

Effect of BCS at Mating on Some Reproductive Performance of Saanen Goat under Raised Semi Intensive Conditions

¹Murat Yilmaz, ²Gunes Erdogan, ³H. Erbay Bardakcioglu, ⁴Turgay Taskin and ¹Tufan Altin

¹Department of Animal Sciences, Faculty of Agriculture,

²Department of Obstetrics and Gynecology, ³Department of Animal Sciences,
Faculty of Veterinary Medicine, Adnan Menderes University, Aydin, Turkey

⁴Department of Animal Sciences, Faculty of Agriculture, Ege University, Izmir, Turkey

Abstract: The aim of this study was to determine the effects of the Body Condition Score (BCS) of 53 Saanen does on their reproductive performance 15 days before mating season and at the beginning of the mating season under raised semi intensive conditions. In this study, the does were synchronized in two different periods, one of which was 15 days before the other. Before the introduction of buck to the goats, the goats were weighed after measuring their BCS. Detailed records were kept for herd in year. It was found significant effects of mating period on body weight of does before mating and fecundity ($p < 0.05$); effects of age on body weight of does before mating ($p < 0.001$), body weight of does on birth ($p < 0.01$), fecundity ($p < 0.01$) and litter size ($p < 0.05$), effect of BCS on body weight of does before mating ($p < 0.001$), fecundity ($p < 0.01$) and litter size ($p < 0.05$). The BCS for the highest fecundity and litter size was determined ≥ 2.01 while the lowest rates for these traits were ≤ 1.50 . Average of body weight of does before mating, body weight of does on birth, kid birth weigh, fecundity and litter size were 35.65, 42.71, 3.44, 0.65, 0.65 and 1.30 kg, respectively.

Key words: Saanen goat, body condition scores, live weight, fecundity, litter size, Turkey

INTRODUCTION

Goat production has traditionally been done for centuries in Turkey. This production has contributed significantly to economical, social and cultural structures of the regions. Goat production in general has mostly been done in extensive conditions in the country, hair goat is the most widespread breed among the goat breeds in Turkey (Bardakcioglu *et al.*, 2009). Although, hair goat is produced nearly everywhere in Anatolia, Saanen goat production has started to be done in Western regions. Saanen goat was first used for improvement of hair goat which started in 1960's by Aegean University and later was continued by Canakkale University. Saanen genotype named as Turkish Saanen and whose blood level is not known under breeding conditions is produced in Aegean region mainly in Canakkale. Saanen and Saanen x hair goat cross breeds have started to spread in the province of Aydin for the last years.

Success of reproduction season in small ruminant production plays an important role on continuity of herd and managing economy biotechnological methods use to increase the productivity of the herd (Konyali *et al.*, 2010). Oestrus synchronization methods are used mostly before

the other biotechnological methods in assisted reproductive technology in livestock production. The progesterone impregnated sponge insertion is the widespread method for oestrus synchronization in small ruminants (Mellado *et al.*, 1998; Wildeus, 2000). Body Condition Score (BCS) is a better predictor of body fat than live weight (Russel *et al.*, 1969; Sanson *et al.*, 1993). There are many reports suggesting a correlation of BCS with reproductive performance (Ucar *et al.*, 2005; Maurya *et al.*, 2009; Sejian *et al.*, 2010; Yilmaz *et al.*, 2011). Ewes with low BCS have been associated with higher prenatal (West *et al.*, 1989) and neonatal mortality (Nordby *et al.*, 1986). Yilmaz *et al.* (2011) found in a study done on sheep that the BCS values obtained for the highest rates of the pregnancy, lambing and fecundity ranged between 2.51-3.00, 2.00-3.00 and 2.51-3.00, respectively also BCS rates of Saanen goats in beginning of synchronization have affected on pregnancy rate in Saanen goats (Serin *et al.*, 2010). For the lowest rates of all traits, the BCS values were ≤ 1.50 . BCS rates for different physiological periods could vary depending on breed and region. For this reason, there should not be a general standard for each breed; instead BCS standards should be determined individually and locally for different

physiological periods as standards. Thus, more research should be conducted for the same breeds in similar conditions (Yilmaz *et al.*, 2011).

The aim of this study was to determine the effects of the BCS of Saanen does on their reproductive performance raise under semi intensive conditions in Aydin province in two different periods as 15 days before mating season and at the beginning of the mating season.

MATERIALS AND METHODS

This study was performed for over a year period (2009-2010) in the Didim district of Aydin in the West of Turkey (37°24'53.37" N and 27°22'27.10" E) at an altitude of 24 m above sea level.

A total of 53 Saanen goats at different ages on breeder's farm were used. The animals were randomly divided into two groups in the herd. Grouping was done randomly because the age and the live body weight were to be tested to decide whether they had any effects on all of the results. The animals in the 1st group were synchronized in the 1st period and the remaining animals were synchronized in the 2nd period. First synchronization period started at last week of August and the 2nd synchronization period started 15 days later than the 1st (at 2nd week of September). Normally, the mating season of goats starts in September and continues until November in Western Anatolia in Turkey.

The does were synchronized with intravaginal progestagen sponges impregnated with 40 mg cronolone (Chronogest⁷-Intervet, Istanbul, Turkey). Sponges were withdrawn after 14 days and the females received an intramuscular injection 500 IU Pregnant Mare Serum Gonadotropin (PMSG) and seven or six does were mated with each buck.

The BCS and body weight indicators were determined before introducing the buck. Mating, pregnancy and birth data were recorded. The annual maintenance-feeding and the applied flock management were also recorded. BCS of each does was accepted as the average value of the BCS estimates made by two researchers and one goat keeper. BCS chart was developed on the system described by Russel *et al.* (1969). In this system, scores for goat range from 1 (very poor condition) to 5 (very good condition) with half unit increments. Scoring is based on feeling the amount of muscling and fat deposition over and around the vertebrae in the loin region of the does. Scores were given as follow:

Score 1: Spinous processes are sharp and prominent. Loin eye muscle is shallow with no fat cover.

Score 2: This means sharp and prominent Spinous processes. Loin eye muscle has little fat cover but is full.

Score 3: Spinous processes are smooth and rounded and one can feel individual processes only with pressure, loin eye muscle is full with some fat cover.

Score 4: Spinous processes can be detected only with pressure as a hard line, transverse processes cannot be felt and loin eye muscle is full with a thick fat cover.

Score 5: It is impossible to detect Spinous processes and the loin eye muscle is very full with a very thick fat cover (Thompson and Meyer, 1994).

In this study, the obtained BCS scores were collected in three groups according to the values ≤ 1.5 was included as group 1, the value between 1.51-2 was included as group 2 and the value > 2.1 as group 3. There were no animals having a BCS score > 4 .

The farm has about 1000 da grazing area. This area is used as a pasture but the region is very poorly planted is covered with bushes and is full of stones. The vegetation is not convenient to feed goats. The herd was grazed in this area about 6 h for every day 1.5 kg vetch straw with wheat straw per animal was given to the herd every day and only during the milking period, a total of 400 g concentrated feed a day was added per animal. In addition, withered meadow grass was also given to animals for a month in May.

Data were analyzed with SPSS 11.5 statistical package program using Least square method, the effect of body condition groups, mating period, age of does were determined by the general linear model. The mathematical model was:

$$Y_{ijkl} = \mu + a_i + b_j + c_k + e_{ijkl}$$

Where:

Y_{ijkl} = The effects as follows; I is body condition score groups; j is mating period; k is age of does

μ = Overall mean

a_i = The effect of body condition score groups (i = 1, 2, 3; body condition score groups 1.50 \leq , 1.51-2.00, 2.10 \geq)

b_j = The effect of mating period (j = 1, 2; 15 days before mating season and mating season)

c_k = The effect of age of does (k = 1-5; age of does 1st-5th)

e_{ijkl} = Random error term

RESULTS AND DISCUSSION

The effect of BCS on body weight of the does before mating was found significant ($p < 0.001$), fecundity and

litter size were significant as well ($p<0.01$ and $p<0.05$). The BCS for the highest fecundity and litter size was determined in the 3rd group (1.23 and 1.60) as a striking increase nearly twice or half more than in the first 2 groups (0.29/0.65-1.00/1.18) while the lowest rates for these traits were in group 1. However, the highest kid birth weight was 3.53 kg and this value was found in group 2. The effect of mating period on body weight of does before mating and fecundity was significant ($p<0.05$) and the rates in 2nd period were higher than in 1st period for all characteristics. Effects of age on body weight of does before mating ($p<0.001$), body weight of does on birth ($p<0.01$), fecundity ($p<0.01$) and litter size ($p<0.05$) were all found significant. The highest body weight of does before mating (44.49 kg), the highest fecundity rate (1.36) and the highest litter size (1.67) were in the 4th age group however, the highest body weight of does on birth (49.26 kg) and the highest kid birth rate were in the 5th age group. The average of body weight of does before mating, the body weight of the does on birth, kid birth weight, fecundity and litter size were 35.65, 42.71, 3.44, 0.65 and 1.30 kg, respectively (Table 1).

It was observed that BCS at mating period in does which was >2.1 was positively effective on the reproductive performance of the animals and that the lower BCS, the lower reproductive performance. Similarly, the same effect of BCS on reproduction performance of the animals was found to be important in many other studies as follow; Mellado *et al.* (1996) found that there was a significant effect of BCS on the likelihood of abortion. Compared to all other goats, the thinnest animals were nine times more likely to abort. In contrast, goats with BCS >2.5 had less than half the risk of having an abortion, compared to all other goats. BCS at mating was positively correlated to kidding rate and negatively to reproductive losses Hussain *et al.* (1996) have shown that

low energy intake or BCS causes decreasing of fertility. Mellado *et al.* (1996) reported that kidding rates of goats having BCS 3 were around 20% lower than rates of goats having BCS 4 or greater. Additionally, Meza-Herrera *et al.* (2008) documented that does with higher BCS have more CL than does with lower condition. Atti *et al.* (2001) observed higher fertility in Barbarine ewes which has BCS (>1.5) and body weight (>35 kg) at the beginning of mating period. Yilmaz *et al.* (2011) found similar results in a study done on sheep. The highest rates of lambing and fecundity rates were 2.00-3.00 and the BCS values for the lowest rates were ≤ 1.50 . In the study, the rates of fecundity and litter size of the animals having ≥ 2.1 BCS values were found higher. For the lowest rates of fecundity and litter size, the BCS values were ≤ 1.5 . Unfortunately, an ideal BCS interval could not be determined in the region because researchers did not have any groups having an average BCS value >2.1 , additional studies should be done to determine this interval for Saanen goats.

The fecundity rate (0.65) obtained in this study was lower than the rate of 1.2 found in another study done on the Saanen breed by Ceyhan and Karadag and than the rate of 1.2 reported by Ulutas. The result was also lower than the rate of 0.72 found in a study done on the Saanen x hair goat cross bred by Sengonca and than the rate of 0.95 reported in a study carried on the hair goat by Atay *et al.* (2010). However, the litter size (1.30) in the study was found >1.09 found in the study done on the hair goat by Atay *et al.* (2010) and as the same value reported in a study on the Saanen x hair goat cross bred by Sengonca. The finding was lower than the 1.6 value reported by Ceyhan and Karadag and than the 1.55 value for the Saanen breed reported by Ulutas. The kid birth weight of Saanen (3.44 kg) in the study was higher than the weight of 2.9 kg for Saanen goat.

Table 1: The effects of BCS, mating period and age of does on body weights, fecundity and litter size

Parameters	n	Body weight of does before mating (kg)	n	Body weight of does on birth (kg)	n	Kid birth weight (kg)	n	Fecundity (head)	n	Litter size (head)
BCS groups										
Group 1 (1.5 \leq)	21	30.77 \pm 1.02 ^c	6	38.71 \pm 2.23	5	3.30 \pm 0.35	21	0.29 \pm 0.10 ^b	6	1.00 \pm 0.00 ^b
Group 2 (1.51-2)	19	36.65 \pm 2.06 ^b	11	42.40 \pm 2.29	11	3.53 \pm 0.19	19	0.65 \pm 0.15 ^b	11	1.18 \pm 0.12 ^b
Group 3 (2.1 $>$)	13	42.03 \pm 2.37 ^a	10	45.46 \pm 2.75	10	3.41 \pm 0.12	13	1.23 \pm 0.23 ^a	10	1.60 \pm 0.51 ^a
	-	***	-	NS	-	NS	-	**	-	*
Mating period										
1	25	33.06 \pm 1.62	8	41.025 \pm 3.48	8	3.29 \pm 0.65	25	0.40 \pm 0.12	8	1.25 \pm 0.43
2	28	37.97 \pm 1.58	19	43.42 \pm 1.59	18	3.50 \pm 0.15	28	0.86 \pm 0.13	19	1.32 \pm 0.47
	-	*	-	NS	-	NS	-	*	-	NS
Age of does										
1	5	27.84 \pm 1.84 ^c	3	35.93 \pm 2.21 ^b	3	3.46 \pm 0.14	5	0.60 \pm 0.24 ^b	3	1.00 \pm 0.00 ^b
2	20	30.75 \pm 0.71 ^{bc}	6	36.51 \pm 2.13 ^b	5	3.67 \pm 0.29	20	0.30 \pm 0.10 ^b	6	1.00 \pm 0.00 ^b
3	11	34.68 \pm 2.24 ^b	6	41.21 \pm 3.83 ^{ab}	6	3.17 \pm 0.20	11	0.73 \pm 0.23 ^b	6	1.33 \pm 0.21 ^{ab}
4	11	44.49 \pm 2.09 ^a	9	47.92 \pm 1.64 ^a	9	3.41 \pm 0.23	11	1.36 \pm 0.24 ^a	9	1.67 \pm 0.16 ^a
5	6	44.11 \pm 3.80 ^a	3	49.26 \pm 2.25 ^a	3	3.68 \pm 0.20	6	0.43 \pm 0.20 ^b	3	1.00 \pm 0.00 ^b
	-	***	-	**	-	NS	-	**	-	*
Average	53	35.65 \pm 1.17	27	42.71 \pm 1.50	26	3.44 \pm 0.17	53	0.65 \pm 0.09	27	1.30 \pm 0.46

CONCLUSION

In order to maintain a maximum reproduction rate, animals must have an optimum BCS value. Improvement efforts for the Saanen goats should be dealt with according to the BCS values and the fertility must be increased. Thus, fertility will rise when selection and BCS are evaluated together in studies done for fertility. As a result, it is possible to claim that when Saanen goats have convenient BCS and high live weight during the mating period they will have higher fecundity and litter size. Although, this breed is a dairy breed there are some problems in feeding and management of this breed because there is not enough knowledge available to breed Saanen goats for breeders in the province. More studies should be done in the region on this matter and the results should be made available for the breeders.

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