Fertility and Milk Production Characteristics of Saanen Goats Raised in Muş Region [1]

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[1] *This study was summarized from PhD thesis of first author*

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Summary

The aim of this study was to determine the fertility and milk yield characteristics of Saanen goats raised in Muş province, Eastern Anatolia region. This experiment was carried out in Düzova village of Korkut country, Muş. 129 female and 8 male Saanen goats, for first year and 122 female and 7 male Saanen goats for second year (2007-2008) were utilized for mating seasons. Goats were fertilized as free mating in the years 2007-2008 (August-September). Percentages of pregnancy, abortion, birth, single birth and twinning were 90.04, 9.73, 81.27, 42.16 and 57.84%, respectively, kid yields per birth and yields of kids were 1.59 and 129%, respectively. Lactation period, daily milk yield and milk yield per lactation were 273.12 d, 1.37 kg and 383.05 kg. The effects of factors such as year, age and birth types on fertility and lactation of goats were evaluated. In concllusion, the reproduction and milk production data obtained in the current study from Saanen goats raised in Muş province have revealed that Saanen goats can be used for goat milk and kid production in the region.

Keywords: *Goat, Saanen, Fertility, Milk yield*

Muş Bölgesinde Yetiştirilen Saanen Keçilerinin Döl Verimi ve Süt Verimi Özellikleri

Özet

Bu araştırma, Doğu Anadolu Bölgesi Muş ilinde yetiştirilen Saanen keçilerinin döl verimi ve süt verimi özelliklerini belirlemek amacıyla yapılmıştır. Bu çalışma, Muş ili Korkut ilçesi Düzova Köyünde özel bir işletmede yürütülmüştür. 2007 ve 2008 sıfat sezonlarında sırasıyla 129 ve 122 baş Saanen keçisi, 8 ve 7 baş Saanen tekesi kullanılmıştır. Keçiler 2007 ve 2008 yılı sıfat sezonlarında (Ağustos-Ekim) serbest sıfat yöntemiyle tohumlanmıştır. Saanen keçilerinde gebelik, abort, doğum, tek doğum ve ikiz doğum oranları genel olarak sırasıyla %90.04, 9.73, 81.27, 42.16 ve 57.84; bir doğumda ortalama doğan oğlak sayısı 1.59 ve oğlak verimi ise %129 olarak saptanmıştır. Laktasyon süresi, günlük süt verimi ve laktasyon süt verimi genel olarak sırasıyla 273.12 gün, 1.37 kg ve 383.05 kg olarak saptanmıştır. Keçilerin döl verimi ve laktasyon süt verimi üzerine yıl, yaş ve doğum tipi gibi faktörlerin etkisi incelenmiştir. Sonuç olarak, Muş ilinde yetiştirilen Saanen keçileri üzerinde yürütülen bu araştırmada elde edilen dölverimi ve süt verimi özelliklerine ait bulgular ışığında, Saanen keçi ırkının bölgede keçi sütü ve oğlak üretiminde kullanılabileceği sonucuna varılmıştır.

Anahtar sözcükler: *Keçi, Saanen, Döl verimi, Süt verimi*

INTRODUCTION

The world's goat population was around 867 million in 2009, with over 60% of that found in Asia and more than 95% in developing countries. Since 1990, there has been a significant increase (47%) in goat numbers all over the world. The goat population has been described as comprising three main types; namely, fiber goats (e.g. Angora, Cashmere), dairy goats (e.g. Saanen, Toggenburg, Nubian), and meat goats (e.g. Boer, Spanish). Annual mean milk production per goat is 84.3 kg in worldwide. When countries are ranked based on annual milk production per goat, Germany comes first with a 972.2 kg, Belarus is second with 819.1 kg and Czech Republic comes third with 750.0 kg. However, Turkey is ranked 43th with 104.9 kg [1].

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Goat farming is highly common in Turkey due to geographical and economical conditions of Turkey, agricultural background and traditions of Turkish people. Turkish goat population comprises of hair, Angora and dairy goats. Based on 2009 statistics, Turkish goat population is ranked 27th in World with 5.128.285 and has great potential as number of goats. Majority of Turkish goat population consists of hair goat, followed by Angora, dairy and their cross-breeds. Contribution of goat into meat and milk production as percentage in animal production sector is considerable. Goat milk comprises of 1.53%, of total milk production and goat meat comprises of 2.83% of total meat production in Turkey in 2009. Moreover goat provided 2002 tons of goat hair and 174 tons of mohair [1-3].

There are some criteria used in the evaluation of fertility. These are: pregnancy rate, infertility rate, mortality rate, birth rate, abortion rate, single kidding rate, twinning rate, mean kid number per birth and kid yield. These criteria are under the effects of dam's age, genotype, live weight and environmental climate conditions such as season, feeding and hormones. However, numbers of weaned kids are used as main criteria for fertility in practice [4-7].

Following factors can be counted as factors affecting milk production in goats. These factors are; pure breeding, crossing, age, birth season, birth type, duration of lactation and dry period, milking type, frequency and duration of milking, mating season, first pregnancy age, survival rate of kids, nutrition and diseases.

Saanen goat which is the most commonly used breed in goat breeding studies possesses 800-1.000 kg milk yield with 3-4% fat content, 250-300 d of lactation period 1.80-1.90 kidding rate and 55-60 kg live weight [8].

Lactation period and milk yield of Saanen goat raised at Aegean Sea region ranged 213 d and 286.8 kg; 247d and 691.4 kg in first and second lactation periods, respectively. Averages of these values after 8 years of control studies were 213.4 d and 423.09 kg, respectively [9].

The aim of this study was to determine the fertility and milk yield characteristics of Saanen goats raised in Muş province, Eastern Anatolia region.

MATERIAL and METHODS

The experiment was conducted at Düzova village of Korkut county of Muş province with a Project prepared by village administration (Project reference number: DG-ELARG/MEDTQ/04-01/ARD-176). Animal materials of the experiment consisted of Saanen male and female goats obtained from Sarıdüz and Türkmenli villages of Bayramiç county of Çanakkale province and Animal husbandry and Agricultural research center of Çanakkale Onsekiz Mart University in July 2007. 129 female and 8 male Saanen goats for first year and 122 female and 7 male Saanen goats for second year (2007-2008) were utilized for mating seasons. Goats were fertilized as free mating in year 2007-2008 (August-September).

Goats were grazed on pasture which belong to the village during April-June months (first 90 days of lactation), and also fed 500 g of concentrate feed per day per animal. Thus, animals were taken to highland pasture due to significant reduction of pasture quality in July. Goats were grazed on highland pasture from July to October. Goats were brought back to barn at November and kept in a barn from October to March. Goats were fed 200 g/animal/d oncentrate and ground alfalfa hay *ad libitum*.

Data regarding fertility were calculated according to Akçapınar and Özbeyaz [5].

Pregnancy rate; number of pregnant goat/number of goat for mating *100

İnfertility rate; number of none-pregnant goat/number of goat for mating * 100

Birth rate; number of goat having birth/number of goat for mating * 100

Abortion rate; number of goat with abortion/number of pregnant goat * 100

Single kidding rate; number of goat with single kid/number of goat having birth * 100

Twinning rate; number of goat with twin kids/number of goat having birth * 100

Mean kid number per birth; number of kid born/number of goat having birth * 100

Kid yield; number of kid born/number of goat for mating * 100

Milk were sampled every month starting 10 day after parturition and continued until daily milk production was less than 50 ml. Before milk sampling kids were separated from their mothers for 24 h. Milk were sampled twice a day at morning and evening. Milk samples were achived with hand milking. Amount of milk were measured with a measure sensitive to 10 ml and multiplied with 1.035 to convert to kilogram.

Daily milk production at 30, 60, 90, 120, 150, 180, 210, 240, 270, 300 and 330th day were determined using interpolation method. Milk production at different period of lactation milk yield was calculated with Trapez II (Fleischmann) method using daily milk production data. Moreover, lactation period were also determined after culling off goats giving less than 50 ml daily milk [10].

Xi square method was used to compare infertility, pregnancy, abortion, birth, single and twinning rates. Comparison tests were used for comparison of mean number of kid born per birth and kids yield. Kruskall Wallis test was used for comparison of more than two groups [11].

A model of $Y_{ijkl} = \mu + a_i + b_j + c_k + e_{ijkl}$ was used to determine daily milk production and lactation periods where Y = lactation period daily milk yield and lactation milk yield of a goat at any given time, μ = population mean of given trait, a_i = the effect of year, b_j = the effect of age, c_k = effect of birth type, e_{ijkl} = error terms. It was assumed that there was no interaction among factors used in the model and thus, the sum of addition effect of a factor on its sub-group was zero.

Data regarding the milk production features of goats were analyzed using GLM procedures of SAS. Means were separated with Duncan's multiple comparison tests [12].

RESULTS

Fertility features of Saanen goat are presented in *Table 1*. In general, pregnancy rate, infertility rate, birth rate, abortion rate, single kidding rate, twinning rate, mean kid number per birth and kid yield were 90.04%, 9.96%, 81.27%, 9.73%, 42.16%, 57.48%, 1.59 and 129%, respectively.

Least square means, significance and the results of multiple comparison test for lactation period, daily milk production and lactation milk yield of Saanen goats are shown in *Table 2*. In general, mean lactation period, daily

milk production and lactation milk yield were 273.12d, 1.37 kg and 383.05 kg. While the effect of year was not significant (P>0.05), the effects of age (P<0.001) and birth type (P<0.01) was significant on lactation period, daily milk production and lactation milk yield. As age and the number of kid per birth increased, lactation period and lactation milk yield also increased. The higher daily milk production was observed at 5 year old goats.

Least square means, significance and the results of multiple comparison tests for daily milk production of different times of lactation are seen in *Table 3*. Mean daily milk production at 30, 60, 90, 120, 150, 180, 210, 240, 270, 300 and 330th days of lactation were generally 2.15, 2.44, 2.19, 1.70, 1.25, 0.89, 0.62, 0.45, 0.30, 0.26 and 0.19 kg, respectively.

DISCUSSION

The pregnancy rate of Saanen goats was 90.04% in the current study. When this rate is compared to some studies carried out in Turkey, it was higher than value reported by Çam et al. (75.00%) [13] but lower than the values reported by Tozlu (94.12%) [14], Koylu (96.3%) [15] and Gül et al. (100.0%) [16], which were carried out with Saanen cross-breeds. These differences in the literature regarding pregnancy rate of

Table 1. *Fertility parameters of Saanen goats*
Tablo 1. *Saanen keçilerinin döl verimi parametreleri*

Factors		Number of Goat for Mating	Pregnancy Rate	İnfertility Rate	Birth Rate	Abortion Rate	Single Kidding Rate	Twinning Rate	Mean Kid Number Per Birth	Kid Yield (%)
General	n	251	226	25	204	22	86	118		
	%	100.00	90.04	9.96	81.27	9.73	42.16	57.84	1.59	129
Year			–	–	–	*	**	**	**	***
2008	n	129	116	13	100	16	54	46		
	%	51.39	89.92	10.08	77.52	13.79	54.00	46.00	1.46	113
2009	n	122	110	12	104	6	32	72		
	%	48.61	90.16	9.84	85.25	5.45	30.77	69.23	1.72	147
X²			0.004	0.004	2.460	4.468	11.283	11.283		
Age			*	*	***	**	***	***	***	***
1	n	41	31	10	22	9	17	5		
	%	16.33	75.61[a]	24.39[a]	53.66[b]	29.03[b]	77.27[a]	22.73[c]	1.22[e]	66[e]
2	n	75	69	6	63	6	40	23		
	%	29.88	92.00[b]	8.00[b]	84.00[a]	8.70[a]	63.49[a]	36.51[c]	1.37[d]	115[d]
3	n	74	70	4	66	4	21	45		
	%	29.48	94.59[bc]	4.05[bc]	89.19[a]	5.71[a]	31.82[b]	68.18[b]	1.68[c]	150[c]
4	n	44	40	4	37	3	7	30		
	%	17.53	90.91[ab]	11.36[ab]	84.09[a]	7.50[a]	18.92[bc]	81.08[ab]	1.86[b]	157[b]
5	n	17	16	1	16	0	1	15		
	%	6.77	94.12[ab]	5.88[ab]	94.12[a]	0.00[a]	6.25[c]	93.75[a]	2.00[a]	188[a]
X²			11.905	11.905	26.030	16.463	42.432	42.432		

*–: P>0.05, *: P<0.05, **: P<0.01, ***: P<0.001, [a,b,c,d,e]: Subscripts with different letters within columns significantly (P<0.05) differ*

Table 2. *Least square means, significance and the results of multiple comparison test for lactation period, daily milk production and lactation milk yield*

Tablo 2. *Laktasyon süresi, günlük süt verimi ve laktasyon süt verimine ait en küçük kareler ortalamaları, önemlilik ve çoklu karşılaştırma testi sonuçları*

Factors	n	Lactation Period (Day)			
		X±Sx	%S²	Min.	Max.
General	204	273.12±2.697	14.07	172.00	344.00
Year		–			
2008	100	277.33±3.884	14.36	172.00	335.00
2009	104	268.91±3.410	13.76	197.00	344.00
Age		***			
1	22	238.53±7.004[c]	12.84	184.00	298.00
2	63	257.83±4.229[b]	12.40	172.00	321.00
3	66	269.83±4.072[b]	12.24	197.00	330.00
4	37	294.77±5.553[a]	11.70	210.00	344.00
5	16	304.65±8.647[a]	9.93	225.00	343.00
Birth Type		*			
Single	86	266.91±4.059	12.53	184.00	335.00
Twin	118	279.33±3.363	13.56	172.00	344.00
Factors	**n**	**Daily milk production (kg)**			
		X±Sx	%S²	Min.	Max.
General	204	1.37±0.021	28.77	0.49	2.16
Year		–			
2008	100	1.38±0.030	29.61	0.49	2.13
2009	104	1.35±0.026	26.60	0.67	2.16
Age		***			
1	22	0.84±0.054[e]	19.96	0.49	1.10
2	63	1.15±0.032[d]	23.50	0.65	2.13
3	66	1.39±0.031[c]	19.47	0.85	2.16
4	37	1.63±0.042[a]	15.24	1.04	2.15
5	16	1.82±0.066[a]	8.97	1.58	2.14
Birth Type		***			
Single	86	1.30±0.031	29.15	0.49	1.98
Twin	118	1.42±0.026	23.31	0.65	2.16
Factors	**n**	**Lactation milk yield (kg)**			
		X±Sx	%S²	Min.	Max.
General	204	383.05±6.746	36.61	98.04	703.10
Year		–			
2008	100	391.35±9.712	35.91	98.04	673.24
2009	104	374.75±8.528	35.28	150.30	703.10
Age		***			
1	22	203.28±17.516[e]	25.25	98.04	307.11
2	63	297.67±10.575[d]	25.57	118.64	483.91
3	66	376.67±10.184[c]	23.48	167.75	581.96
4	37	483.27±13.886[b]	20.58	290.99	693.92
5	16	554.36±21.626[a]	13.61	360.36	703.10
Birth Type		***			
Single	86	355.40±10.150	32.70	98.04	533.28
Twin	118	410.70±8.411	30.60	118.64	703.10

*– : P>0.05, * : P<0.05, *** : P<0.001, [a, b, c, d, e] : Subscripts with different letters within columns significantly (P<0.05) differ; %S²: Percent of variance*

Table 3. *Least square means, significance, the results of multiple comparisons for daily milk production at different times of lactation (kg)*
Tablo 3. *Laktasyonun çeşitli dönemlerindeki günlük süt verimlerine ait en küçük kareler ortalamaları, önemlilik ve çoklu karşılaştırma testi sonuçları (kg)*

Factors	30 d		60 d		90 d		120 d	
	n	X±Sx	n	X±Sx	n	X±Sx	n	X±Sx
General	204	2.15±0.036	204	2.44±0.037	204	2.19±0.036	204	1.70±0.035
Year		–		*		*		–
2008	104	2.20±0.051	100	2.53±0.053	100	2.25±0.052	100	1.73±0.050
2009	100	2.10±0.044	104	2.35±0.047	104	2.14±0.046	104	1.68±0.044
Age		***		***		***		***
1	22	1.27±0.091[e]	22	1.49±0.096[e]	22	1.27±0.095[e]	22	0.92±0.090[e]
2	63	1.80±0.055[d]	63	2.08±0.058[d]	63	1.80±0.057[d]	63	1.32±0.054[d]
3	66	2.17±0.053[c]	66	2.46±0.056[c]	66	2.19±0.055[c]	66	1.71±0.052[c]
4	37	2.57±0.072[b]	37	2.88±0.076[b]	37	2.67±0.075[b]	37	2.12±0.072[b]
5	16	2.95±0.113[a]	16	3.30±0.119[a]	16	3.04±0.117[a]	16	2.45±0.111[a]
Birth type		***		***		***		**
Single	86	2.01±0.053	86	2.29±0.056	86	2.05±0.055	86	1.60±0.052
Twin	118	2.29±0.044	118	2.59±0.046	118	2.34±0.045	118	1.81±0.043

Factors	150 d		180 d		210 d		240 d	
	n	X±Sx	n	X±Sx	n	X±Sx	n	X±Sx
General	204	1.25±0.028	203	0.89±0.023	192	0.62±0.020	158	0.45±0.021
Year		–		–		–		–
2008	100	1.28±0.040	99	0.90±0.034	93	0.62±0.029	78	0.43±0.027
2009	104	1.23±0.035	104	0.88±0.030	99	0.63±0.026	80	0.48±0.027
Age		***		***		***		***
1	22	0.63±0.072[e]	22	0.39±0.061[d]	18	0.27±0.057[e]	8	0.23±0.070[d]
2	63	0.93±0.043[d]	62	0.65±0.037[c]	59	0.45±0.032[d]	45	0.31±0.031[d]
3	66	1.23±0.042[c]	66	0.88±0.035[b]	62	0.62±0.031[c]	56	0.40±0.027[c]
4	37	1.66±0.057[b]	37	1.21±0.048[a]	37	0.82±0.041[b]	34	0.61±0.036[b]
5	16	1.83±0.088[a]	16	1.32±0.075[a]	16	0.97±0.064[a]	15	0.71±0.056[a]
Birth type		**		**		***		**
Single	86	1.18±0.041	86	0.82±0.035	81	0.55±0.031	58	0.40±0.031
Twin	118	1.33±0.034	117	0.96±0.029	111	0.70±0.026	100	0.50±0.024

Factors	270 d		300 d		330 d			
	n	X±Sx	n	X±Sx	n	X±Sx		
General	109	0.30±0.025	54	0.26±0.021	12	0.19±0.028		
Year		–		–		**		
2008	50	0.28±0.030	23	0.24±0.026	4	0.11±0.034		
2009	59	0.32±0.031	31	0.28±0.027	8	0.26±0.031		
Age		***		***		–		
1	4	0.11±0.089[d]		---		---		
2	26	0.23±0.035[cd]	7	0.16±0.041[b]		---		
3	33	0.31±0.031[bc]	18	0.22±0.028[b]	1	0.11±0.050		
4	31	0.41±0.034[ab]	19	0.22±0.029[a]	8	0.22±0.024		
5	15	0.44±0.052[a]	10	0.33±0.041[a]	3	0.23±0.035		
Birth type		*		–		–		
Single	31	0.25±0.038	8	0.24±0.038	1	0.20±0.049		
Twin	78	0.35±0.025	46	0.28±0.017	11	0.17±0.021		

*–: P>0.05, *: P<0.05, **: P<0.01, ***: P<0.001, [a, b, c, d,e]: Subscripts with different letters within columns significantly (P<0.05) differ*

Saanen goat may have resulted from the differences in environment, care, nutrition where animals were raised and also genotype of animals.

Infertility rate was 9.96% in Saanen goat in this study. This rate was higher than the value by Ulutaş et al. (4.76%) [17] and lower than those of Ceyhan and Karadağ (18.3%) [18] and Karadağ (12.79%) [19]. When this fertility rate was compared to the values obtained with Saanen cross-breed, it was higher than those of Tozlu (5.88%) [14], Koylu (3.6%) [15] and Şengonca et al. (4.47%) [20], but lower than the value reported by Karadağ (15.38 and 20.00% for Saanen × Hair goat F_1 and G_1 cross-breed) [19].

In the study, among factors affecting infertility, the effect of year was not significant but the effect of age was significant (P<0.05). Contrary to the result of the current study, Şengonca et al.[20] reported a significant year effect on infertility rate. Similar to the results of the current study, Taşkın et al.[21] reported non-significant year effect and Şengonca et al.[20] and Taşkın et al.[21] noted a significant age effect on fertility rate.

The birth rate of Saanen goat in this study was 81.27%. When the birth rate observed in this study was compared to some value in the literature it was similar to those of Ceyhan and Karadağ (81.7%) [19], Koylu (84.13%) [15] and Ulutaş et al. (80.95%) [17]. The birth rate observed in this study was lower than the values observed with Saanen cross-breed by Tozlu (94.2%) [14] and Gül et al. (100.0%) [16] but similar to the value of.

Saanen goats has 9.73% abortion rate in this study. The abortion rate observed in this study was lower compared to the results in the study of Ulutaş et al. (12.50%) [17] but similar to those of Çam et al. (10.00%) [12]. When the abortion rate in the current study was compared to experiment carried out with Saanen cross-breed, it was higher than that of Tozlu (0.00%) [14] but lower than that of Koylu (12.5%) [15].

The single birth rate of Saanen goat was 42.16% in this study. The single birth rate of Saanen goat was lower than the results in the study of Ceyhan and Karadağ (50.0%) [18], similar to those of Ulutaş et al. (41.17%) [17] and Karadağ (47.69%) [19]. When this value was compared to Saanen cross-breed, it was lower than those of Tozlu (88.54%) [14], Koylu (60.5%) [15] and Gül et al. (55.0%) [16] but higher than that of Karadağ (50.00% and 83.33% for Saanen × Hair goat F_1 and G_1 cross-breed) [19].

Saanen goat had 57.84% twinning rate in the current study. The twinning rate observed in this study was lower than that of Taşkın et al. (71.43%) [21], similar to that of Ulutaş et al. (58.83%) [17], but higher than those of Ceyhan and Karadağ (44.2%) [18] and Karadağ (52.31%) [19]. When twinning rate observed in this study was compared to crossbreeding studies carried out in Turkey it was lower than those of Tozlu (11.46%) [14], Koylu (14.4%) [15] and Gül et al. (45.0%) [16].

In the study, among factors affecting twinning rate, the effects of year (P<0.01) and age (P<0.001) were significant. The significant effects of year and age were in agreement with the results of Taşkın et al.[21].

Mean number of kids born per birth was 1.59 in this study. When this value was compared to some domestic literature value, it was lower than that of Taşkın et al. (1.85) [21], similar to those of Ceyhan and Karadağ (1.6) [18], Karadağ (1.52) [19] and Ulutaş et al. (1.55) [17]. When number of kid born per birth in the current study was compared to the values observed with Saanen cross-breed, it was lower than that of Eker and Tuncel (1.82 for Saanen × Hair goat F_1) [22], higher than those of Tozlu (1.11) [14] and Koylu (1.06) [15] and similar to that of Karadağ (1.68 and 1.50 for Saanen × Hair goat F_1 and G_1 cross-breed) [19].

In the study among factors affecting the number of kids born per birth, the effects of year (P<0.01) and age (P<0.001) were significant. The significant effects of year and age on the number of kids per birth were in agreement with the results of Şengonca et al.[20] and Taşkın et al.[21].

Saanen goats had 129% kid production in this study. The kid production obtained in this study were lower than that of Taşkın et al. (152%) [21] but similar to those of Ulutaş et al. (126%) [17] and Ceyhan and Karadağ (120%) [18]. When this value was compared to the values obtained with Saanen cross-breed, it was lower than that of Gül et al. (148%) [16], higher than those of Koylu (89%) [15] and Karadağ (70% for Saanen × Hair goat G_2 cross-breed) [19] but similar to those of Karadağ (141 and 121% for Saanen × Hair goat F_1 and G_1 cross-breed) [19] and Şengonca et al. (125%) [20].

In the experiment, the effects of year and age on kids production were significant (P<0.001). These significant year and age effects were in agreement with the results of Şengoca et al.[20] and Taşkın et al.[21].

When the birth rate, abortion rate, single kidding rate, twinning rate, mean kid number per birth and kid yield was examined according to years, they were 77.52% and 85.25%; 13.79% and 5.45%; 54.00% and 30.77%; 46.00% and 69.23%; 1.46 and 1.72; 113% and 147% for 2008 and 2009, respectively. These values showed that birth rate, twinning rate, mean kid number per birth and kid yield were higher and abortion rate and single kidding rate were lower in second year of arrival of goats into region. The increased birth rate, twinning rate, mean kid number per birth and kid yield and the decreased abortion rate and single kidding rate in second year may have resulted from better adaptation of Saanen goat in region and improved knowledge of farmers about dairy goat raising.

Mean lactation period of Saanen goats in this study was 273.12 d. The lactation period observed in this study was higher than that of Ulutaş et al. (204.9 d) [17], but less than that of Tölü (288.4 d) [23]. When this lactation period was

compared to the lactation period obtained with Saanen cross-breed, it was higher than those values reported by Koylu (240.0 d) [15], Gül et al. (238.3 d) [16] and Şengonca et al. (201.5 d) [20].

Among factors affecting lactation period, while the effect of year was not significant (P>0.05), the effects of age (P<0.001) and birth type (P<0.001) were significant in this study. Similarly Şengonca et al.[20] has reported a significant age effect on lactation period. In contrast to the result of current study, Şengonca et al.[20] noted a significant year effect on lactation period.

The longer lactation period observed with Saanen goats in the current study compared with values in the literature may have been due to environmental factors such as taking animals to highland pastures and having longer vegetation period during summer.

Saanen goats had average of 1.37 kg daily milk production in this study. The daily milk production obtained in this study was less than that of Pala and Savaş [24] who obtained an average of 1.8 kg/d milk from goat with machine milking, however goats were fed 500 g/animal/d concentrate feed in addition to grazing on pature in that study. Our value was higher than that of Ulutaş et al. (0.95kg) [17] but was similar to values reported for cross-breed by Gül et al. (1.3 L) [16] and Şengonca et al. (1.83 kg) [20].

Among factors affecting daily milk production, the effect of year was not significant (P>0.05) but effects of age and birth type were significant (P<0.001) in the experiment. The significant age effect on daily milk production observed in the study was in agreement with the result of Şengonca et al.[20]. However, in contrary to our finding, Şengonca et al.[20] has noted a significant year effect on daily milk production.

Mean lactation milk yield was 383.05kg in this study. When lactation milk yield obtained in this study was compared to some literature, it was lower than that of Sönmez et al. (423.09kg) [9], higher than those of Ulutaş et al. (193.2 kg) [17] and Karadağ (277.1 L) [19] and similar to that of Tölü (408.6 kg) [23]. When the lactation yield was compared to the values obtained in the literature, for crossbreeds with this lactation milk yield was less than those of Eker and Tuncel (551-704 kg) [22] and higher than those of Koylu (332.6 kg) [15], Gül et al. (302.3L) [16] and Karadağ (290.1 and 273.1 kg for Saanen × Hair goat F_1 and G_1 cross-breed) [19].

In the experiment, among factors affecting lactation milk yield, the effect of year was not significant (P>0.05) but the effects of age and birth type were significant (P<0.001). Similar to Şengonca et al.[20] noted a significant age effect on lactation milk yield, which is in agreement with our result. In contrary to our result, Şengonca et al.[20] also reported a significant year effect on lactation milk yield.

In conclusion, the reproduction and milk production data obtained in the current study from Saanen goats raised in Muş province have revealed that Saanen goats can be used for goat milk and kid production in the region.

REFERENCES

1. FAO: Food and agriculture organization statistical databese. http://faostat.fao.org/site/339/ default.aspx *Erişim tarihi:* 13.09.2010.

2. DPT: Dokuzuncu kalkınma planı, 2007-2013, Hayvancılık özel ihtisas komisyon raporu. Devlet Planlama Teşkilatı, 2007, Ankara. P.18-19, DPT 2717 - ÖİK 670, Ankara. www.dpt.gov.tr/DocObjects/Download/3175/oik670.pdf, *Erişim tarihi:* 06.06.2010.

3. TUIK: Hayvancılık istatistikleri. http://www.tuik.gov.tr/hayvancilikapp/hayvancilik.zul *Erişim tarihi:* 05.06.2010.

4. Sönmez R, Şengonca M: Saanen süt keçilerinde Ege Bölgesi adaptasyonu ve verimleri üzerine bir araştırma. *Ege Üniv Zir Fak Derg*, 1, 1-19, 1964.

5. Akçapınar H, Özbeyaz C: Hayvan Yetiştiriciliği Temel Bilgileri. Kariyer Matbaacılık Ltd. Şti. 1. Baskı, Ankara, 1999.

6. Al-Najjar K, Salhab S, Al-Merestani S, Kasem R, Al-Azzawi W, Dawa M, Omed H, Saatcı M: Environmental factors affecting kid mortality in Shami Goats. *Kafkas Univ Vet Fak Derg,* 16 (3): 431-435, 2010.

7. Ceyhan A, Sezenler T, Yıldırır M, Erdogan İ: Reproductive performance and lamb growth characteristics of Ramlıç sheep. *Kafkas Univ Vet Fak Derg,* 16 (2): 213-216, 2010.

8. Aytuğ CN, Alaçam E, Özkoç O, Yalçın BC, Türker H, Gökçen H: Koyun-Keçi Hastalıkları ve Yetiştiriciliği. Tüm Vet Hayv Hiz Yay No:2, Teknografik Basımevi, İstanbul, 1990.

9. Sönmez R, Şengonca M, Alpbaz AG: Ege Üniversitesi Ziraat Fakültesinde yetiştirilen Saanen süt keçilerinin çeşitli özellikleri ve verimleri üzerinde bir araştırma. *Ege Üniv Zir Fak Derg*, 7 (1): 115-134, 1970.

10. Maria G, Gabina D: Simplification of milk recording scheme in Latxa milking sheep. *Livest Prod Sci*, 31, 313-320, 1992.

11. MINITAB: MINITAB 16, trail version. http://www.minitab.com/en-TR/products/minitab/free-trial.aspx *Erişim tarihi:* 20.05.2010.

12. SAS: Institute Inc., SAS OnlineDoc®, Version 8, Cary, NC, 1999.

13. Çam MA, Olfaz M, Selçuk E, Şekeroğlu A: Saanen ve Ezine keçilerinin süt ve döl verim özellikleri. *Karadeniz Bölgesi Tarım Sempozyumu,* Bildiriler, Cilt 2, 375-382, 1999.

14. Tozlu H: Amasya ili Kıl keçisi ıslah projesi kapsamında elde edilen Saanen x Kıl keçisi (F1) melezleri ile saf Kıl keçilerinin büyüme ve diğer yetiştiricilik özellikleri bakımından mukayesesi. *Yüksek Lisans Tezi*. Ondokuz Mayıs Üniv. Fen Bil. Enst., 2006.

15. Koylu MU: İleri kan dereceli Saanen melezi keçilerin mersin koşullarında adaptasyonu ve verimleri üzerine bir araştırma. *Yüksek Lisans Tezi*. Çukurova Üniv. Fen Bil. Enst., 2009.

16. Gül S, Keskin M, Biçer O: Farklı keçi genotiplerinin Doğu Akdeniz Bölgesi koşullarındaki performanslarının karşılaştırılması: 2. Verim özellikleri. *Ulusal Keçicilik Kongresi*, s, 211-214, 24-26 Haziran, Çanakkale, 2010.

17. Ulutaş Z, Kuran M, Şirin E, Aksoy Y: Tokat şartlarında yetiştirilen Saanen ırkı keçilerin döl, süt verimi ve oğlakların gelişme özelliklerinin belirlenmesi. *Ulusal Keçicilik Kongresi*, s, 215-218, 24-26 Haziran, Çanakkale, 2010.

18. Ceyhan A, Karadağ O: Marmara araştırma enstitüsünde yetiştirilen Saanen keçilerinin bazı tanımlayıcı özellikleri. *Tarım Bilimleri Dergisi*, 15 (2): 196-203, 2009.

19. Karadağ O: Saanen, (Saanen x Kıl) G1 ve (Saanen x Kıl) G2 keçilerinde verim özellikleri üzerine karşılaştırmalı araştırmalar. TAGEM/HAYSÜT/08/08/04/0, http://www.tagem.gov.tr/program%20degerlendirme/2010/HAYSUD/2010_%20Buyukbas_%20Kucukbas_Prog_Deg_Kitabi.pdf *Erişim tarihi:* 13.06.2010.

20. Şengonca M, Taşkın T, Koşum N: Saanen x Kıl keçi melezlerinin ve saf

Kıl keçilerinin kimi verim özelliklerinin belirlenmesi üzerine eş zamanlı bir araştırma. *Turk J Vet Anim Sci*, 27 (6): 1319-1325, 2003.

21. Taşkın T, Demirören E, Kaymakçı M: Saanen ve Bornova keçilerinde oğlak veriminin üretkenliği ve etkinliği. *Ege Üniv Zir Fak Derg*, 40 (2): 33-40, 2003.

22. Eker M, Tuncel E: Ankara Üniversitesi Ziraat Fakültesinde yetiştirilen Kilis ve Saanen x Kilis melezi sütçü keçilerde döl verimi ve yaşama gücü üzerinde araştırmalar. *Ankara Üniv. Zir. Fak. Yıllığı,* 22 (1-2): 140-162, 1972.

23. Tölü C: Farklı keçi genotiplerinde davranış, sağlık ve performans özellikleri üzerine araştırmalar. *Doktora Tezi.* Çanakkale Onsekiz Mart Üniv. Fen Bil. Enst., 2009.

24. Pala A, Savaş T: Persistency within and between lactations in morning, evening and daily test day milk in dairy goats. *Arch Tierz*, 48 (4): 396-403, 2005.