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Araştırma Makalesi/*Research Article (Original Paper)*

Some Growth, Reproduction and Lactation Characteristics of Hamdani Sheep

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Abstract: This research was conducted to determine some growth reproduction and lactation characteristics of fat tailed Hamdani sheep in extensive farm conditions in the Çığlı village of Çukurca district of Hakkari Province in Turkey. It was found out that average of birth weight, weaning weight and 6th month live weight were 4.13, 21.78 and 35.09 kg respectively. The average daily gains from birth to weaning and from birth to the 6th month were 171.98 and 196.30 g respectively. Hamdani, sheep giving birth between December to February, it's reproduction characteristics such as lambing rate, infertility rate, fecundity, twinning rate and litter size were found to be 92%, 8%, 1.04, 13.05% and 1.13 respectively. The survival rates of lambs until the 7th and 90th (until weaning) days were 98.5% and 94.6% respectively. The means of lactation milk yield and lactation length for ewes were 83.96 L and 170.98 days respectively. Consequently, it was concluded that Hamdani sheep had a better performance over performance for traits in question compared to Turkish native sheep breeds and some certain cross breeds developed and recently known in Turkey.

Keywords: Growth, Hamdani sheep, Milk yield, Reproductive traits, Weaning

Hamdani Koyunlarında Bazı Büyüme-Gelişme, Döl ve Süt Verim Özellikleri

Özet: Bu çalışma, Hakkari ili Çukurca ilçesi, Çığlı bölgesinde ekstansif (yetiştirici) koşullarda yetiştirilen yağlı kuyruklu Hamdani koyunlarının, bazı büyüme-gelişme, üreme ve süt verim özelliklerinin belirlenmesi amacıyla yapılmıştır. Hamdani kuzularında doğum, sütten kesim ve 6. ay canlı ağırlık ortalamaları 4.13, 21.78 ve 35.09 kg olarak bulunmuştur. Kuzularda doğumdan-sütten kesime ve doğumdan-altıncı aya ortalama günlük canlı ağırlık artışları da 171.98 ve 196.30 g olarak tespit edilmiştir. Aralık-Şubat ayları arasında doğum yapan Hamdani koyunlarının döl verim özelliklerinden doğum oranı, kısırlık oranı, koçaltı koyun başına doğan kuzu sayısı, ikizlik oranı ve doğuran koyun başına doğan kuzu sayısı sırasıyla %92, %8, 1.04, %13.05 ve 1.13 olmuştur. Koyunlar için ortalama laktasyon süt verimi ve laktasyon süresi ise 83.96 l ve 170.98 gün olarak tespit edilmiştir. Bu verilere dayalı olarak; Hamdani koyunlarının gerek yerli ve gerekse bazı melez koyun ırklarıyla karşılaştırılabilir özelliklere sahip olduğu sonucuna varılmıştır.

Anahtar kelimeler: Büyüme-gelişme, Hamdani koyunları, Süt verimi, Üreme özellikleri, Sütten kesim

Introduction

In addition to its role in human nutrition, sheep production has maintained its importance for centuries in agriculture and in terms of economics in Turkey. Turkey has a rich domestic animal population but a poor animal productivity. Reason for this is the high number of native breeds having traditional extensive production methods. Sheep population in Turkey is about 30 million heads (TUIK 2017).

Hamdani sheep, geographically Iran, northern Iraq and Turkey's Southeast, involving over a wide area are grown. Hamdani sheep of Iraqi origin and that "Karadi" of the types to be preferred of domestic sheep were reported (Aziz and Al-Oramary 2005). The greatest density of sheep is at the Eastern Anatolia. The environmental conditions are restrictive for optimum production. Especially, reared Hamdani sheep such as Hakkari, Van, Siirt, Şırnak, Batman, and Bitlis in Eastern and South-eastern Anatolia region of Turkey are preferred and wanted by sheep farmers. Therefore, it is demanded 10-20% more than other breeds in the market, although it is preferable for its selling price (Orkiz et al. 1984). Hamdani sheep are kept in their shed during cold season following lambing in February-March when each of them depends mainly on straw for feeding. During the rest of year, the

sheep are taken out to graze on pastures and stubble. Sheep are housed in simple and generally unhygienic sheep-sheds during winter, and they are generally fed on straw and haystack. The grazing period is about 6 to 7 months. The fat-tailed Hamdani sheep are known by their white body with black-brown head and black neck, high-legged and long-eared. The rams and ewes are generally hornless. They can be easily distinguished from other native breeds and varieties grown in the region with such feature (Ozturk 1998). The live weight and milk yield vary depending on their raising conditions. Hamdani sheep are favorable as characterized by their adaptation to adverse weather and conditions of feeding and strong flocking instinct.

The structural measures of traditional extensive production systems should be well defined from the standpoint of the nature condition, cultural structure, native breed characteristics, management methods and traditional cooperation for all different regions. This information is necessary to create contemporary breeding organizations in Turkey. More information is needed on the sheep production structure and the performance of native sheep breeds of Turkey in rural farm conditions.

Materials and Methods

The present study was carried out in 125 Hamdani ewes (2-4 years old) and their lambs to determine the production traits. They were maintained under the rural farm conditions in the Çığlı village of Çukurca district, Hakkari city, Turkey. The ewes were lambed from mid-December to February, and they were kept under similar management conditions. Ewes and lambs received routine vaccination and parasite treatment. In winter, animals were put in a barn with an outdoor lot and fed hay, straw and a small amount of concentrate. In grazing season, animals were grazed only.

The lambs' birth weight (BWT), age of dam, birth type, sex and birth weight were recorded within 24 hours after birth. From birth to six months of age, their live weight was measured and recorded every 30 days. Lambs were allowed to suck continuously from birth to 30 days postpartum. But after this, lambs were separated their dams at 18.00 pm and rejoined their dams at about 09.00 am and they were allowed to suck until 18.00 pm. After the parturition, the ewes were not milked up to three days. Lamb body weights were recorded at monthly intervals until six months of age. The lambs were weaned around 90 days after lambing and given crushed barley and wheat, lentil hay and wheat straw starting from about 3 weeks after lambing. The 3th month (weaning) and 6th month weights were computed by linear interpolation from recorded data, and weight gains at different ages were calculated.

The model used for analysis of birth weight, 90th, and 180th day live weight and birth - 90th, birth - 180 days daily live weight gain was as follows:

$Yijkl = \mu + ai + bj + ck + b1 + eijkl$

Where is;

Yijkl = the observation of lamb weights or daily live weight gains,

μ = the overall mean,

ai = the effect of dam age (i = 2, 3 and 4),

bj = the effect of birth type (j = 1(single); 2 (twin))

ck = the effect of lamb sex (k = 1 (male); 2 (female))

b1 = regression coefficient of body weight of dam at parturition on lamb birth weight, live weights of lambs at different periods or average daily live weight gains,

eijkl = random errors with the assumption

For lactation milk yield (LMY) and lactation length (LL), data from 111 ewes was used. The milk recordings of ewes were performed with an interval of 28 days throughout lactation period. Due to geographical location and transportation difficulties for place of work, measurements were taken only once a day throughout the working day. In the milk yield test day, the ewes were milked by handing once a day in the morning milking. Lactation milk yield and Lactation length were computed according to the procedure reported by Kaymakçı (2010) as follows:

Lactation milk yield: $\overline{X} = a \sum_{1}^{n} ki - \left(\frac{a}{2} - A\right)_{k1}$ (1)

Lactation length (day): L= n.a - (a/2 - A) (2)

Where is; $\overline{X}$ = avarage of lactation milk yield, a: milk recording interval (day), kı: milk yield (record at first individual measurement) (liter), A: days between lambing and the first recording (day), ki: milk yield (at any measurement day) (liter), $\sum_{1}^{n}$ ki: recording of milk day (liter).

The data was analyzed using SAS (2006) statistical package software. Differences between subgroup means were tested using the Duncan's test (Duncan, 1955). In the study, due to death of the two lambs in birth period and six of them during later period, recordings were conducted with a total of 122 lambs. Reproductive characteristics of ewes and survival rate of lambs were determined according to the results of lambing and weaning processes (Kaymakçı and Sönmez 1996).

Results and Discussion

Lambs growth performance

The results of tests for lamb weights for each age of dam, sex and birth type of lamb are presented in Table 1.

The average birth weight (BWT) were found as 4.13 kg varying between 3.91 and 4.33 in the present study. In a study conducted by Bingöl and Aktaş (Bingol 1998; Aktas et al. 2014), type of birth and sex of lamb affected BWT significantly. In some other researches, it was reported that age of dam did not have significant effect on BWT (Vanli and Ozsoy 1986; Koncagul et al. 2013). Like previous reports, the mean BWT of males was heavier than females (Gootwine and Rozov 2006; Aktas et al. 2014). Effect of the type of birth on BWT was significant and similar to some reports (Ceyhan et al. 2007; Ozturk and Odabasioglu 2011a). Twin lambs are preferable than the single lambs, because twin lambs are more economical, because of higher return.

Weaning Weight WWT (at the 90th day) and Six Month Live Weight (SMLW): for WWT (21.78 kg), results obtained in the study were similar to reports in previous studies (Ozturk and Odabasioglu 2011a; Abdul-Rahman and Al-Barzinjy 2007) conducted on Hamdani lambs. Live weight data of Hamdani lambs at WWT obtained in this study were higher than values obtained in other studies conducted for Akkaraman (Aktas et al. 2014), Karakaş (Gokdal 1998) and Norduz (Demirel et al. 2004). On the other hand, live weight of Akkaraman, İvesi and Kivircik lambs (Yakan et al. 2012) at WWT obtained in other studies were higher than the values of Hamdani lambs. Effect of age was insignificant similar to that data reported on WWT (Vanli and Ozsoy 1986) while the effect of year was significant in studies reported on Akkaraman and Zom sheep (Koncagul et al. 2013; Aktas et al. 2014). This can be explained by the fact that environmental and managemental conditions vary for these breeds. Effect of sex on WWT was significant ($p<0.05$), and males were heavier at weaning than females. This result is similar to those concluded in previous studies (Gootwine and Rozov 2006; Ceyhan et al. 2007) on Akkaraman and Zom sheep (Ozturk and Odabasioglu 2011a; Koncagul et al. 2013; Aktas et al. 2014). Mean live weight of Hamdani lambs at SMLW was 35.09 kg. Live weight of Hamdani (Dahal 2011) and Norduz (Bingol 1998) lambs was higher than the value determined in the present study for lambs of the same age. On the other hand, live weight of Karakas (Gokdal et al. 2006) and Kivircik (Yakan et al. 2012) at SMLW obtained in other studies were lower than the values related to Hamdani lambs.

Table 1. Least squares means (±se) tests of significance for lamb weights analysed and results of Duncan's multiple range tests for Hamdani lambs each factor

Factors		**BWT**		**WWT (90th day)**		**SMLW**		**ADWG1**		**ADWG2**
	N	$\overline{X} \pm S\overline{x}$	N	$\overline{X} \pm S\overline{x}$	N	$\overline{X} \pm S\overline{x}$	N	$\overline{X} \pm S\overline{x}$	N	$\overline{X} \pm S\overline{x}$
Age of dam								*		
2	33	4.10±0.05a	31	21.31±0.29	31	34.55±0.37b	31	169.17±1.98b	31	191.16 ± 3.23
3	64	4.13±0.04b	61	21.75±0.23	61	35.38±0.28ab	61	173.53±1.54ba	61	195.60 ± 2.51
4	31	4.12±0.04ab	31	21.68±0.27	30	35.51±0.34a	30	174.42±1.81a	30	195.36 ± 2.96
Sex		*		*		*		*		*
Male	45	4.33±0.04	43	22.40±0.25	43	36.38 ± 0.31	43	178.07±1.68	43	200.88 ± 2.74
Female	83	3.91±0.03	80	20.75±0.17	79	33.91 ± 0.22	79	166.68±1.18	79	187.20 ± 1.92
Birth type		*		*		*		*		*
Single	98	4.24±0.03	94	22.36±0.16	94	35.61 ± 0.19	94	174.26 ± 1.07	94	201.25 ± 1.75
Twin	30	3.99±0.06	29	20.80±0.34	28	34.67 ± 0.43	28	170.49 ± 2.30	28	186.83 ± 3.76
Overall	128	4.13±0.21	123	21.78±1.30	122	35.09 ±1.62	122	171.98 ± 8.75	122	196.30 ± 14.27

*:p<0.05, a b:p<0.05, N: Number, BWT: Birth weight, WWT: Weaning weight, SMLW: 6th Month weight, ADWG1: Average daily gains from birth to weaning, ADWG2: Average daily gains from birth to 6th month, N: Number

Average Daily Weight Gains (ADWGs): Table 1 shows standard errors of ADWG1, ADWG2 and the least square means. ADWG1 ($p<0.05$) was affected significantly by all factors in this study, but ADWG2 ($p<0.05$) was affected only by sex and birth type. According to these results, males grow faster than females during the period from birth to the 6-month age. In previous studies, significant effects of year, sex, and type of birth on ADWG1 were reported (Bingol 1998). Daily weight gains from birth to 6-month age among Norduz lambs (Bingol 1998) were similar to values obtained for Hamdani lambs. The ADWG2 (196.30 g) of lambs in the study was higher than that of Karakaş (Gokdal et al. 2006). Nevertheless, daily weight gains until 3-month age in this study were lower than values determined for Hamdani (Ozturk and Odabasioglu 2011a; Dahal 2011) and Norduz lambs (Bingol 1998). Since there were differences in maintenance conditions and genotype, it was difficult to make direct comparisons.

Milk yield

Lactation Milk Yield (LMY): In study, type of lambing and the age of dam had a significant effect ($p<0.05$) on lactation milk yield (Table 2). For this property, it is determined that this characteristic is in compliance with the declared property for age of sheep (Alkass et al. 2009) and parturition type (Al-Barzinji and Abdul-Rahman 2012). The calculated general average of LMY in Hamdan sheep was higher than Akkaraman and Hamdani X Akkaraman (Altin 2001) and Karakas (Karaca et al. 2003) while lower LMY was reported for Hamdani in another study (Ozturk and Odabasioglu 2011b). Values of LMY found in the present study were obtained from a single milking.

Lactation Lenght (LL): In study, the general average of LL of sheep was found as 170.98 days (Table 2). Effects of age were no significant while effects of parturition type were significant on LL ($p<0.05$). In terms of LL, Hamdani sheep was similar to Norduz (Koncagul et al. 2012b) and Akkaraman (Altin 2001) while it was longer than Awassi (Reidal et al. 2010) Karakaş sheep (Gokdal et al. 2000). On the other hand, LL obtained in this study was lower than findings reported for Hamdani ewes (Ozturk and Odabasioglu 2011b). As a result of the study and according to the field literature, not only the breed of sheep but also the environment and managerial condition in which a breed/sheep type raised affected LL.

Table 2. Least squares mean (±se), tests of significance for milk yield and lactation length and results of Duncan's multiple range tests for Hamdani ewes each factor

Factors	LMY (liter)		LL (day)	
	N	$\overline{X} \pm S\overline{x}$	N	$\overline{X} \pm S\overline{x}$
Age of dam		*		
2	31	87.22 ± 2.66c	31	176.30 ± 2.32
3	55	91.83 ± 1.82b	55	171.56 ± 1.56
4	25	100.35 ± 2.64a	25	175.79 ± 2.39
Fertility status		*		*
Single	96	81.48 ± 1.22	96	170.09 ± 1.15
Twin	15	104.79 ± 3.17	15	179.02 ± 2.59
Overall	111	83.96 ± 11.55	111	170.98 ± 10.72

*: $p<0.05$; a, b, c: $p<0.05$, LMY: Lactation milk yield, LL: Lactation length

Some reproductive performance of ewes and lamb survival rates (SRs)

The mean lambing (LR), infertility (IR), twinning rate (TW), fecundity (FEC) and litter size (LITS) were 92%, 8%, 13.05%, 1.04 and 1.13 respectively (Table 3). These study results were higher than previously reported findings for LR in Akkaraman sheep (Yakan et al. 2012), for IR on Karakas (Bingol and Aygün 2013), for TW on Hamdani (Ozturk and Odabasioglu 2011b), for FEC on İvesi and Morkaraman (Esenbuga and Dayioglu 2002) and for LITS on Norduz (Bingol 1998), while results obtained for FEC and LR in the present study were similar to those reported on Hamdani (Ozturk and Odabasioglu 2011b).

The survival rates of lambs until 7-day (SR1) and 90-day (SR2) lambs were 98.5% and 94.6% respectively. Such results of the study were higher than those found for SR1 and SR2 on Akkaraman lambs (Yakan et al. 2012), while results obtained for SR1 and SR2 were similar to those reported on Hamdani lambs (Ozturk 1998).

Table 3. Reproductive characteristics of ewes and survival rates of Hamdani lambs

Reproductive characteristics	Values
Lambing rate (LR)	92 %
Infertility rate (IR)	8%
Twinning rate (TW)	13.05 %
Fecundity (FEC)	1.04
Litter size (LITS)	1.13
Survival rates	Values
Survival rates of lambs (until 7th day from birth (SR1))	98.5%
Survival rates of lambs (until 90th day from birth (SR2))	94.6%

Consequently, this study is important since it was the first study conducted on Hamdani sheep in the Hakkari region of Turkey. The weight gain values and live weight in various periods of Hamdani lamb were found to be similar to values reported for the lamb of other breeds reared in the area. Information provided about the growth rates of this indigenous sheep will provide convenience for future studies. There is not much difference between Hamdani and native sheep breeds for LMY and LL, and they are believed to be enough for milk and meeting local needs including Norduz and Karakaş sheep in eastern Anatolia, Turkey. In Turkey, milk production shall continue to be an important economic trait of sheep. Compared to native sheep, high reproductive efficiency of Hamdani sheep is great advantage of this breed. The results indicated that some reproductive and survival rate traits of Hamdani ewes were concluded to be comparable determined by the characteristics of the study on other domestic ewe breeds.

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