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Effects of flushing during normal breeding season on reproductive performance and birth weights of lambs in Akkaraman Ewes

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Özet: Bu araştırma, normal yetiştirme sezonunda Akkaraman koyunların döl verimi üzerine flushing uygulamasının ve kuzuların doğum ağırlıkları üzerine bazı çevresel faktörlerin etkisini araştırmak amacıyla yapılmıştır. Araştırmada toplam 120 koyun kullanılmış, kontrol grubu ve flushing grubu olmak üzere her birinde 60 koyun bulunan iki eşit grup oluşturulmuştur. Kontrol grubuna günlük 8.61 MJ (düşük enerjili), flushing grubuna ise 13.68 MJ (yüksek enerjili) enerji içeren yonca ve arpadan oluşan rasyonlar verilmiştir. Östrus, gebelik, doğum, tek ve ikiz doğum oranları ve doğum başına düşen kuzu sayısı kontrol grubunda sırasıyla % 93.33, 86.67, 86.67, 90.38, 9.62 ve 1.096; flushing grubunda ise % 98.33, 88.33, 88.33, 79.25, 20.75 ve 1.208 olarak belirlenmiştir. Flushing grubundaki ikizlik oranı kontrol grubundan % 11.13 daha yüksek bulunmuştur (P>0.05). Sonuç olarak, düşük ve yüksek enerjili rasyonlarla beslenen Akkaraman koyunların döl verim özellikleri arasında istatistiksel bir farklılığın oluşmadığı belirlenmiştir. Ayrıca, kuzuların doğum ağırlıkları üzerine ana yaşı, doğum tipi ve cinsiyetin etkisi çok önemli (P<0.001), flushing uygulamasının etkisi ise önemsiz bulunmuştur (P>0.05).

Anahtar Kelimeler : Flushing, Akkaraman koyun, döl verimi, doğum ağırlığı

Abstract

This study was conducted to investigate effects of flushing during the normal breeding season on reproductive performance of Akkaraman ewes and environmental factors birth weights of lambs in Akkaraman sheep. A total of 120 ewes were used in this study. The ewes were allocated in equal numbers to 2 groups. The first group was control group, the second group was flushing group. While sheep in the control group received 8.61 MJ per day, sheep in the flushing group received 13.68 MJ per day. Rates of estrus, conception, birth and single-twin lambing and litter size were 93.33, 86.67, 86.67, 90.38, 9.62 % and 1.096 in the control group and 98.33, 88.33, 88.33, 79.25, 20.75 % and 1.208 in the flushing group, respectively. Twinning rate was 11.13 % greater in the flushing group compared with the control group (P>0.05). In conclusion, there were not significant differences between the mean values of reproduction characteristics of Akkaraman ewes subjected to low and high level energy of nutrition. Furthermore, effects of age of dam, type of birth and sex on birth weights of Akkaraman lambs were significant (P<0.001), but effect of flushing on birth weights of lambs was not significant (P>0.05).

Key Words: flushing, Akkaraman ewes, reproduction, birth weight

Introduction

Akkaraman sheep are found in Central, East and Southeast Anatolia in Turkey. Akkaraman is fat-tailed and the most commonly found sheep breed in Turkey. It is raised for both meat and milk production. Its wool is of carpet wool quality. In East Anatolia in Turkey, mating coincides with dry season (October, November) when rangelands are at their lowest nutritional quality.

Nutrition is one of the environmental cues that affect reproduction in domestic animals (1). Direct effects of poor nutrition are reflected in reduced conception, embryonic losses, reduced lambing rates (2). Selection and high level energy of nutrition can increase productivity and twinning rate. Some breeds and strains produce a higher percentage of twins and triplets (or more) than do others. High plane of nutrition is the practice of conditioning or having thin ewes gain in weight just prior to breeding. Its purpose is to increase to the ovulation rate and, consequently, the lambing rate. It is a widely accepted practice in sheep production to provide ewes with extra energy supply for 2-3 weeks prior to and during breeding, for the purpose of increasing the number of lambs produced (3).

ME requirement for 40-70 kg ewe is 9.8-13.1 MJ during mating (4). Flushing may negatively affect fertility in ewes (5, 6). Furthermore, high level of feeding which increased ovulation rates also increased embryonic mortality resulting in a lower lambing rate (7). However, other authors have shown that high plane of nutrition can improve reproductive performance in sheep (8,9). The aim of this study was to evaluate effects of different levels energy of nutrition during normal breeding season on reproductive performance and birth weights of lambs in Akkaraman sheep.

Materials and Methods

The experiment was conducted during October-November (normal breeding season) of 2002 in Van, in East Anatolia in Turkey. One hundred and twenty Akkaraman ewes, 3-5 years old, were used in this study. All ewes were individually identified by ear-tag and drenched with an anthelmintic. The ewes were allocated in equal numbers to 2 groups. Ewes in both groups were weighed at the onset and at the end of the experiment. The experimental period started on 20 October, lasted for 2 weeks pre breeding and the first 3 weeks of breeding. The ewes in the low level energy of nutrition (control) group were fed 800 g of alfalfa hay and 250 g of barley per animal per day for 35 days. The ewes in the high level energy of nutrition (flushing) group were fed 800 g of alfalfa hay and 700 g of barley per animal per day for 35 days. Ewes in both groups consumed the all feed fed throughout the experiment. Animals were fed twice a day at 12 h intervals. The low and high level energy of nutrition resulted in mean daily metabolizable energy (ME) intakes of 8.61 and 13.68 MJ respectively. Chemical compositions of barley and alfalfa hay were analyzed according to Cloge and Menke (10). Chemical compositions of feeds are presented in Table 1.

To minimize the influence that low and high level energy of nutrition might have on ram fertility, the rams were exchanged between the groups at regular intervals. Half of the rams in both groups were exchanged every 3 days (11). At the end of the experiment, single and twin bearing ewe lambing was recorded for each group. Barren ewes at the end of mating were identified. At birth, each lamb was identified, and the date of birth, sex, type of birth and birth weight were recorded.

Data on body weights of ewes were analyzed using the "t" test; data on estrus, conception, birth and single-twinning rates were analyzed using the chi-square (x2); data on litter size was analyzed using the Generalized Linear Model; data on birth weights of lambs were using least squares method (12). The difference between the mean values was determined statistically by using Duncan's test (13).

Table 1. Chemical compositions of alfalfa hay and barley, as-fed basis (%)

	Alfalfa hay	Barley grain
Dry matter	92.84	90.43
Ash	8.03	2.06
Organic matter	84.81	88.37
Crude protein	14.76	8.22
Crude fibre	26.49	4.64
Neutral detergent fibre	48.26	27.38
Acid detergent fibre	36.61	8.49
Ether extract	0.78	1.04
Non-fibre carbohydrates[1]	28.17	61.30
ME (MJ/kg)[2]	7.25	11.26

[1]: Non-fibre carbohydrates ? 100-(Crude protein, % + Neutral detergent fibre, % + Ether extract, % + Ash, %)

[2]: Metabolizable energy (ME) was calculated according to TSE (14)

Results

The means of body weights of ewes in the control and flushing groups at the initiation and at the end of the experiment are presented in Table 2. Body weights were 42.57 and 42.39 kg for the control and flushing groups at the initiation of the experiment, respectively. Body weights were 43.34 and 44.97 kg for the control and flushing groups at the end of the experiment, respectively. Ewes in the flushing group were 1.33 kg heavier at the end of the experiment than ewes in the control group. This difference was not significant.

Table 2. Body weights of Akkaraman ewes at the onset and at the end of the experiment (kg).

Age of ewes (year)	At the onset of the experiment					At the end of the experiment				
	n	Control Diet $\bar{X} \pm S\bar{x}$	n	Flushing Diet $\bar{X} \pm S\bar{x}$	Significance	n	Control Diet $\bar{X} \pm S\bar{x}$	n	Flushing Diet $\bar{X} \pm S\bar{x}$	Significance
3	26	41.00 0.50	23	40.39 0.62	ns	26	41.92 0.48	23	42.77 0.61	ns
4	19	40.72 0.73	22	41.31 0.34	ns	19	41.87 0.73	22	43.90 0.33	ns
5	15	47.62 1.47	15	47.03 1.65	ns	15	48.84 1.48	15	49.91 1.61	ns
Overall	60	42.57 0.61	60	42.39 0.59	ns	60	43.64 0.61	60	44.97 0.60	ns

$\bar{X}$: Mean; $S\bar{x}$: Standard error of means; ns: non-significant

Differences between means in same row are not significant (P>0.05).

Reproductive traits for the control and flushing groups at the end of the experiment are presented in Table 3. Estrus, conception, birth, single born, twinning rates and litter size in the control group were 93.33, 86.67, 86.67, 90.38 % and 9.62 % and 1.096, respectively and in the flushing group were 98.33, 88.33, 88.33, 79.25 % and 20.75 % and 1.208, respectively. Estrus, conception, birth, twinning rates and litter size of Akkaraman ewes subjected to in the high level energy of nutrition (flushing group) during normal breeding season were improved. Twinning rate were 11.13 % greater in the flushing group compared with control group. However, there were no significant differences between groups for the mean values of these characteristics.

Table 3. Reproductive performances of Akkaraman ewes at the end of the experiment.

	Control Diet	Flushing Diet
Estrus (%)	93.33	98.33
Conception (%)	86.67	88.33
Birth (%)	86.67	88.33
Single (%)	90.38	79.25
Twinning (%)	9.62	20.75
Litter Size	1.096	1.208

Differences between means in same row are not significant (P>0.05)

Significant probabilities for each main effect and subclass mean (±standard errors) for levels energy of nutrition, age of dam, type of birth and sex of lamb on birth weight of lambs are presented Table 4. The least squares means of birth weights of lambs were 3.037±0.058 and 3.145±0.049 kg, respectively, for the control and flushing groups. In general, birth weight for Akkaraman lambs was 3.091 kg. Effects of age of dam, type of birth and sex of lamb on birth weights of Akkaraman lambs were significant (P<0.001), but effect of nutrition on birth weights of lambs was not significant (P>0.05).

Table 4.Least squares means, standard errors and significance probabilities for birth weights of lambs.

Factors	n	Effects	$\bar{X}$	S $\bar{x}$
Expected mean	121		3.091	0.040
Level energy of nutrition	ns			
Control Diet	57	-0.054	3.037	0.058
Flushing Diet	64	0.054	3.145	0.049
Age of dam	***			
3	45	-0.403	2.688^{c}	0.063
4	46	0.134	3.225^{b}	0.061
5	30	0.269	3.360^{a}	0.071
Type of birth	***			
Single	89	0.626	3.717	0.042
Twin	32	-0.626	2.465	0.069
Sex of lamb	***			
Male	52	0.161	3.252	0.057
Female	69	-0.161	2.930	0.050

ns : P>0.05

***: Values in columns with different letters are significant (P <0.001)

Discussion

In the experiment, the ewes were fed equal amount of alfalfa hay and supplemented with 250 g or 700 g of barley per ewe daily. The rations consist of low density energy (ME 8.61 MJ) and high density energy (ME 13.68 MJ). In the present study, ME level in the flushing group was similar to that recommended by Tuori et al. (4).

Flushing has not always influenced the lambing performance (15). Since the effect of flushing on live weight was apparently minimal, it must therefore be assumed that the increased litter size, as suggested by the results of Gunn et al. (16), was related to an increase in ME intake, which affected the ovulation rate directly and not through any increase in body condition.

In spite of an increase in live weight of the ewes during high level energy of nutrition in this study, even the higher rate of supplementation did not significantly increase prolificacy. The effects of high level energy of nutrition was not significant on the number of lambs born, but numerically greater compared with those sheep fed low level energy of nutrition. In the literature there has been little or no response to increased nutrition prior to mating (17).

In the experiment, conception rate of the flushing group averaged 88.33 %, which is lower than that of Akkaraman 90 % (18), Karacabey Merino 92.9 % (19), higher than that of Kıvırcık 87 % (20).

In the present study, the effect of barley supplementation was not significant on the ewe's reproductive performances. But, litter size tended to be higher in sheep fed flushing diet compared with those fed control diet. Litter size, of the

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flushing group averaged 1.208, which is lower than those of DS (D'man and Sardi crosses) 1.55 (21), Akkaraman 1.77 (18), Romanov, Rasa, Salz, Romanov x Rasa (F_1) (2.34, 1.40, 1.71 and 1.87, respectively) (22), Karacabey Merino 1.57 (19), but higher than that of Polypay breed 1.14 (23).

Effects of sex, type of birth and age of dam were significant on birth weights of lambs which are in agreement with the results of Aslan et al. (24). The effect of high level energy of nutrition on birth weights of lambs was not significant which is in agreement with that reported by Ogan et al. (19) for Karacabey Merino lambs. However, Reese et al. (25) reported that energy supplementation resulted in a significant ($P<0.01$) effect on lamb birth weight. El-Hag et al. (26) reported that energy supplementation had resulted in a significant ($P<0.05$) effect on lamb birth weight.

In conclusion, there were no significant differences between the mean values of estrus, conception, birth, twinning rates, litter size and body condition of Akkaraman ewes subjected to low and high planes of nutrition. Effects of age of dam, type of birth and sex of lamb on birth weights of Akkaraman lambs were significant ($P<0.001$), but effect of level energy of nutrition was not significant.

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