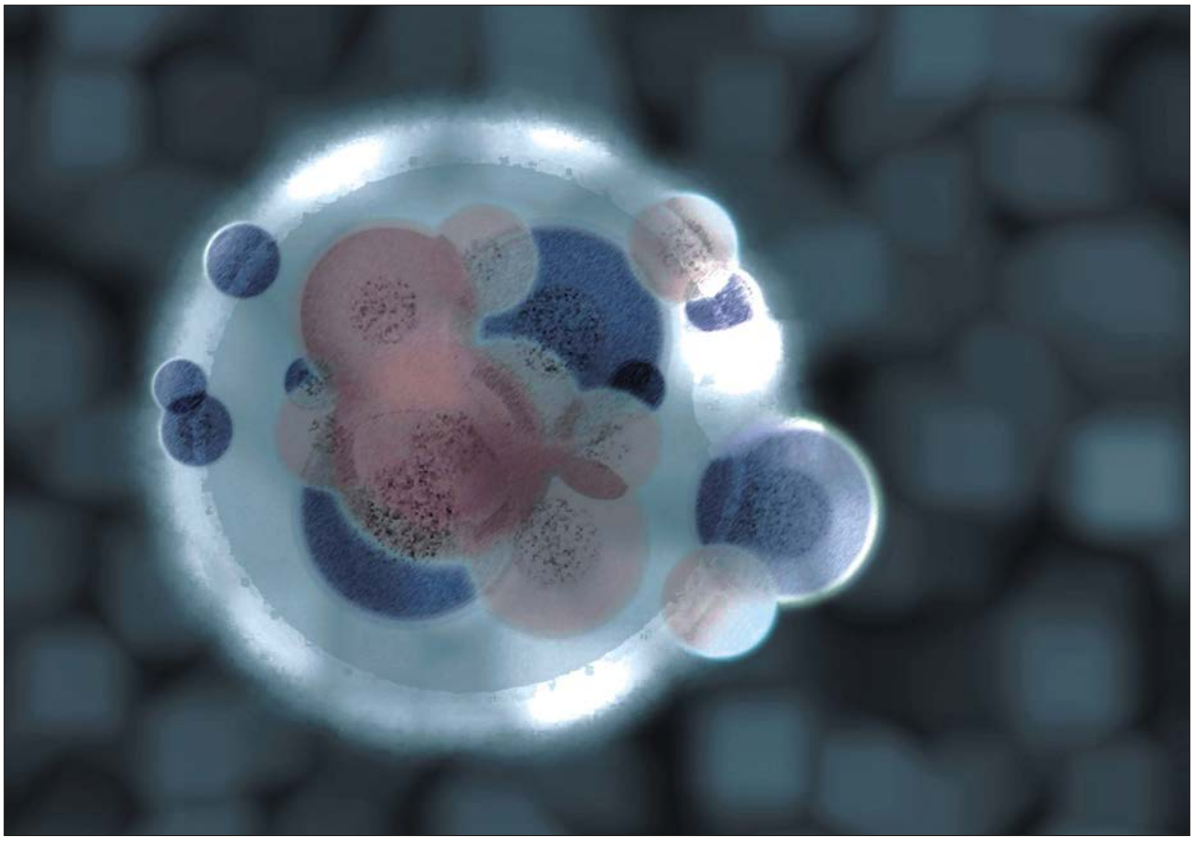

Journal of Biological Sciences

ISSN 1727-3048

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Journal of Biological Sciences 4 (3): 283-287, 2004
ISSN 1727-3048

Effects of Different Feeding Levels During Mating Period on the Reproductive Performance of Norduz Ewes and Growth and Survival Rate of Their Lambs

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Abstract: A total of 78 Norduz ewes and their lambs were used in the study. Group 1 (control) was grazed only on pasture and Group 2, 3 and 4 were supplied with 200, 300, 600 g^{-1} head day $^{-1}$ rolled barley, respectively, in addition to pasture. There were increases in live weights in Norduz ewes in response to supplementary feeding during feeding period ($P<0.01$). Feed supplementation during mating period did not affect reproductive traits. The effect of ewe age on the twinning rate and litter size ($P<0.01$) and fecundity ($P<0.05$) was significant. The mean lamb birth weight, weaning weight, daily live weight gain and survivability at weaning were 4.65 kg, 19.29 kg, 192 g and 96.43%, respectively. In conclusion, supplementary feeding in addition to grazing during breeding season affected live weight in Norduz ewes but not other reproductive traits. Further detailed studies should be carried out in order to determine the effects of supplementary feeding on reproductive traits in this breed.

Key words: Norduz ewes, supplementary feeding, reproductive performance, lamb traits

INTRODUCTION

Reproductive efficiency is one of the important subjects in economical sheep farming. Since heritability of reproductive traits, e.g. litter size, is low in sheep and this trait is largely affected from environmental factors[1], especially feeding, special care should be given to feeding practices during breeding season in genetic improvement programs. In East Anatolia Region in Turkey, ram introduction period is within autumn season. Since this period is characterised with insufficient supply of forage to meet the maintenance requirement of grazing ewes during breeding season it was reported that if sheep grazed on these areas enter ram introduction period with poor body condition some reproductive losses would occur, however, if a short term supplementary feeding applies during this period it would improve reproductive performance in these animals[1]. It is well established that supplementary feeding for 2-3 weeks prior to and 2-4 weeks during ram introduction increases litter size and reduces infertility rate[2,3]. Body weight and condition of ewes, quality and amount of feed affect the success of improving reproductive efficiency[1,4,5].

Norduz sheep is considered as a subtype of Akkaraman, a native breed of the Turkey comprising the largest number of native sheep breeds. This type of breed is present in a restricted area known as Norduz region characterised with high quality and quantity forage producing rangelands. The first attempt to identify various characteristics of Norduz sheep was mediated by Bingöl[6] in their natural living area. As it is the case at Yüzüncü Yil University sometimes farmers living outside Norduz region prefer to raise these sheep in their farms. Differing from Norduz region, the rangeland characteristics of Yüzüncü Yil University are very similar to that of East Anatolia Region which characterised with insufficient supply of forage to meet the maintenance requirement of grazing ewes during breeding season. It is not known how Norduz ewes raised outside their habitat are affected from supplementary feeding.

In ewes of many breeds body condition and level of feed intake affect ovulation rate[1], however, in some breeds this rate is independent of body condition and level of feed intake[7,8]. In the ewes having similar genetic constitution live weight alone has been found to be a more accurate predictor of ovulation rate than body condition[9]. The effects of supplementary feeding in addition to grazing during breeding season on live weight and reproductive characteristics in Norduz ewes have not been studied. On the other hand, there are not much data about lamb characteristics of Norduz sheep. Therefore the purposes of this study are to determine the effects of supplementary feeding in addition to grazing during breeding season on reproductive traits of Norduz ewes

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raised outside their natural habitat and several characteristics of their lambs at various periods.

MATERIALS AND METHODS

78 Norduz ewes raised in Yüzüncü Yil University, Faculty of Agriculture Sheep Facility (2-4≥yr old) were assigned into four groups as one control (Group 1, n=20) and three supplement groups (Group 2, n=20; Group 3, n=19 and Group 4, n=19). Supplement groups were fed with rolled barley for 6 weeks and this started 3 weeks before introduction of ram. Control group was grazed only on pasture and supplement groups were fed with 200, 400 or 600 g day^{-1} $animal^{-1}$ rolled barley, respectively, in addition to pasture. Rams used in the study were supplemented with 600 g day^{-1} $animal^{-1}$ rolled barley during mating period. Free mating system was applied and mating period lasted for three weeks. In order to determine the mated ewes, ram introduction was mediated at the facility twice a day. During the last 6 weeks of their pregnancy ewes in all groups were given 650 g barley, 1,5 kg chopped alfalfa hay; and from lambing until weaning they were given 600 g concentrate and 2.0 kg chopped alfalfa hay per animal at daily bases. Data recorded related to breeding season were initial body weight, body weight at the end of ram introduction. Lambing rate, twinning rate and lamb numbers per lambed and mated ewe, ewe weight at lambing and lamb birth weights were determined at lambing season.

Lambs received only milk of their mothers during the first 15 days after lambing and then they were made accustomed to concentrate and chopped alfalfa hay. Accordingly, 130 g concentrate and 150 g chopped alfalfa hay were supplied to the suckling lambs at a daily basis. Nutrient contents of the feed used in the study were given in Table 1. Lambs were weighed at lambing and then at 15, 30, 45, 60 and 75 th day of age following a 12 hours fasting period. All lambs were weaned at 75 days of age. Feed was analysed for dry matter, crude protein, fat and ash content[10] as well as ADF and NDF content[11].

Live weights of ewes and lambs were analysed using following model:

$$y_{ijklm}=\mu+G_i+A_j+B_k+S_l+b(X_{ijklm}-\bar{x}_{ijklm})+e_{ijklm}$$

where μ is population mean; G, A, B and S are the effects of group, age, birth type and sex of the animals, respectively b is regression for initial ewe weight and lamb birth weight for ewe weights and lamb weights at various ages, respectively; e_{ijklm} is the experimental error; X and are birth weight and $\bar{x}$ average birth weight, respectively. Solution of this equation was analysed using least square technique. Least square analysis were mediated in SAS/GLM procedure. Duncan test was utilised for determining differences among the means. Since distribution of discrete data such as reproductive traits and survivability is binomial, SAS/GENMOD was utilised in the evaluation of the effects of supplement groups and ewe age on these traits[12].

Table 1: Nutrient contents of the feed used in the study (%)

	Rolled barley	Concentrate for ewes	Concentrate for lambs	Chopped alfalfa hay
Dry matter	90.65	90.67	90.07	90.42
Organic matter	97.25	84.45	89.08	91.26
Crude protein	9.81	12.28	12.86	10.40
Crude fat	1.82	2.43	2.41	1.89
Crude ash	2.75	15.55	10.92	8.24
ADF	8.22	19.00	15.75	47.88
NDF	50.40	44.55	49.67	55.25

RESULTS AND DISCUSSION

The effect of supplementary feeding on live weight during ram introduction period was significant ($P<0.01$), however, the effect of ewe age was not significant. These results are in agreement with previous reports that various ewe breeds respond positively to supplementary feeding during breeding season[3,13,14]. The effect of initial weight on live weight at the end of ram introduction was significant ($P<0.01$). This indicates that using the initial weight as a regression factor is important in such studies (Table 2).

Infertility rate was higher in Group 2 than control group ($P<0.05$), but there were no differences in this trait among other groups. Supplementary feeding did not affect twinning rate and lamb number per lambed and mated ewe. Overall reproductive traits of Norduz ewes observed in the present study were similar to those reported by Bingöl[6] in their natural habitat. Although some investigators reported that supplementary feeding did not affect reproductive efficiency[7,8,13,15] others reported that depending on some factors such as the amount and quality of supplementary feeding, duration of feeding, condition and age of ewe, this practice reduced infertility rate[14], increased twinning rate, lamb number per mated and lambed ewe[2,3,16]. Various mechanisms involved in improving reproduction via feeding are proposed[17]. Some of them are related to increase in ovulation rate while others are related to embryo survival. Although it is difficult to speculate using current findings, one possibility for why supplementary feeding did not improve reproductive efficiency in Norduz sheep might be that ovulation rate is independent level of feed intake in this breed. Thus, this phenomenon was observed in some studies[7,8]. Nevertheless, some detailed studies are

Table 2: Mean (±SEM) live weights (kg) and some reproductive traits in Norduz ewes subjected to various levels of supplementary feeding during mating season

	N	Initial live weight	Live wt at the end of ram introduction	Infertility rate (%)	Lamb number per mated ewe	N	Lamb number per lambed ewe	Twinning (%)
General	78	55.18±1.02	57.21±0.39	5.13±2.20	1.09±0.43	74	1.15±0.36	14.86±3.58
Feeding groups			**	*				
Group 1	20	54.95±1.03	56.22±0.39c	0.00±0.00a	1.15±0.37	20	1.15±0.37	15.00±3.66
Group 2	20	54.95±1.02	56.89±0.39bc	10.00±3.08b	1.00±0.46	18	1.11±0.32	11.11±3.23
Group 3	19	55.58±1.02	57.72±0.40ab	5.26±2.29ab	1.16±0.50	18	1.22±0.43	22.22±4.28
Group 4	19	55.22±1.02	58.07±0.40a	5.26±2.29ab	1.05±0.40	18	1.11±0.32	11.11±3.23
Dam age groups		**			*		**	**
2 Yr	27	48.39±0.86c	57.39±0.43	3.70±1.93	0.96±0.19b	26	1.00±0.00b	0.00±0.00b
3 Yr	32	54.72±0.79b	57.22±0.30	6.25±2.46	1.09±0.47a	30	1.17±0.37a	16.67±3.79b
4 Yr	19	62.41±1.05a	57.07±0.53	5.26±2.29	1.26±0.56a	18	1.33±0.39a	33.33±4.85a
Initial live wt regres.			0.91±0.04**					

*p<0.05 **p<0.01 a, b, c: Means with different letter(s) within the same column were different

Table 3: Mean (± SEM) lambing weights of Norduz ewes and their lambs' live weights at various periods (kg)

	N	Ewe lamb weight	N	Lamb birth weight	Live wt at 15 days of age	N	Live wt at 30 days of age	Live wt at 45 days of age	N	Live wt at 60 days of age	N	Live wt at 75 days of age
General	73	65.51±1.37	84	4.65±0.15	9.54±0.51	78	11.85±0.41	14.86±0.47	73	17.35±0.54	64	19.29±0.74
Feeding groups												
Group 1	16	65.14±1.31	24	4.49±0.15	9.27±0.50	21	11.30±0.41	14.70±0.46	21	17.07±0.51	17	18.89±0.76
Group 2	19	67.37±1.42	18	4.64±0.16	9.23±0.51	19	12.10±0.42	15.23±0.48	19	18.04±0.53	15	19.71±0.75
Group 3	19	64.89±1.31	18	4.87±0.15	10.32±0.48	20	12.19±0.39	15.00±0.44	18	17.39±0.51	18	19.89±0.66
Group 4	19	64.71±1.45	24	4.59±0.16	9.33±0.55	18	11.85±0.44	14.51±0.49	15	16.82±0.61	14	18.56±0.82
Dam ages groups		**								**		
2 Yr	25	58.25±1.44c	23	4.55±0.18	9.41±0.55	22	11.43±0.45	14.02±0.52	20	16.32±0.59b	17	18.82±0.82
3 Yr	30	65.05±1.08b	27	4.67±0.12	9.76±0.40	33	11.70±0.32	14.37±0.36	30	17.24±0.44ab	27	18.66±0.58
4 Yr	18	73.29±1.21a	28	4.71±0.18	9.45±0.44	23	12.45±0.36	16.19±0.41	23	18.43±0.45a	20	20.30±0.62
Sex				**								*
Male			35	4.93±0.12	9.60±0.39	36	12.04±0.32	15.23±0.36	35	17.80±0.41	31	20.22±0.55
Female			49	4.36±0.12	9.48±0.40	42	11.67±0.32	14.49±0.36	38	16.86±0.43	33	18.30±0.63
Birth type				**	**		**	**		**		**
Single			55	5.05±0.18	10.61±0.30	57	12.78±0.24	16.37±0.28	54	19.26±0.31	47	21.90±0.43
Twin			29	4.24±0.16	8.46±0.54	21	10.75±0.44	13.34±0.49	19	15.40±0.59	17	16.63±0.82
Lamb birth wt regr.								1.15±0.34**		1.24±0.40**		0.92±0.56
Dam lamb wt regres.				0.028±0.01**								

* p<0.05 ** p<0.01. a, b, c: Means with different letter(s) within the same column were different

needed to support this proposal. Older ewes had higher twinning rate (P<0.01), lamb number per mated ewe (P<0.01) and lamb number per lambed ewe (P<0.05).

Lambing weight was affected from dam age (P<0.01). These results are in agreement with other reports that lambing weights of 2 yr old ewes were lower than that of 3 and 4≥yr old ewes[18,19]. The mean birth weight of lambs was 4,65 kg (Table 3). Previously, Bingöl[6] reported 4,15 kg birth weight for this breed raised in rural conditions. Aygün and Bingöl[6] reported 4,20 kg birth weight in semi-intensive conditions. Relatively high birth observed in the present study could be attributed to the feeding during the last 6 weeks of the pregnancy. The effect of dam age on lamb birth weight was not significant, however, the effect of sex, birth type and lambing weight on this trait were significant (P<0.01).

Live weight at weaning (75 d) was not affected from dam age and birth weight regression but affected from sex (P<0.05) and birth type (P<0.01). Previous reports support these findings that sex[2,14,21] and birth type[2,14,18,21] affected weaning weight in native breeds.

Average daily live weight gains, live weights changes and survivability rates of lambs were given in Table 4. Birth type affected all lamb traits (P<0.01), except survivability. On the other hand, live weight changes and daily live weight increase were affected from sex (P<0.05). There was no dam age effect on any lamb traits, however, as in agreement with previous findings, live weights and changes in live weight were higher in 4 yr old ewes[2,14].

Daily live weight gain in Norduz lambs was not affected from birth weight regression, however, the differences in this trait were significant between male and female lambs (P<0,05) and single lambs and twins (P<0,01). Similar results were reported for this trait previously[6,21].

Survivability rates were not affected from any traits. Survivability rates for this genotype at this age in their natural habitat were similar to the findings of the present study[6]. This might be an indication that Norduz sheep could be raised out of their natural habitat without

Table 4: Mean (± SEM) daily weight gain (g), live weight changes (g) and survivability rates (%) of Norduz lambs

	N	Daily wt gain	N	Live wt changes	N	Survivability rate
General	64	0.19±0.01	64	14.42±0.74	84	96.43±1.87
Feeding groups						
Group 1	17	0.18±0.01	17	14.02±0.76	23	95.65±2.09
Group 2	15	0.19±0.01	15	14.84±0.75	20	95.00±2.24
Group 3	18	0.20±0.01	18	15.02±0.66	22	95.45±2.13
Group 4	14	0.18±0.01	14	13.69±0.82	19	100.00±0.00
Dam ages groups						
2 Yr	17	0.18±0.01	17	13.95±0.82	26	92.31±2.72
3 Yr	27	0.18±0.01	27	13.79±0.58	34	100.00±0.00
4 Yr	20	0.20±0.01	20	15.43±0.62	24	95.83±2.04
Sex		*		*		
Male	31	0.20±0.01	31	15.35±0.55	38	94.74±2.26
Female	33	0.17±0.01	33	13.43±0.63	46	97.83±1.47
Birth type		**		**		
Single	47	0.22±0.01	47	17.03±0.43	62	96.77±1.78
Twin	17	0.15±0.01	17	11.76±0.82	22	95.45±2.13
Lamb birth wt regres.		-0.00±0.008		-0.07±0.56		

*p<0.05 **p<0.01 a, b: Means with different letters within the same column were different

lowering survivability rate but it is hard to speculate about their other production traits.

In conclusion, while supplementary feeding in addition to grazing during breeding season increased live weight in Norduz ewes this practice did not affect twinning rate, lamb number per mated and lambed ewe, lamb weights at various ages and survivability rates. Apparently, Norduz ewes respond to supplementary feeding, nevertheless, further detailed studies in which some facts such as body condition, rangeland situation and various levels of feed supplements are included should be carried out in order to determine the effects of supplementary feeding on reproductive traits. It is believed that the presented study has produced some useful data on this genotype for the next investigations.

ACKNOWLEDGMENTS

This study was supported by Yüzüncü Yil University Research Fund. Project no: 2001-ZF-062. The authors whish to thank Dr. Serhat Arslan for statistical advising.

REFERENCES

1. Gordon, I., 1997. Induction of multiple births in sheep. In: Controlled Reproduction in Sheep and Goats: 205-240.
2. Baş, S., M.K. Özsoy and Y. Vanli, 1986. The effects of supplementary feeding at different periods prior to ram introduction on reproduction in ewes, growth and survivability in lambs. Doğa Bil. Derg., 10: 221-234.
3. El-Hag, F.M., B. Fadlolla and M.A. Elmadih, 1998. Effect of strategic supplementary feeding on ewe productivity under range conditions in North Kordofan. Small Rum. Res., 30: 67-71.
4. Işik, N., 1998. An investigation on the effects of rations with various energy content given prior to mating on reproductive performance of Akkaraman ewes. A.Ü. Zir. Fak., 1980, Yay. No: 774.
5. Başpinar, H., M. Oğan, E.S. Batmaz and M. Petek, 1996. An investiation on the main production performance of Karacabey Merine sheep under semi-intensive conditions. I. Fertility traits, milk production and body weight at mating. Hayvancilik Araştirma Dergisi, 6: 40-44.
6. Bingöl, M., 1998. Reproductive, milk, growth and developmental traits in Norduz sheep). Ph.D. Thesis. Yüzüncü Yil University, Fen Bilimleri Enst., Van, Turkey.
7. Doney, J.M. and R.G. Gunn, 1973. Progress in studies on the reproductive performance of hill sheep. Hill Farming Res. Org., Sixth Report, pp: 69-73.
8. Rhind, S.M. and B.D. Schanbacher, 1991. Ovarian follicle populations and ovulation rates of Finnish Landrace cross ewes in different nutritional states and associated profiles of gonadotrophins, inhibin growth hormone (GH) and insuline-like growth factor-I. Dom. Anim. Endoc., 8: 281-291.
9. Cumming, I.A., 1977. Relationships in the sheep of ovulation rate with live weight, breed, season and plane of nutrition. Aust. J. Exp. Agric. Anim. Husban., 17: 234-241.
10. Akyildiz, A.R., 1974. Feed Laboratory Manual. A.Ü. Zir. Fak. Yay., 1974. No: 895, 213.
11. Van Soest, P.J., J.B. Robertson and B.A. Lewis, 1991. Methods of dietary fiber, neutral detergent fiber and nonstarch polysaccharides in relation to animal nutrition. J. Dairy Sci., 74: 3583-3597.

12. Akmaz, A. and H. Akçapinar, 1990. The effects of various levels of nutrition before mating and at late pregnancy on the reproductive performance of Konya Merino ewes and growth and survival rates of their lambs. Tr. J. Vet. Anim. Sci., 14: 301-319.
13. SAS., 1998. PC SAS User's Guide:Statistics. SAS Inst., Cary.
14. Filya, I., A. Karabulut and V. Akgündüz, 1996. The effects of notritional levels on reproductive prformance of ewes and growth and survival rates of their lambs atmating priod and last period of gestation. Hayvancilik Ulusal Kong., 18-20, Eylül, pp: 248-256.
15. Özder, M., I.Y. Yurtman and E. Köycü, 1988. The effects of supplementary feeding during mating period in Türkgeldi ewes having different condition score II. Ulusal Zootekni Bilim Kongresi, 22-25, Eylül, Bursa, pp: 311-319.
16. Reese, A.A., S.W. Handayani, S.P. Ginting, W. Sinulingga, G.R. Reese and W.L. Johnson, 1990. Effects of energy supplemantation on lamb production of Javanese thin-tail ewes. J. Anim. Sci., 68: 1827-1840.
17. Boland, M.P., P. Lonergan and D. O'Callaghan, 2001. Effect of nutrition on endocrine parameters, ovarian physiology and oocyte and embryo development. Theriogenology, 55: 1323-1340.
18. Demirel, M., T. Aygün, T. Altin and M. Bingöl, 2000. The efect of different levels of feeding in late gestation on ewe weight, lamb birth weight and lamb growth of Karakas and Hamdani ewes. Tr. J. Vet. Anim. Sci., 24: 243-249.
19. Gökdal, Ö., H. Ülker, M. Oto, C. Temur and C. Budağ, 2000. Some yield traits and body measurements of Karakaş ewes in rural farm conditions. Yüzüncü Yil University, Zir. Fak. Tar. Bil. Derg., 11: 103-111.
20. Aygün, T. and M. Bingöl, 1999. Comparison of he birth weights of Karakaş and Norduz lambs. Uluslararasi Hayv. Kong. Izmir, 21-24, Eylül, 738-7742.
21. Esen, F. and N. Yildiz, 2000. Production characteristics of White Karaman, Chios x White Karaman (F1) crossbred lambs. Tr. J. Vet. Anim. Sci., 24: 223-231.