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ARAŞTIRMA MAKALESİ **RESEARCH ARTICLE**

Some reproductive, fattening and milk yield traits of South Karaman sheep

Güney Karaman koyunlarının bazı üreme, besi ve süt verim özellikleri

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Ö Z E T / A B S T R A C T

Aims: In this study, reproductive, lamb growing, fattening and milk yield characteristics of South Karaman ewes and lambs were investigated.
Methods and Results: The animal material of the study consisted of South Karaman sheep raised in the nomadic system in Tarsus district of Mersin province. The flock was managed under breeders' condition. In addition to the pasture, straw and concentrate feed were given to the animals during their stay in Tarsus. The feeding of animals was provided only by grazing in the pasture during the highland period. Lambing rate, number of lambs per ewe at mating period, number of lambs per ewe giving birth, survival rate and single and twin birth rates were calculated to determinate the reproductive characteristics. Fattening characteristics were determined by applying 60 days of fattening in 20 head male animals randomly selected from lambs of similar weight and three months old. Milk yield controls were made at 30 days interval. The Holland method was used for each lactation milk yield calculation. At the end of the study number of lambs per ewe at mating period, birth weight, weaning weight, daily weight gain and lactation milk yield were detected as 1.24, 3.4±0.07 kg, 16.7±0.18 kg, 232.8±10.24 g and 37.7 L, respectively.
Conclusions: South Karaman sheep has low milk yield, fattening and reproductive characteristics similar to other fat-tailed native breeds under semi-intensive breeding conditions.
Significance and Impact of the Study: At the end of the study, it can be stated that South Karaman sheep is an important breed to sustainable sheep production systems. The reproductive, fattening and milk yield characteristics of this breed are sufficient for sheep farmers, especially nomadic breeders.

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INTRODUCTION

Sheep and goat breeding has a special place in Turkish history. Turks who lived in nomadic life in their previous states preferred the small ruminant breeding for reasons such as ease of management, milk and meat yield, use of wool and hair as raw materials in carpets, rugs, bed-quilts, tents and weaving.
Sheep and goat rearing still have a special place in the livelihood of the society that lives in rural areas in different parts of Anatolia and has not given up on nomadic life (Aydın and Keskin, 2018; Tüney Bebek and Keskin, 2018; Karagöl and Keskin, 2018).
The sheep population has declined in the last half century in Turkey and there are 33.7 million head of sheep in the country for 2019 (Anonymous, 2019a). This decrease has been mainly due to the government supports for cattle production. Due to both these supports and for reasons such as decreased pasture areas, shepherd problem, terrorism problem the

breeders have been preferred cattle rearing instead of sheep in this period.

Milk production in the country has increased especially with the preference of dairy cattle breeding, but serious problems have occurred in meat production. However, since Turkey's climate and pasture characteristics is not suitable for profitable milk production in cattle breeding, it is seen that the complaints of the breeders are increasing day by day.

The increase in crossbreeding of native sheep breeds and importation of live sheep has attracted attention in recent years. There is a similar situation for Mersin province. White Karaman, Red Karaman, South Karaman, Sakız, Awassi, Hamdani, Herik and Merino sheep are reared as pure or crossbred in sheep breeding in the province of Mersin (Tüney Bebek and Keskin, 2018). Sheep and goat breeding is carried out primarily for meat and milk production throughout the province. In the region where herd sizes vary between 100-1000 heads, animals are generally fed based on pasture and supplemental feed is given during periods when pasture is insufficient. In the province where the mating generally between June and September, the rams are left in the herd continuously (Gündüz and Özkul, 2017). Sheep breeders generally carry out production activities on their own lands or on state lands. In the region where nomadic sheep breeding is still widespread, these breeders mostly prefer the South Karaman sheep (Tüney Bebek and Keskin, 2018). It can be evaluated that there is an important relationship between the breed preference of nomadic breeders and the durability of animals to natural conditions.

There is not much information about South Karaman sheep in the literature. However, it can be said that the South Karaman sheep is a breed that is under threat in terms of pure sheep rearing. Different studies are carried out by the Ministry of Agriculture and Forestry on the conservation and breeding of this breed in private farm condition (Anonymous, 2019b)

In this study, it was aimed to determine the fertility, lamb development, fattening and milk yield characteristics of South Karaman sheep.

MATERIALS and METHODS

Animal material of the study consisted of 100 head female and 10 head male South Karaman sheep raised in the nomadic system in Tarsus district of Mersin province. The study was carried out with the approval of the Hatay Mustafa Kemal University Ethics committee (MKUHADYEK-2017/9-3).

The flock was managed under breeders' condition. The herd was remained in a tent in the district of Tarsus, of Mersin province (36° 46' North and 34° 54' East) from 01 November 2017 until 30 May 2018. After this date, they migrated to the Çinili Lake (37° 38' North and 34° 51' East) located in the borders of Çamlıyayla district of Mersin, with an altitude of approximately 2500 m. And, they returned to Tarsus again on October 20, 2018.

In addition to the pasture, 60 kg of straw and 50 kg of concentrate feed were given to 100 head animals per day during their stay in Tarsus (40 heads primiparous, 52 heads multiparous, 4 heads infertile and, 4 heads aborted). The feeding of animals was provided only by grazing in the pasture during the highland period.

The rams were constantly kept in the herd and the dates they mated were recorded. If a ewe did not show estrus after mating, it was accepted that she became pregnant. The births started from November 2017 and continued until April 2018.

During the mating period, the flock was visited 3 days a week and information about the mating was obtained from the breeder. If a ewe did not show estrus behavior in the following weeks after mating, it has been accepted in pregnant on the date of last mating. Regarding the reproductive characteristics; the number of sheep to be mated, the number of mating sheep, the number of pregnant sheep, the number of abortions, lamb birth weight and date, sex of lambs, number of lambs born, weaning (60 days) weight, and type of birth were determined. Lambing rate, lamb yield by mated ewes, lamb yield by ewes giving birth, survival rate, single and twin birth rates were calculated using the formulas reported by Özcan (1989).

Fattening characteristics were determined by applying 60 days of fattening in 20 head male animals randomly selected from lambs of similar weight and three months old. For this purpose, weights at the beginning and end of the fattening, feed conversion rates and daily live weight increases were determined for the lambs. Vitamins A, D and E (ADEMIN®), antiparasitic injection and enterotoxemia vaccine were applied to the lambs at the beginning of the fattening. Concentrate feed containing 15% crude protein and 2600 kcal ME in kg dry matter was given as *ad-libitum* during the fattening. In this period, lambs were also given alfalfa hay of 200 g per head and per day. The animals were allowed an initial training period of 7 days to familiarize the metabolic consequences of feed ingredients. The feed was given by weighing daily, and the remaining feed was taken by weighing from the feeders the next day for the determination of feed consumption during the fattening period. From this difference, firstly the daily feed

consumption of 20 lambs was calculated as a group, and then individual consumption was calculated by dividing this amount by 20. Lambs were weighed for three days at the same time without starving in order to determine the beginning weight for fattening. In order to determine the fattening performance, the lambs were weighed once a week on the same day and hour with a bascule with a sensitivity of 100 g.

Milk yield controls were made at 30 days interval. The Holland method was used for each lactation milk yield calculation (Özcan, 1989).

Statistical analysis of the study was evaluated by using the SPSS package program (Version 22.00, SPSS, IBM, NY, USA).

RESULTS and DISCUSSION

Fertility is the most important yield feature for a livestock farm. Because, the animal must give birth in order to produce milk and to provide fattening material for meat production. Although multiple births are desired in sheep breeds with high milk yield, sheep owners, if they have low-yielding and extensively managed sheep, they want their sheep to give one healthy offspring each year. Because the milk of the dams is enough to raise only one lamb. Otherwise, the survival rate until weaning may be lower, since the multiple lambs are born weaker and also the milk yield of the dams will not be enough for two lambs. South Karaman sheep has also been reported as a breed that is reared extensively and has a low milk yield by breeders of Mersin province (Tüney Bebek and Keskin, 2018). In the current study, the reproductive characteristics of South Karaman sheep which is the experimental material are given in Table 1.

The lambing rate, number of lambs per ewe at mating period, number of lambs per ewe giving birth, twinning rate and survival rate were calculated as 92%, 1.24, 1.35, 34.8% and 91.9%, respectively (Table 1). Ten heads of lamb died until weaning. Seven of these lambs were born twins and three heads were born single. The birth rate of Karagül sheep was determined as 91% by Erol and Akçadağ (2009) and it was reported close to our finding in the current study. However, the researcher reported the twining rate in this breed as 4% and the average number of lambs at one birth as 1.04. Birth rate, twining rate and litter size for Karagül sheep were informed as 91.43%, 6.25% and 1.063 October mating period by Yılmaz (2001). These differences may have originated from breed and regional differences. As stated by Sönmez et al (2009), twinning rates of fat-tailed native sheep breeds (such as Akkaraman, Morkaraman, Dağlıç, İvesi) vary between 1-10%. Esen and Yıldız (2000) reported the survival rate of Akkaraman lambs in weaning (105 days of age) as 68.96%. It can be assumed that the reproductive characteristics calculated from South Karaman sheep which is considered to be related to Karakul and White Karaman sheep are within normal limits.

Table 1. Some reproductive traits of South Karaman sheep in the experiment

Traits	Value
Number of ewes during mating period	100
Number of infertile ewes	4
Number of abortion ewes	4
Number of ewes giving birth	92
Number of ewes with single lamb	60
Number of ewes with twin lambs	32
Number of lamb born	124
Number of male lambs	60
Number of female lambs	64
Number of weaned lambs	114
Birth rate, %	92.0
Abortion rate, %	4.0
Number of lambs per ewe at mating period	1.24
Number of lambs per ewe giving birth	1.35
Twinning rate, %	65.2
Survival rate, %	91.9

Birth weight in sheep varies according to different factors such as breed, feeding regimes in pregnancy period, birth type and sex. Birth weight, which can be different for each breed, is closely related to the breed

being a meat type or dairy type. In the current study, the change of birth weight and weaning weight in South Karaman sheep by birth type, gender and maternal age are given in Table 2.

As seen in Table 2, the effects of birth type on the development of lambs from birth to weaning were found significant (*P* <0.05). In single and twin lambs, birth weights were calculated as 3.5±0.13 kg and 3.2±0.07 kg, weaning weights were calculated as 17.2±0.29 kg and 16.2±0.21 kg, respectively. It has also been reported by different researchers that birth and weaning weights were higher in single-born lambs (Çolakoğlu and Özbeyaz, 1999; Esen and Yıldız, 2000; Koyuncu et al., 2001; Doğan and Doğan, 2005; Koyuncu et al., 2018). The fact that single lambs were heavier than twin lambs continued from birth to weaning. Undoubtedly, the fact that milk yield of mothers is insufficient for twin lambs has an effect on this. Yurtman et al. (1999) reported a significant correlation (r = 0.90) between postpartum milk consumption and lamb's live weight gain. In addition, it was determined that male lambs were heavier than female lambs (*P* <0.01) both at birth and at weaning (Table 2). Many studies with different sheep breeds reported that male lambs were born more heavily than females and this difference continued until weaning (Çolakoğlu and Özbeyaz, 1999; Esen and Yıldız, 2000; Koyuncu et al., 2001; Doğan and Doğan, 2005; Koyuncu et al., 2018). Moreover, the effect of maternal age on birth and weaning weight has also been determined as statistically important (*P* <0.01). It was also stated by different researchers that mother age is one of the factors affecting birth weight, and birth weight, which is low in first-time births, increases with second birth. (Esen and Yıldız, 2000; Koyuncu et al., 2001; Doğan and Doğan, 2005).

Table 2. Effect of birth type, sex and dam's age on birth and weaning weight in South Karaman sheep

	Birth weight	**Weaning weight**
Birth type		
Single	3.5±0.13 (60)	17.2±0.29 (56)
Twin	3.2±0.07 (64)	16.2±0.21 (58)
P	<0.05	<0.05
Sex		
Male	3.7±0.10 (60)	17.4±0.27 (56)
Female	3.1±0.09 (64)	16.0±0.21 (58)
P	<0.01	<0.01
Dam's age		
Primiparous	3.0±0.12 (49)	16.1±0.32 (42)
Multiparous	3.7±0.11 (75)	17.3±0.29 (72)
P	<0.01	<0.01
Overall mean/Total	3.4±0.07 (124)	16.7±0.18 (114)

The birth and weaning weight values obtained from the trial material lambs were found similar to the value reported for South Karaman sheep in the rescript on the Registration of Domestic Animal Breeds and Lines published by the Ministry of Agriculture and Forestry (Anonymous, 2004). Similarly, it can be said that the birth weight determined in the study was compatible with the birth weight reported by Erol and Akçadağ (2009) as 3.13 kg for Karakul sheep, which was considered to be related to South Karaman sheep.

In another study published by the Ministry of National Education, the birth weight for Karakul sheep was 4.2 and 3.6 kg for males and females. It can be said that the findings obtained in the current study were also in line with this notification. On the other hand, birth weight was reported between 3.73 kg and 4.92 kg in different studies in Akkaraman and Awassi sheep, which are considered to be related with South Karaman sheep (Çolakoğlu and Özbeyaz, 1999; Esen and Yıldız, 2000; Ayhan, 2015; Kul and Akcan, 2002). The birth weight

differences between experimental material and these researchers' reports may have been due to genotype and environmental differences.

The fattening properties of South Karaman male lambs are given in Table 3. As seen in Table 3, the live weight of lambs reached 37.9±0.88 kg from 24.0±0.70 kg as a result of 60 days ad libitum fattening. In other words, lambs gained 13.9 kg live weight in 60 days. Lambs reached the highest daily live weight gain with an increase of 298.7±28.98 g per day in the second 15-day period. The average daily live weight gain was calculated as 232.8±10.24 g during the period from the beginning to the end of the fattening. During the fattening period, the daily feed consumption of lambs was 1250 g and the feed consumption for 1000 g daily live weight gain was calculated as 5.36 kg. Daily live weight gain for South Karaman lambs was reported as 195.7 g in a study by Boztepe et al (1997). No other literature on the fattening performance of this breed has been found. However, the daily live weight gains in White Karaman lambs, which is related to this breed, were reported as 294.1 g by Boztepe et al (1997), 304 g by Karabacak (2007) and 291 g by Aytekin et al (2015). Karabacak (2007) reported 234 g of daily live weight gain for Dağlıç lambs. The average daily weight gain value determined in the current study was higher than the value indicated by Boztepe et al (1997) for the South Karaman lambs, lower than the values reported by Boztepe et al. (1997), Karabacak (2007), Aytekin et al. (2015) for White Karaman lambs and it was similar to the value reported by Karabacak (2007) for Dağlıç lambs. In the current study, the feed consumption value calculated for 1 kg live weight gain was found similar to the value of 5.337 kg reported by Akçapınar (1981) for Dağlıç sheep. This feed conversion ratio was higher than the value of 4.31 and similar to the value of 5.25 for Akkaraman and Dağlıç lambs, respectively reported by Karabacak (2007). Aytekin et al. (2015) stated that feed conversion value as 5.13 for Akkaraman lambs. Aytekin et al. (2015) reported the feed conversion value for Akkaraman lambs as 5.13 and in accordance with the current study.

Table 3. Some fattening characteristics of South Karaman sheep lambs

Live weight change during fattening period				
İnitial	15th day	30th day	45th day	60th day
24.0±0.70	27.3±0.84	31.8±0.88	35.5±0.91	37.9±0.88
Daily live weight gain (g)				
1st to 15th days	16th to 30th days	31st to 45th days	46th to 60th days	1st to 60th days
221.9±20.16	298.7±28.98	246.7±20.34	163.8±20.03	232.8±10.24
Feed consumption (g)				
1st to 15th days	16th to 30th days	31st to 45th days	46th to 60th days	1st to 60th days
1200	1300	1300	1200	1250
Feed conversion rate				
1st to 15th days	16th to 30th days	31st to 45th days	46th to 60th days	1st to 60th days
5.40	4.35	5.26	7.3	5.36

In the current study, some milk yield characteristics determined for South Karaman sheep are presented in Table 4. The experimental material South Karaman sheep are not milked under normal breeding conditions by the herd owner and it is preferable to consume all the milk by the lambs. In order to determine the milk yield characteristics of this breed, 20 randomly selected sheep were milked once a month. At the end of the study, the average lactation milk yield and lactation length were determined as 37.7±1.56 liters and 172.5±2.98 days, respectively (Table 4). The lactation milk yield for the same breed is reported as 25-50 kg by Özcan (1989), as 30 liters in the notice on the Registration of Domestic Animal Breeds and Lines published by the Ministry of Agriculture and Forestry (Anonymous, 2004) and as 25-30 kg by Yılmaz et al (2013). It can be said that the

lactation milk yield calculated in the current study was compatible with these knowings. On the other hand, Öztürk (2000) stated that milk yield of South Karaman sheep is close to milk yield of Akkaraman and Morkaraman sheep. Sönmez et al. (2009) stated that lactating milk yield of fat-tailed native sheep breed in Turkey (such as Akkaraman, Morkaraman, Dağlıç, İvesi) is 35-40 kg. It can be said that the milk yield value of 37.7±1.56 liters determined in the current study is compatible with these reports.

Table 4. Some milk yield characteristics of South Karaman sheep

	N	Min	Max	Average	Standard error
Lactation milk yield (L)	20	27.9	50.4	37.7	1.56
Lactation length (day)	20	150	180	172.5	2.98

CONCLUSIONS

The importance of native breeds reared for both meat and milk production is better understood by widespread concepts such as organic production and global climate change in Turkey.

As conclusion in the study; (a) The rate of birth and twinning in South Karaman sheep is at acceptable levels for extensive breeding, (b) in these sheep, single-born lambs had more birth and weaning live weight than twin-born lambs, (c) likewise, male lambs were heavier than females during these periods, (d) the mother age also influenced the birth and weaning weights of lambs, (e) the fattening performances of the male lambs are similar to those of other native breeds (f) milk yield of this breed is also low.

All these findings show that conservation and rearing of South Karaman sheep will be beneficial for the region's livestock.

ÖZET

Amaç: Bu çalışmada Güney Karaman koyununun üreme, kuzu gelişimi, besi ve süt verim özelliklerinin belirlenmesi amaçlanmıştır.

Yöntem ve Bulgular: Çalışmanın hayvan materyalini Mersin ili Tarsus ilçesinde göçer sistem ile yetiştirilen Güney Karaman koyunu oluşturmuştur. Sürü yetiştirici şartlarında yönetilmiştir. Tarsus'ta kaldıkları dönemde koyunlara meraya ilave olarak saman ve kesif yem verilmiştir. Yaylada oldukları dönemde ise sadece merada otlatılarak beslenmişlerdir. Üreme ile ilgili özelliklerin belirlenmesi için kuzulama oranı, çiftleşen koyun başına kuzu verimi, doğuran koyun başına kuzu verimi, yaşama gücü, tekiz ve ikiz doğum oranları belirlenmiştir. Besi özellikleri, üç aylık yaştaki kuzulardan benzer ağırlıktaki 20 baş kuzuya 60 günlük besi uygulanarak belirlenmiştir. Süt kontrolleri 30 gün ara ile yapılmıştır. Laktasyon süt verimleri Hollanda metodu kullanılarak hesaplanmıştır. Çalışma sonunda döl verimi, doğum ağırlığı, sütten kesim ağırlığı, günlük canlı ağırlık artışı ve laktasyon süt verimi sırası ile 1.24, 3.4±0.07 kg, 16.7±0.18 kg, 232.8±10.24 g ve 37.7 L olarak belirlenmiştir.

Genel Yorum: Güney Karaman koyunları yarı entansif yetiştirme şartlarında diğer yağlı kuyruklu yerli ırklar gibi düşük süt verimine, besi ve üreme özelliklerine sahiptirler.

Çalışmanın Önemi ve Etkisi: Çalışma sonunda Güney Karaman koyununun sürdürülebilir koyun yetiştiriciliği için önemli bir ırk olduğu söylenebilir. Bu ırkın, üreme, besi ve süt verim özellikleri koyun yetiştiricileri özellikle göçer yetiştiriciler için önemlidir.

Anahtar Kelimeler: Yayla, kuzulama, yaşama gücü, besi, laktasyon.

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CONFLICT OF INTEREST

The authors declare no conflict of interest for this study.

AUTHOR'S CONTRIBUTIONS

The contribution of the authors is equal.

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