.19	425.12±52.80	4.77±0.31	7.30±0.52	4.45±0.05	4.68±0.16	4.61±0.21	5.44±0.25
III	25	79.12±6.77	126.71±4.15	685.73±65.76	455.32±44.99	4.52±0.26	7.70±0.44	4.46±0.04	4.93±0.13	4.60±0.18	5.58±0.22
IV	15	79.34±8.61	121.32±5.28	650.57±83.62	448.88±57.20	4.88±0.33	8.12±0.57	4.40±0.05	4.91±0.17	4.37±0.23	5.48±0.28

-: Non significant (p>0.05)

Results and Discussion

In this study, the overall means for the lactation milk yield and lactation length of Pırlak sheep were 76.98±4.12 kg and 120.79 ± 2.52 days. The least squares means of milk yield characteristics of the sheep were presented in Table 1.

The effects of udder type, age and lambing type on lactation milk yield and lactation length were not statistically significant. Lactation milk yield calculated for Pırlak sheep were higher than the values of Dağlıç breed and close to the low limits reported for the Kıvırcık breed (Sönmez et al 1975, Tekerli et al 2001, Yılmaz and Altınel 2003). According to the findings of the study the milk yield of Pırlak sheep was commensurate with the level of milk yield of Turkish native sheep breeds. The lactation length (120.79 days) was shorter than the values reported for Dağlıç and Kıvırcık breeds (Sönmez et al 1975, Tekerli et al 2001, Yılmaz and Altınel 2003).

Daily milk yield tended to decrease as lactation progressed and was calculated as 680.28 g on day 60 and 431.94 g on day 90. Milk fat ratios increased as lactation progressed and were calculated as 7.88 % on the 90th day.This value was in the range reported for different sheep breeds (Gonzalo et al 1994, De La Fuente et al 1997, Sevi et al 2000, Scharch et al 2000, Leitner et al 2003, Molik et al 2008, Kominakis et al 2009). The milk protein ratio was found to be lower than the values reported in literature (Gonzalo et al 1994, De La Fuente et al 1997, Sevi et al 2000, Scharch et al 2000, Leitner et al 2003, Molik et al 2008, Kominakis et al 2009). The dry matter content determined for milk of Pırlak has been similar to the common values for sheep milk.

The log somatic cell counts in the milk on 60 and 90 days of lactation were 4.66 and 5.66. The log SCC detected at day 60 of lactation was similar or lower than the values reported for sheep (Baro et al 1994, Gonzalo et al 1994, De La Fuente et al 1997, Fernandez et al 1997, Sevi et al 2000, Scharch et al 2000, Leitner et al 2003, Kominakis et al 2009). The low log SCC showed that Pırlak sheep has potential to produce quality milk for the industry.

The least squares means of the udder and teat characteristics of Pırlak sheep were presented in Table 2.

The effects of lambing and udder type on some udder and teat traits have been found statistically significant (p<0.05). Udder and teat measurements are of great importance both in milk yield and machine milking. In this study, the values of udder depth determined for Pırlak sheep were lower than the values reported for Sakız and Bafra breeds (Mavrogenis et al 1988, Ünal et al 2008) and higher than the values reported for Kıvırcık and Kıvırcık x Akkaraman crossbreeds (Altınçekiç and Koyuncu 2001, Mundan and Özbeyaz 2004). This can be explained by the fact that Pırlak sheep are raised for mainly meat production and breeders give less consideration to milk production.

When the teat characteristics of Pırlak sheep are compared to other native breeds, teat length and teat diameter were less than the values for Sakız and Bafra breeds and higher than the values for Kıvırcık x Akkaraman crossbreeds and similar to the values of Morkaraman breed (Odabaşıoğlu 1983, Mavrogenis et al 1988, Mundan and Özbeyaz 2004). In addition, the teat length and diameter of the Pırlak sheep indicated that there will be no problem in machine milking. As a matter of fact, when the lambs were weaned, daily milkings were performed by using a por-

Table 2. Least square means and standard errors for udder and teat traits in Pırlak sheep

		Udder depth (cm)		Udder width (cm)		Udder circumference (cm)		Udder volume (cm^3)	
Factors	n	60 days	90 days	60 days	90 days	60 days	90 days	60 days	90 days
μ	70	15.25±0.26	14.76±0.29	13.20±0.24	11.21±0.25	40.94±0.77	34.79±0.66	2180.45±101.48	1429.58±77.04
Age		-	-	-	-	-	-	-	-
4	42	15.34±0.34	14.33±0.38	13.32±0.32	11.12±0.34	41.87±1.02	34.53±0.87	2298.11±134.25	1423.26±101.92
5+	28	15.16±0.39	15.19±0.44	13.08±0.36	11.30±0.38	40.01±1.17	35.04±1.00	2062.78±153.89	1435.90±116.83
Lambing Type		-	**	-	-	-	-	-	-
Single	29	14.79±0.38	13.81±0.43b	13.03±0.35	10.85±0.38	40.62±1.14	33.82±0.98	2015.13±150.84	1290.92±114.51
Twin	41	15.71±0.34	15.71±0.39a	13.36±0.32	11.57±0.34	41.27±1.03	35.76±0.88	2345.76±135.81	1568.25±103.10
Udder Type		-	-	-	-	-	-	-	-
I	12	15.59±0.59	15.21±0.67	11.99±0.55	10.32±0.59	36.93±1.78	33.14±1.53	1829.93±234.88	1237.21±178.31
II	18	15.18±0.50	15.01±0.56	13.71±0.46	11.48±0.49	42.47±1.49	35.91±1.27	2367.78±195.77	1596.86±148.62
III	25	15.25±0.42	15.00±0.48	13.49±0.39	11.78±0.42	42.19±1.27	35.89±1.08	2345.36±166.79	1522.28±126.62
IV	15	14.99±0.54	13.80±0.61	13.58±0.50	11.27±0.53	42.18±1.61	34.21±1.38	2178.71±212.08	1361.90±161.00
		Right teat length (cm)		Left teat length (cm)		Right teat diameter (cm)		Left teat diameter (cm)	
μ	70	2.77±0.07	2.66±0.07	2.60±0.08	2.53±0.07	1.58±0.04	1.44±0.03	1.48±0.04	1.41±0.04
Age		-	-	-	-	-	-	-	-
4	42	2.73±0.10	2.54±0.09	2.62±0.10	2.49±0.09	1.61±0.06	1.44±0.04	1.52±0.05	1.39±0.05
5+	28	2.82±0.11	2.78±0.10	2.59±0.11	2.57±0.10	1.55±0.07	1.45±0.05	1.44±0.06	1.43±0.05
Lambing Type		-	*	-	*	-	*	-	*
Single	29	2.69±0.11	2.52±0.10^b	2.52±0.11	2.37±0.10^b	1.51±0.07	1.36±0.05^b	1.47±0.06	1.34±0.05^b
Twin	41	2.86±0.10	2.79±0.09^a	2.69±0.10	2.70±0.09^a	1.65±0.06	1.52±0.04^a	1.50±0.05	1.49±0.05^a
Udder Type		-	-	-	-	-	-	-	-
I	12	2.55±0.17	2.51±0.16	2.52±0.17	2.56±0.16	1.46±0.10	1.45±0.08	1.37±0.09	1.40±0.08
II	18	2.68±0.14	2.54±0.13	2.59±0.15	2.44±0.13	1.58±0.09	1.39±0.06	1.51±0.08	1.41±0.07
III	25	2.79±0.12	2.72±0.11	2.49±0.12	2.55±0.11	1.54±0.07	1.43±0.05	1.45±0.07	1.42±0.06
IV	15	3.07±0.15	2.85±0.14	2.81±0.16	2.58±0.14	1.74±0.09	1.50±0.07	1.60±0.09	1.43±0.08
		Distance between teats (cm)		Distance between teat and ground(cm)		Right cistern depth (cm)		Left cistern depth (cm)	
μ	70	16.05±0.30	14.47±0.25	28.93±0.43	32.19±0.53	5.08±0.13	4.77±0.16	5.00±0.15	4.76±0.16
Age		-	-	-	-	-	-	-	-
4	42	16.37±0.39	14.33±0.33	28.74±0.57	31.95±0.71	4.90±0.18	4.51±0.21	4.88±0.19	4.62±0.21
5+	28	15.73±0.45	14.61±0.37	29.12±0.65	32.43±0.81	5.26±0.20	5.03±0.24	5.12±0.22	4.89±0.24
Lambing Type		-	*	-	*	-	-	-	-
Single	29	15.84±0.44	13.88±0.37b	28.18±0.64	31.13±0.79^b	4.97±0.20	4.56±0.23	5.00±0.22	4.54±0.24
Twin	41	16.26±0.40	15.06±0.33a	29.69±0.57	33.25±0.71^a	5.19±0.18	4.98±0.21	5.01±0.19	4.98±0.21
Udder Type		*	-	-	-	-	-	-	-
I	12	15.21±0.69^b	14.23±0.57	30.47±0.99	33.97±1.23	4.87±0.31	4.61±0.37	4.57±0.34	4.40±0.37
II	18	17.21±0.57^a	15.27±0.48	28.99±0.83	31.96±1.03	5.21±0.26	4.76±0.30	5.06±0.28	5.05±0.31
III	25	16.68±0.49^a	14.82±0.41	29.08±0.70	32.03±0.88	5.10±0.22	4.98±0.26	5.27±0.24	5.10±0.26
IV	15	15.10±0.62^b	13.56±0.51	27.19±0.89	30.81±1.11	5.15±0.28	4.73±0.33	5.11±0.30	4.48±0.33

-: Non significant (p>0.05), *: p<0.05, **: p<0.01
a, b, c: Means superscripted by different letters differ significantly (p<0.05) among themselves

table machine to avoid early drying of sheep and no problem was encountered in terms of teat length and diameter during this stage of the study. Udder cistern depth in the right and left udder lobes were detected higher values than those reported in the study by Milerski et al (2006). The findings showed that milk yield and udder characteristics have potential to improve.

The values of udder and teat characteristics except the distance between udder-ground decreased with the progress of lactation whereas an increase in the distance between the teat and the ground has been determined.

Phenotypic correlation coefficients calculated among milk yield,

Table 3. Coefficients of phenotypic correlation among milk yield, milk contents, udder traits and log somatic cell count in Pırlak sheep

	Lactation milk yield		Daily milk yield		Fat percentage		Protein percentage		Log somatic cell count	
	60 days	90 days	60 days	90 days	60 days	90 days	60 days	90 days	60 days	90 days
Daily milk yield	0.92**	0.80**								
Fat percentage	-0.20	-0.39**	-0.24*	-0.46**						
Protein percentage	-0.28*	-0.42**	-0.22	-0.41**	0.53**	0.76**				
Lof Somatic cell count	-0.43**	-0.41**	-0.44**	-0.34**	0.35**	0.69**	0.05	0.67**		
Udder depth	0.44**	0.31**	0.42**	0.27*	-0.18	-0.07	-0.34**	-0.15	-0.03	0.02
Udder width	0.63**	0.61**	-0.40**	0.59**	-0.40**	-0.54**	-0.23	-0.33**	-0.50**	-0.39**
Udder circumference	0.68**	0.55**	0.70**	0.60**	-0.45**	-0.58**	-0.31**	-0.38**	-0.53**	-0.39**
Udder volume	0.69**	0.67**	0.72**	0.62**	-0.43**	-0.53**	-0.31**	-0.43**	-0.37**	-0.35**
Right teat length	0.24*	0.09	0.24*	0.13	0.05	0.09	0.04	0.18	0.02	0.14
Left teat length	0.20	0.07	0.24*	0.08	0.15	0.19	0.11	0.30*	0.11	0.20
Right teat diameter	0.38**	0.25*	0.43**	0.24*	-0.14	-0.16	-0.10	-0.11	-0.06	0.03
Left teat diameter	0.31**	0.28*	0.36**	0.25*	-0.09	-0.04	-0.15	-0.01	0.05	0.01
Distance between teats	0.56**	0.52**	0.56**	0.58**	-0.34**	-0.36**	-0.19	-0.27*	-0.37**	-0.24*
Distance between teat and floor	-0.26*	-0.42**	-0.25*	-0.48**	0.02	0.34**	-0.18	0.38**	0.28*	0.33**
Right cistern depth	0.49**	0.61**	0.44**	0.64**	-0.12	-0.40**	-0.37**	-0.36**	0.07	-0.29*
Left cistern depth	0.43**	0.50**	0.35**	0.49**	-0.15	-0.36**	-0.37**	-0.41**	0.17	-0.36**

*: p<0.05, **: p<0.01

udder characteristics and log SCC were presented in Table 3.

There was a negative correlation between the udder-ground distance and milk yield. Correlations between log SCC and udder characteristics were generally found to be negative and statistically significant (p<0.05, p<0.01). The correlations between lactation milk yield, daily milk yield and ultrasonographical measured udder cistern depth on days 60 and 90 of lactation were positive and statistically significant (p<0.05, p<0.01).

Significant positive phenotypic correlation coefficients have been calculated among lactation milk yield, daily milk yield and udder characteristics of Pırlak sheep. Research findings similar to the findings of this study have also been reported (Odabaşıoğlu 1983, Fernandez et al 1997, Izadifard and Zamiri 1997, Dağ 2000, Dzidic et al 2004, Mundan and Özbeyaz 2004, Kırmızıbayrak et al 2005, Ünal et al 2008, Iniguez et al 2009). It is necessary to evaluate udder characteristics in addition to milk yield when making a selection. Negative phenotypic correlations have been determined between milk yield and fat, protein and lactose ratios. The fat, protein and lactose ratios in milk decreases as the milk yield increases.

Between milk yield and log SCC significant negative phenotypic correlations have been determined. As a matter of fact, Baro et al (1994) reported that there was a negative correlation between daily milk yield and SCC in a study conducted on Churra sheep. Flocks with a high milk yield should be checked more thoroughly for udder ailments.

Negative significant correlations between lactation milk yield and daily milk yield and udder-ground distance have been determined. There were also research findings that similar these results (Mavrogenis et al 1988, Ünal et al 2008). This can be explained by the fact that as the milk yield decreases, the udder is elevated and the udder-ground distance increases.

Positive high correlations between the right and left udder cistern depth and lactation milk yield and daily milk yield have been determined. It is likely that milk yield is high in sheep with excessive cistern depth measured by ultrasonography. Therefore, in order to obtain higher milk yield in the flock, sheep with deep cistern depth can be selected and introduced into the flock.

Conclusion

Milk yield in Pırlak sheep is at the level of other Native sheep breeds. The low Somatic cell count was favourable for qualified milk production. The positive correlation between ultrasonographic cistern depth and lactation and daily milk yield has shown that this property can be used to increase production in a selection program.

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References

Akçapınar H, 2000. Koyun yetiştiriciliği İsmat Matbaacılık, ISBN 975-96978-1-5, Ankara.

Ali AKA, Shook GE, 1980. An optimum transformation for somatic cell concentration in milk. Journal of Dairy Science, 63, 487-490.

Altınçekiç ŞS, Koyuncu M, 2001. Relationship between udder measurements and the linear scores for udder morphology traits in Kıvırcık, Tahirova and Karacabey Merino Ewes. Kafkas Üniv. Vet. Fak. Derg. 17 (1), 71-76.

Anonymous, 1993. SPSS Statistical Package in Social Sciences for Windows. Chicago, USA.

Anonymous, 2017. TUİK website. http://www.tuik.gov.tr/PreTablo.do?alt_id=1002 accessed date: 16.08.2017

Baro JA, Carriedo JA, San Primitivo F, 1994. Genetic parameters of test day measures for somatic cell count, milk yield and protein percentage of milking ewes. Journal of Dairy Science, 77, 2658-2662.

Dağ B, 2000. Akkaraman koyunlarında meme ölçüleri ile süt verimi arasındaki ilişkiler. Hayvancılık Araştırma Dergisi, 10 (1-2), 39-42.

De La Fuente LF, San Primitivo F, Fuertes JA, Gonzalo C, 1997. Daily and between-milking variations and repeatabilities in milk yield, somatic cell count, fat, and protein of dairy ewes. Small Ruminant Research. 24, 133-139.

Dzidic A, Kapsb M, Bruckmaier RM, 2004. Machine milking of Istrian dairy crossbreed ewes: udder morphology and milking characteristics. Small Ruminant Research. 55,183-189.

Emediato RMS, Squeira ER, Stradiotto MM, Maesta SA, Fernandes S, 2008. Relationship between udder measurements and milk yield in Bergamasca ewes in Brazil. Small ruminant Research, 75, 232-235.

Fernandez G, Baro JA, De La Fuente F, San Primitivo F, 1997. Genetic parameters for linear udder traits of dairy ewes. Journal of Dairy Science, 80, 601-605.

Gonzalo C, Carriedo JA, Jesus AB, San Primitivo F, 1994. Factors influencing variation of test day milk yield, somatic cell count, fat and protein in dairy sheep. Journal of Dairy Science, 77, 1537-1542.

Gonzalo C, Linage B, Carriedo JA, De la Fuente F, San Primitivo F, 2006. Evaluation of the overall accuracy of the Delaval cell counter for somatic cell counts in ovine milk. Journal of Dairy Science, 89, 4613-4619.

Iniguez L, Hilali M, Thomas DL, Jesry G, 2009. Udder measurements and milk production in two Awassi sheep genotypes and their crosses Journal of Dairy Science, 92, 4613-4620.

Izadifard J, Zamiri MJ, 1997. Lactation performance of two Iranian fat-tailed sheep breeds. Small Ruminant Research, 24, 69-76.

Kırmızıbayrak T, Aksoy AR, Saatçi M, Tilki M, 2005. Tuj ve Akkaraman koyunların süt verimi ve meme özellikleri ile bu özellikler arasındaki ilişkiler. Kafkas Üniv. Vet. Fak. Derg., 11 (1), 11-15.

Kominakis AP, Papavasiliou D, Rogdakis E, 2009.Relationships among udder characteristics, milk yield and, non-yield traits in Frizarta dairy sheep. Small Ruminant Research, 84, 82-88.

Leitner G, Chaffer M, Caraso Y, Ezra E, Kababea D, Winkler M, Glickman A, Saran A, 2003. Udder infection and milk somatic cell count, NAGase activity and milk composition-fat, protein and lactose-in Israeli-Assaf and Awassi sheep. Small Ruminant Research, 49, 157-164.

Mavrogenis AP, Papachristoforou C, Lysandrides P, Roushıas A, 1988. Environmental and genetic factors affecting udder characters and milk production in Chios sheep. Genetic Selection Evalution, 20(4), 477-488.

Milerski M, Margetin M, Čapistrak A, Apolen D, Španik J, Oravcova M, 2006. Relationships between external and internal udder measurements and the linear scores for udder morphology traits in dairy sheep. Czech Journal of Animal Science, 51(9), 383–390.

Mills O, 1982. Practical Sheep Dairying, Thorsons Publishers Limited, Wellingborough.

Molik E, Murawski M, Bonczar G, Wierzchoś E, 2008. Effect of genotype on yield and chemical composition of sheep milk. Animal Science Papers and Reports, 26 (3), 211-218.

Mundan D, Özbeyaz C, 2004. Akkaraman, Kıvırcık x Akkaraman G_1 ve Sakız x Akkaraman G_1 koyunlarda süt verim özellikleri ile kuzularda büyüme ve yaşama gücü. Lalahan hayvancılık Araştırma Enstitüsü Dergisi, 44(2), 23-35.

Odabaşıoğlu F, 1983. Morkaraman, Akkaraman ve İvesi koyunlarının süt verim özelliklerinin karşılaştırılması. DoktoraTezi, Fırat Üniversitesi Sağlık Bilimleri Enstitüsü, Elazığ.

Sevi A, Taibi L, Albenzio M, Muscio A, Annicchiarico G, 2000. Effect of parity on milk yield, composition, somatic cell count, renneting parameters and bacteria counts of Comisana ewes. Small Ruminant Research, 37 (1-2), 99-107.

Scharch C, Süb R, Fahr RD, 2000. Factor effecting milk traits and udder health in East Friesian milk sheep. Proceedıngs of The 6th Great Lakes Dairy Sheep Symposium November 2-4, Guelph, Ontarıo, Canada.

Sönmez R, Alpbaz AG, Sarıcan C, Kızılay E, 1975. Kıvırcık koyunlarının süt yönünde ve yapağı-et yönünde saf yetiştirme ve melezleme yolu ile ıslahı. TUBİTAK projesi, Kesin Raporu.

Tangorra FM, Zaninelli M, Bruni G, Zanatta G, Mercandino L, 2008. Comparison among actual and estimated milk yields in dairy goats. Innovation Technology to Empower Safety, Health and Welfare in Agriculture and Agro-food Systems, International Conference: September 15-17, Ragusa – Italy.

Tekerli M, Akcan A, Akıncı Z, Gündoğan M, 2001. Akkaraman, Dağlıç, Sakız ve İvesi koyunlarının Afyon koşullarındaki verim özelliklerinin belirlenmesi. AKÜ Yayın No: 34, ISBN:975-7150-46-0.

Ünal N, Akçapınar H, Atasoy F, Yakan A, Uğurlu M, 2008. Bafra

koyunlarında bazı meme özellikleri ve kuzularda büyüme ile bu özelliklerin farklı süt control yöntemleriyle tespit edilen süt verimi ve sağım özellikleriyle fenotipik korelasyonları. Ankara Üniv. Vet. Fak. Derg., 55, 117 – 124.

Yılmaz A, Altınel A, 2003. Alman Siyah Başlı Etçi x F1 Melezleri ile Kıvırcık ve Türk Merinoslarında bazı çevre faktörlerinin süt verimi ve büyüme özellikleri üzerine etkileri. İstanbul Üniv. Vet. Fak. Derg., 29 (2), 259-266