

Araştırma Makalesi/Research Article (Original Paper)  
**Milk Production Abilities of Kıvrıcık Ewes**

**İbrahim CEMAL, Nezih ATA, Onur YILMAZ\*, Orhan KARACA**

Aydın Adnan Menderes University, Faculty of Agriculture, Department of Animal Science, Aydın, Turkey  
\*e-posta: oyilmaz@adu.edu.tr; Tel: +90 (256) 772 7023 / 2574; Fax: +90 (256) 772 7233

**Abstract:** Eşme district of Uşak province is one of the important centers in Western Anatolia in terms of sheep breeding. The aim of the present study is to determine milk yield characteristics of Kıvrıcık ewes in extensive conditions of rural farms at Eşme district of Uşak province. Milk yield characteristics of the breed were obtained using test day milk records of 227 ewes in four farms. Test-day milk yields recorded at 14 days interval starting 15 days after lambing until the ewes dried off. Means for average daily milk yield, the length of lactation and lactation milk yield were 656.8 g, 162.4 day and 107.6 kg, respectively. Lactation milk yield of ewes are ranged between 31.4 and 262.8 kg. It points to the presence of high variation in this population. Means obtained for farms in terms of daily milk yield, the length of lactation and lactation milk yield were show us statistically significant differences. Results indicated that milk yield performances of Kıvrıcık ewes is remarkable and the income of breeders can be increased by improving milk yield performances of ewes by exploiting the present high variation by selection.

**Keywords:** Sheep, Kıvrıcık, Lactation, Milk yield

**Kıvrıcık Koyunlarının Süt Verim Yetenekleri**

**Öz:** Uşak ili Eşme ilçesi, Batı Anadolu'da koyun yetiştiriciliği açısından önemli merkezlerden biridir. Eşme ilçesinde yürütülen çalışmada ekstansif koşullarda yetiştirilen Kıvrıcık koyunların süt verim özelliklerinin belirlenmesi amaçlanmıştır. İrkin süt verim özellikleri, dört işletmedeki 227 koyunun günlük süt verim denetim kayıtları kullanılarak belirlenmiştir. Günlük süt verim denetim ölçümlerine doğumdan 15 gün sonra başlanmış ve koyunlar kuruya çıkıncaya kadar 14 gün arayla devam ettirilmiştir. Günlük ortalama süt verimi, laktasyon süresi ve laktasyon süt verimi için ortalamalar sırasıyla 656.8 g, 162.4 gün ve 107.6 kg olmuştur. Bireylere ait laktasyon süt verimleri 31.4 ve 262.8 kg arasında değişmiştir. Bu durum süt verimi bakımından populasyonda geniş bir varyasyona işaret etmektedir. Günlük süt verimi, laktasyon süresi ve laktasyon süt verimi açısından çiftlikler için elde edilen ortalamalar, istatistiksel olarak anlamlı farklar ortaya koymuştur. Sonuçlar, Kıvrıcık koyunların süt verim performanslarının dikkat çekici olduğunu, ortaya konan bu yüksek varyasyona dayalı gerçekleştirilecek seleksiyon programları ile koyunların verim performanslarının ve dolayısıyla yetiştirici gelirlerinin artırılabilirliğini göstermiştir.

**Anahtar kelimeler:** Koyun, Kıvrıcık, Laktasyon, Süt verimi

**Introduction**

Milk, a product that must be consumed for the newborn to develop and grow, is one of the most important products of livestock. The main source of the importance in the feeding of human and animal offspring is that it contains many basic nutrients.

Milk production in sheep is important both for feeding of lambs and for processing dairy products, especially cheese. This importance is further increased in breeds that give birth to multiple births. Incomes from sales of milk and/or milk product take second place after income from lamb or lamb meat sales. It can be said that the Chios and Awasi (called as İvesi in Turkey) breeds came to the forefront in milk production considering the breeds raised in Turkey. The variation of milk production is high in the other breeds, but the average milk yield is generally low in native sheep breeds raised in Turkey (Karaca et al. 2002).

In recent years, regional animal breeding schemes started in Europe have resulted in significant increases both milk and meat yields of domestic sheep breeds. As a result of these studies, applications have been simplified in keeping records, standard methods have been applied and new technological developments have been integrated into the field (ICAR 1992; Boyazoglu et al. 2001; Barillet 2001). Milk yield controls performed at certain intervals are essential to knowing milk yield performance and implementing successful genetic selection for milk production in sheep (Kaymakçı and Sönmez 1996). Factors affecting the amount and composition of the milk and information on genetic

variation are essential selection criterion in the regions where milk production is important. Environmental factors such as age, management and nutritional conditions should be taken into account in order to define the true milk yield capabilities of sheep (Bencini and Pulina 1997; Park et al. 2007; Moran-Fehr et al. 2007).

Eşme district of Uşak province is one of the important center in Western Anatolia in terms of sheep breeding. High number of sheep population (71.516 head; TÜİK 2017) and wide grass resources are important indicators of potential for production of sheep products. The main animal material of the breeders in the region is Kıvrıkcık sheep. The Eşme district of Uşak province has a specific importance in the region in terms of traditional sheep cheese production. In this area, fat tailed Dağlıç sheep was used by breeders until to last four decades. But at the first two of the last four decades, all of Dağlıç population in Uşak province was backcrossed with thin-tailed Kıvrıkcık rams due to changing market demands. As a result of intense backcrossing, whole sheep population were transformed to Kıvrıkcık. The aim of the present study is to determine milk yield characteristics of Kıvrıkcık ewes in extensive rural farm conditions.

## Materials and Methods

The study was carried out on 227 Kıvrıkcık ewes raised in four farms in Eşme district of Uşak province of Turkey. In the study, the farms were chosen by paying attention to the infrastructure of the farms and the adaptability of the farmer. The farms involved in the study were in extensive production system. Farms located that close to each other and have similar management system selected for the study. In addition, special attention was given to the average litter size of ewes in farms. The average litter size of the farms in the study were 1.67, 1.55, 1.42 and 1.56 for the 1st, 2nd, 3rd and 4th farms, respectively. Test-day milk yields was recorded at 14 days interval starting 15 days after lambing till the ewes were dried off. Milking was performed by hand milking twice daily. The milk of each ewe was measured on hand-held scale with 0.01 kg sensitivity. All the lambs were separated from their mothers 12 hours before morning milking and were not allowed to reach their mothers until end of the evening milking. This trial plan continued until the end of the lactation period.

Milk yield characteristics of ewes were calculated from test-day milk records using the Holland method (Kaymakçı and Sönmez 1992) according to the formulas given below:

$$LMY = \frac{\sum_1^n k_i}{n} \times LL$$

Where,

LMY= Lactation milk yield (kg),  $\sum_1^n k_i$ = Sum of yields determined on control days (kg), **n**= Number of milk yield control and, **LL**= Lactation length (day).

The lactation length (LL) was obtained using the following formula:

$$LL = n \times a - \left(\frac{a}{2} - A\right)$$

Where,

LL= Lactation length (day), **n**= Number of milk yield control, **a**= Milk yield control interval (day), **A**= Period between lambing and first milk yield control (day).

Average daily milk yield (ADMV) of ewes were determined by dividing the total amount of milk measured for an animal on all control days into the total number of controls.

## Statistical Analysis

General Linear Model (GLM) procedure in SAS (1999) was used to test the effects of systematic environmental factors. The analysis model used to obtain the least-square means was as follows:

$$Y_{ijkl} = \mu + a_i + b_j + c_k + e_{ijkl}$$

Where,

$Y_{ijkl}$  = Observations for milk production characteristics,  $\mu$ = overall mean of the trait,  $a_i$ = fixed effect of farms ( $i=1, 2, 3$  and  $4$ ),  $b_j$ = fixed effect of birth type ( $j= 1, 2$  and  $3$ ),  $c_k$ = fixed effect of ewe age ( $k= 1, 2, 3, 4, 5$  and  $\geq 6$ ) and  $e_{ijkl}$ = random error.

## Results

Descriptive statistics of milk yield characteristics of ewes were given in Table 1.

Table 1. Descriptive statistics of milk yield characteristics

Variable	N	$\bar{X}$	S <sub>x</sub>	CV (%)	Min.	Max
ADMY (g)	227	685.8	193.5	28.2	259.7	1546.4
LL (day)	227	158.9	29.9	18.8	112.0	256.0
LMY (kg)	227	109.7	38.2	34.8	31.4	262.8

ADMY: average daily milk yield, LL: Lactation length, LMY: Lactation milk yield

The high coefficient of variation values obtained for the various milk yield characteristics indicated that there is an important variation among the animals within population. This situation is clearly seen for the average daily milk yields in the farms (Figure 1).

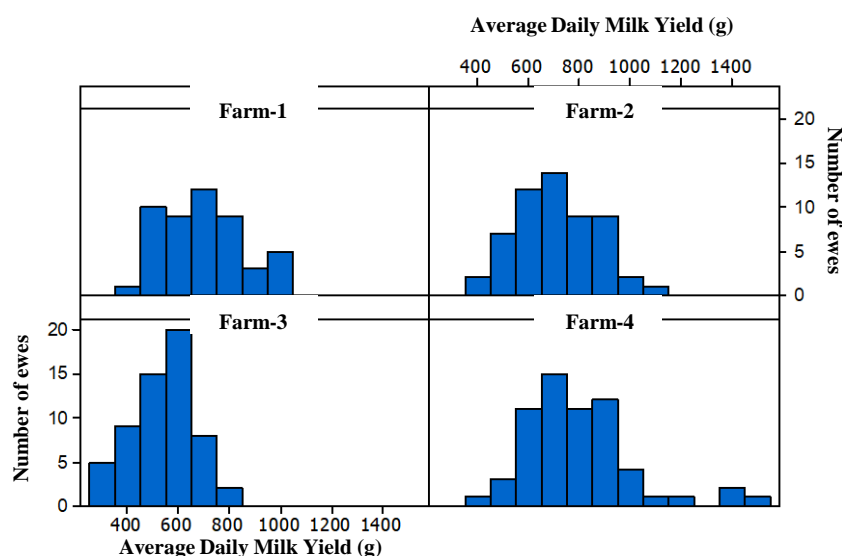


Figure 1. Distribution of average daily milk yield by farms

The least squares means and standard errors for milk production traits were given in Table 2. The differences between the farms are statistically significant ( $P < 0.001$ ) for all the milk production traits. However, the other fixed factors was not have significant effects on milk yield characteristics. The highest mean were observed for Farm-4 in terms of the average daily milk yield. Although the lactation length observed in this farm is relatively shorter compared to the others, it can be said that lactation milk yield is not low.

The highest lactation milk yield was observed in Farm-1. Similarly, lactation length in this farm was also higher than the others. The highest value for average daily milk yield was seen in ewes which is giving twin lambs. It is noteworthy that the best age group is 2, when the average daily milk yield and lactation length are evaluated in terms of age groups.

Table 2. The least squares means and standard errors for milk production traits

	N	LMY (kg)	ADMY (g)	LL (days)
<b>Farms</b>		<b>P=0.000</b>	<b>P=0.000</b>	<b>P=0.000</b>
Farm-1	49	124.6±5.88	676.3±27.83	182.9±4.20
Farm-2	56	109.8±5.68	684.5±26.88	158.2±4.06
Farm-3	60	84.1±5.79	500.4±27.39	162.4±4.13
Farm-4	62	111.9±5.51	765.9±26.06	145.9±3.93
<b>Birth type</b>		<b>P=0.469</b>	<b>P=0.096</b>	<b>P=0.421</b>
Single	117	108.8±3.46	681.2±16.38	158.5±2.47
Twin	96	112.8±3.77	698.2±17.82	160.4±2.69
≥Triplet	14	101.2±9.81	590.9±46.41	168.2±7.00
<b>Ewe ages</b>		<b>P=0.974</b>	<b>P=0.728</b>	<b>P=0.067</b>
2	45	105.5±6.33	683.5±29.98	152.94±4.52
3	63	108.5±5.39	662.7±25.54	163.24±3.85
4	31	108.8±7.21	660.9±34.12	162.52±5.15
5	40	105.4±6.37	636.7±30.17	163.63±4.55
≥6	48	109.9±5.99	640.2±28.36	169.56±4.28
<b>Overall</b>	<b>227</b>	<b>107.6±3.71</b>	<b>656.8±17.55</b>	<b>162.4±2.65</b>

LMY: Lactation milk yield, ADMY: average daily milk yield, LL: Lactation length

## Discussion

Mean values of lactation milk yield and lactation length obtained in this study were higher than the values reported in other studies on Kıvrıkcık sheep (Sönmez, 1987; Kaymakçı and Sönmez, 1996; Karaca et al., 1999; Altinel et al., 2000; Yılmaz and Altın, 2004; Ceyhan et al., 2007). Similarly, values for these parameters were higher than values reported for Syrian Awassi, Turkish Awassi and crossbred sheep between Syrian and Turkish Awassi (Haile et al., 2017). On the other hand, lactation milk yield was lower than values in Ghezel and Mehraban sheep breeds raised in Iran that reported by Izadifard and Zamiri (1997). This is the most concrete indication that the genotype studied has a very high milk yield performance among some native Turkish sheep breeds (Ceyhan et al., 2007). The high milk yield characteristics obtained are an expected finding when considering the high litter size, which is known as one of most the important parameters of reproductive traits, in genotype studied.

Although statistical analysis of the effects of age groups on milk yield was not significant, the lactation length was prolonged while the average daily milk yield was decreased with age. This is a very remarkable finding that should be considered.

The milk yield performance of Kıvrıkcık ewes reared in Eşme which stands out in terms of sheep cheese production has not been defined so far. Milk is consumed by lambs for a long time because lamb meat production is in the forefront in the region. For this reason, sheep are milked once a day until the lambs are sold. After the sale of lambs immediately after weaning, milking was performed twice a day and total milk used to make cheese. Thus, milk is economically meaningful to breeders after being processed in the product.

## Conclusion

Results indicated that milk yield performances of Kıvrıkcık ewes is remarkable and the income of breeders can be increased by improving milk yield performances of ewes by exploiting of high variation by selection. Even though they have not been selected for dairying, milk yields compare favorably with those of many indigenous breeds. This indicates that selective breeding and improved nutritional programs can considerably increase milk production.

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