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Effect of Body Condition Score, Live Weight and Age on Reproductive Performance of Afshari Ewes

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ABSTRACT

Effect of Body Condition Score (BCS), ewe live weight and age at mating were studied on reproductive performance of Afshari ewes. Total 162 Afshari ewes divided in four BCS Group (2, 2.5, 3 and more than 3.5). Reproductive parameters, such as number of Lambs born per joined ewes, kilograms (kg) lambs born per joined ewes, gestation period and birth weight of lambs were determined. Obtained results from present study showed that, the BCS had a significant effect on lambs born per joined ewes ($p<0.05$). In BCS = 3 reproductive performance was better and heavier lambs (kg) were born. While the lambing rate in ewes with BCS >3.5 declined. Estrus cycle in ewes with BCS = 3 was normal, while in ewes with BCS 2 and 2.5, estrous cycle duration was shorter and more irregular. Number of lambs born per lambing in ewes with 74 to 80 kg weighing was higher. Effect of BCS and ewes weight on weaning weight was very significant ($p<0.001$) and followed by ewes weight increases, lambs weaning weight increased. Effect of ewe age on pregnancy period was significant ($p<0.05$). Ewes with two years old age had lower gestation period and this factor in eight years old ewes was highest. Results revealed, the importance of BCS on lambs born per joined ewes, lambing rates, positive effect of ewe weight on the number of lambs born per lambing and the impact of age on pregnancy period.

Key words: Afshari ewes, body condition score, reproduction, body weight

INTRODUCTION

Effect of BCS, live weight (static effects) and changes in BCS and live weight (dynamic effects) before mating, during mating and after mating period, on reproductive efficiency of different breeds of sheep in the different rearing systems were studied (Coop, 1966; Gonzalez *et al*., 1997; Gunn and Doney, 1975; Cam *et al*., 2010). Most of researchers have reported that, the absolute effects of BCS and live weight than their variations have greater impact on sheep reproduction efficiency, which suggest the importance of breed and interactions with nutritional and physiological conditions and its impact on reproduction efficiency (Gunn, 1983; Koycegiz *et al*., 2009). A correlation exists between BCS, live weight and amount of reserving body fat (Oregui *et al*., 1997). Also to prediction of adult weight of sheep with different genotypes, BCS is suitable (Zygoyiannis *et al*., 1997). Live weight is a combination of skeleton size and BCS and it's not a good representative to evaluate the reproductive efficiency (Adalsteweight affected by factors

such as skeleton scheme (body si e), fullness or hunger trap (filled or empty digestive tract) or being wet wool (Demirel *et al*., 2004). BCS in many studies, often in tailed ewes, using as an indicator of obesity and impotence of ewes (Doney *et al*., 1982; Ducker and Boyd, 1977; Adalsteinsson, 1979). Also many researchers have reported that, fertility affected by BCS (Doney *et al*., 1982; Guerra *et al*., 1972; Gunn, 1983; Koyuncu, 2005; Madani *et al*., 2009). The criteria related to the amount of muscle tissue and fat covering the vertical and horizontal redundancy of lumbar vertebrae, behind and above the kidney area (Thompson and Cheeke, 2005). Garcia *et al*. (2002) showed the significant effect of body to initiation of lambs' puberty. Ewes' age is an essential factor to optimize production efficiency and reproduction of different breeds of sheep. Gaskins *et al*. (2005) reported the significant effect of ewes' age on fertility and lambing season, also by increase in ewes age from two to five years old, number of non breeding ewes declined also they reported the insignificant effect of maternal age on birth weight. The aim of present study was to evaluate the effect of BCS, ewe live weight and age, on reproductive performance of Afshari ewes.

MATERIALS AND METHODS

The experiment was conducted during the breeding season (October to February), at the Zanjan University farm located in Zanjan city. One hundred sixty two cycling, multiparous fat-tailed Iranian Afshari ewes, weighing 52-80±2.5 kg and aging 2-8 years old were used in the trial. All Animals were provided with water and manually fed alfalfa hay, supplemented with grain pellets and *ad libitum*. One to two weeks before ram induction, ewes' BCSs were determined and weighing performed.

Heat detection for two estrous cycles was conducted by teaser rams (with apron). Then heat joined ewes to selected fertile rams. Evaluation of BCS was done by touching redundancy and cross waist cord vertebrae with 0. 5 point intervals (Russel *et al*., 1969). Ewes divided in four BCS groups (2, 2.5, 3≤3.5) (Table 1) and body weight of the four groups (52-59, 60-66, 67-73, 74-81) were assigned (Table 2). Evaluation of ewe BCS with three referee comment and agreement was done. Statistical design was conducted with randomized complete block design. BCS intended as treatment and weight as covariate. Statistical analysis of this study was conducted with GlM and Mixed procedures in SAS and SPSS software. Duncan method was used for means comparison. Statistical model used is as follows:

$$Y_{ijkmn} = \mu + A_i + B_j + E_k + S_m + D_n (S_m) + E_{ijkmn}$$

Where:

Y_{ijkmn}	=	Value of each observation
μ	=	Overall mean
A_i	=	Effect of BCS
B_j	=	Effect of ewe weight
E_k	=	Age of ewe
S_m	=	Effect ram
$D_n (S_m)$	=	Randomized effect of ewe (Nest) within ram
ε_{ijkm}	=	Experimental error

RESULTS AND DISCUSSION

The obtained results of present study showed that, the fertility and fecundity traits at mating time were significantly ($p<0.05$) affected by ewes Body Condition Score (BCS) (Table 2). Fertility rate in ewes with BCS = 3 was highest and in high body condition score (3.5 or more) was lowest. The lambs born/ewes at mating and kilograms lambs born in ewes with BCS = 3 were significantly more than those in other groups. Lambs born per joined ewes (EB/EJ) in ewes with BCS = 3 and 3.5 were 140 vs. 105%, respectively.

The pregnancy duration related results represent in Table 2. Following BCS increases, this duration reduced ($p>0.05$). Pregnancy period in ewes with BCS = 3.5 was lowest but this trait in BCS = 2 was highest (Table 2). Lambs birth weight was not significantly different between groups.

BCS had a significant effect ($p<0.05$) on lambs born per ewe at mating and reproductive performance in ewes with BCS = 3 was better, While in ewes with BCS = 3.5 or more (Table 3), the lambing rate reduced. Effect of ewe BCS at the time of mating on blood metabolite concentrations is represented in Table 3.

The outcomes of present study illustrated that, the fertility rate in BCS = 3 ewes was more than other BCSs and in BCS = 3 was lower than other scores. Lams born per joined ewes in BCS = 3, 3.5 were 140, 105% respectively. Gunn (1983) reported that, ewes with high BCS (more than 4), have more early abortions and followed by, the reproduction efficiency declined. Rhind *et al.* (1984) observed that BCS more than 3 at mating caused to decrease in born lambs. In this experiment, the number of lambs born per Joined ewes at was highest in ewes BCS = 3 group and followed each unit increases in BCS, this trait reduced to 37%, these findings were in agreement with Thomas *et al.* (1987) results.

Table 1: Effect of BCS on Mean±SEM reproductive traits

Trait	BCS (2)	BCS (2.5)	BCS (3)	BCS (3.5)	SEM
Lambs born/joined ewes	1.24^{ab}	1.30^{ab}	1.40^{a}	1.05^{b}	9.600
Kilograms lambs born/joined ewes	6.70^{ab}	6.71^{ab}	7.40^{a}	5.54^{b}	0.450
No. of mating/conception	1.36	1.20	1.15	1.20	0.090
Birth weight (kg)	5.38	5.15	5.34	5.29	0.100
Weaning weight (kg)	32.50	32.83	33.41	34.87	0.860
Pregnancy duration (day)	151.721	151.312	151.18	151.05	0.150
Ewes conceived in the 1st estrus	78.00	82.00	86.00	86.00	9.600
Ewes conceived per joined ewes	95.00	94.00	97.00	79.00	4.090
Kilograms lambs born/lambing	6.989	7.135	7.568	7.02	0.388

Different superscripts in the same row within BCSs indicate a significant difference ($p<0.05$)

Table 2: Effect of weight on Mean±SEM reproductive traits

Trait	52-59	60-66	67-73	74-80	SEM
Lambs born/joined ewes	1.180	1.200	1.310	1.370	9.260
Kilograms lambs born/joined ewes	6.272	6.750	7.028	7.038	0.433
No. of mating/conception	1.222	1.358	1.153	1.083	0.084
Birth weight (kg)	5.296	5.250	5.336	5.136	0.0961
Weaning weight (kg)	31.820^{a}	32.276^{a}	34.420^{b}	34.550^{b}	0.8050
Pregnancy duration (day)	151.181	151.263	151.685	151.330	0.1999
Ewes conceived in the 1st estrus	1.222	1.358	1.153	1.083	0.0840
Ewes conceived per joined ewes	8.200	7.500	8.700	9.100	6.4300
Kilograms lambs born/lambing	9.400	9.400	9.500	8.900	3.9100

Different superscripts in the same row within BCSs indicate a significant difference ($p<0.05$)

Table 3: Effect of age on Mean±SEM reproductive traits

Trait	2	4	5	6	7	8	SEM
Lambs born/joined ewes	1.110	1.400	1.230	1.350	1.230	1.360	12.200
Kilograms lambs born/joined ewes	5.769	7.254	6.750	7.297	6.373	7.195	0.571
No. of mating/conception	1.173	1.357	1.171	1.352	1.125	1.100	0.109
Birth weight (kg)	5.172	5.248	5.457	5.393	5.178	5.176	0.126
Weaning weight (kg)	32.246	33.150	34.534	34.808	32.456	31.733	0.261
Pregnancy duration (day)	150.500^{a}	151.260^{b}	151.700^{b}	151.470^{b}	151.37^{b}	15.200^{b}	0.261
Ewes conceived in the 1st mating	8.600	7.600	9.100	6.400	8.700	9.000	8.340
Ewes conceived/joined ewes	8.800	9.500	9.200	1.000	9.200	1.000	5.160
Kilograms lambs born/lambing	6.521	7.600	7.328	7.297	6.904	7.195	0.467

Different superscripts in the same row within BCSs indicate a significant difference ($p<0.05$)

In present research no significant difference was observed between Ewes conceived per joined ewes but this trait in BCS = 3.5 group was lower than other groups, also we found that, the BCS of joined ewes in second estrus cycle was lower than those joined in first estrus cycle and it was similar to Kenyon *et al.* (2006) findings. BCS did not affect the lambs born per ewe at lambing which agreed with the result of Abdel-Mageed (2009). Effect of ewes BCS on mean lambs weaning weight was not significant but followed to BCS elevation (from 2 to 3.5); lambs weaning weight increased around 2 kg. Likely, the reason of this phenomenon returned to the body fat source degradation for more milk production.

Following ewes body weight increases, Lams born per joined ewes and Kilograms lambs born per lambing increased (often in 74-80 kg ewes) but it was not significantly different. Molina *et al.* (1994) established that parallel to body weight increases, the rate of multiple births enhanced and it was in line with our outcomes. In present experiment following increase in body weight, the rate of ewes conceived in the 1st estrus elevated but it was not statistically significant. Also the lamb weight of heaviest ewes (74 to 80 kg) was lower than other groups. The reason of this decline returns to increase in multiple births (154%) in heavy ewes (Malik *et al.*, 2000; Cripps *et al.*, 2008). According to establishment of lambs weaning weight (120 days), we found that ewes weaning weight have correlation with ewes weight and followed increase in ewes weight, this factor was increased Also, because of more development in mammary gland, the weaning weight in five and six years old ewes was highest (Ray and Smith, 1966).

Lambs born per joined ewes (%) and Kilogram lambs born per joined ewes, in two years old ewes were lower than 4-8 years old ewes but it was not statistically significant and it was in line with previous study (Demirel *et al.*, 2004). Five and six years old ewes born heavier ewes and lambs born by two years old ewes were lighter than those born by 4-8 years old ewes, also Willham (1970) reported that, the main difference between lams born from two years old ewes than 4-7 years old, return to development in ewes abdominal area and according to it, the lambs birth weight increases. According to the obtained results from present study, following increases in ewe age, the duration of pregnancy enhanced and this factor in eight years old ewes was highest.

CONCLUSION

In conclusion, the results of present study showed that, BCS had a significant effect on lambing rate and Lambs born per joined ewes. So, we recommend to using flashing before mating for lower BCS ewes and in Afshari ewes BCS = 3 and body weight of 67-73 kg caused to improvement in reproduction efficiency and profitability.

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