Original Research

Effect of Body Condition Score at Mating on Reproduction Performance of Beetal Goat

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Abstract

This study was conducted to investigate the effect of body condition score at the time of breeding on reproduction performance of Beetal goats at Goat Research Farm, GADVASU, Ludhiana. A total of 40 breedable female Beetal goats were divided into 5 treatments/groups on the basis of their body condition scores (BCS) one week prior to start of breeding. Nine point scale was used for body condition scoring i.e. 1 to 5 scale with increments of 0.5 point, however, available Beetal goats were having 1.5, 2.0, 2.5, 3.0 and 3.5 BCS ($T_{1.5}$, $T_{2.0}$, $T_{2.5}$, $T_{3.0}$ and $T_{3.5}$ groups, respectively). These groups comprised 3, 18, 8, 8 and 3 number of goats, respectively. These goats were maintained in similar conditions and bred randomly with available bucks. Reproduction performance decreased with decrease in BCS (3.5 to 1.5 BCS) due to decline in conception rate and increase in mean conception period, number of services per conception and anoestrus rate. Beetal goats with higher BCS produced higher (non-statistically) kid mass, litter size and heavier kids, and this trend consistently reversed with decrease in BCS. It is concluded that Beetal goats of higher BCS (up to 3.5) at the time of breeding have better reproduction performance than lower BCS groups.

Key words: Beetal, Body Condition Score, Breeding, Reproduction, Kids

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Introduction

Goats contribute 26.4% to total livestock population in India and are second only to cattle in numbers with 135.17 million heads (19th livestock census, 2012). In Punjab, goat population is 3, 27, 272 and has registered 11.9% increase between last two censuses. Beetal is one of the most important dual purpose breed of trans-gangetic plain region of India, particularly Punjab. As goat husbandry practices are shifting from extensive to intensive or stall-feeding, farmers need more managerial skills to be developed such as assessment of body condition score for better nutritional management of goats.

Goats have to maintain a particular body condition during breeding season, pregnancy and in early lactation to avoid any stress due to metabolic losses. Body condition scoring (BCS) is the most widely used method to assess changes in body fat reserves, which reflects its high potential to be included in on-farm welfare assessment protocols (Vieira *et al.*, 2015). It is an effective and easy method that can help goat farmers to properly manage the nutrition of their flocks (Mendizabal *et al.*, 2011). It is subjective, visual or physical assessment of the amount of metabolizable energy stored in fat and muscle of a live animal. BCS involves assigning a score to animals in relation to the amount of tissue reserves (fat and muscles) present in particular anatomical regions with specific prominences. Effect of BCS before breeding in goats on breeding and kidding performance has not been studied in Indian goat breeds. Therefore, keeping in view the above facts, the present study has been undertaken to investigate effect of BCS at mating on reproduction performance of Beetal goat.

Materials and Methods

Experiment was conducted at Goat Research Farm, Department of Livestock Production Management, College of Veterinary Science, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana. A total of 40 breedable female Beetal goats (1.5 to 4 years of age) at Goat Research Farm, were divided into five groups on the basis of their body condition score one week prior to start of breeding (Table 1). These goats were maintained in similar management conditions at the farm.

Table 1: Grouping of experimental Beetal goats on the basis of BCS before breeding

S. No.	Treatment Groups	Number of Goats (N=40)
1	$T_{3.5}$	3
2	$T_{3.0}$	8
3	$T_{2.5}$	8
4	$T_{2.0}$	18
5	$T_{1.5}$	3

Housing of Animals

Goats were housed in two pens having east-west orientation of long axis. These pens had pucca floor in covered as well as open area. Out of total 40 goats, pregnant goats (31) were shifted to two kidding pens 2 weeks before expected date of kidding (EDK) without mixing i.e. maintaining their pen individuality.

Feeding of Animals

Animals were fed concentrate and green fodder as per standard practices followed at farm. Concentrate feed was offered early in the morning (7-8 am) followed by supply of green fodder twice (11 am and 4 pm) in a day. During late pregnancy and lactation period of goats, concentrate feed was offered twice i.e. in morning and evening. Quantity of concentrate feed offered to goats during different stages is given in Table

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2. Supply of green fodder was dependent upon the seasonal availability. The potable water was made available to all the goats and kids round the clock. Goats were fed in wall mounted linear channel feeders in goat pens while in kidding pens, they were fed in hexagonal feeders (two large feeders/pen).

Table 2: Quantity of feed and fodder offered to various categories of goats

Category	Concentrate (grams)	Green Fodder (kg)
Adult goat	300	5
Advanced pregnancy (4 months onwards)	400	5
During Lactation	500	5
Kids (2 weeks onwards)	*ad lib*	*ad lib*

Breeding of Animals

Heat detection was carried out using intact buck parade (with apron) twice a day i.e. in morning and evening. Natural breeding was practiced by randomly using available bucks. Mating was practiced twice during heat period i.e. 8-10 hours after the detection of heat and second service again after 8-10 hours. All the experimental goats were checked for heat and bred for 45 days period covering two estrus cycles. Pregnancies of the animals were confirmed two months after breeding by ultrasound examination. Total 31 animals conceived out of 40 experimental goats in prescribed period.

Parameters Studied

Reproductive traits were analyzed after the end of the breeding period. Following reproductive traits were recorded-

Conception/pregnancy rate (%)

Number of females got conceived successfully out of total females bred.

Mean Conception Period

Average interval between days of commencement of heat detection to successful breeding.

Service Rate

Average services per conception.

Anoestrus Rate (%)

Number of females which didn't show heat/estrus out of total breedable females.

Kid Performance Traits

Relative performance of kids of Beetal goats with different BCS was studied using following traits i.e. kid mass, litter size and birth weight. Immediately after kidding, kids were dried using clean dry cloth and body weight was measured followed by applying temporary identification number using plastic neck tags. Kid mass was recorded as total weight of kids in a litter. Other important management practices like naval disinfection, colostrum feeding and ear tagging were done as per the standard schedule. Kid mass can be defined as below-

Kid Mass: total body weight of kids of a single litter.

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Statistical Analysis

Collected data was arranged and analyzed using standard statistical methods with SPSS 20.0 software. Comparison between different body condition score groups was made using Tukey's HSD test as groups were unequal in size.

Results and Discussion

Effect of BCS of Beetal Goats at the Time of Mating on Reproduction Performance

Conception rate was found highest in $T_{3.5}$ group and it decreased with decrease in body condition of goats (Table 3). Whereas, mean conception period was lowest in $T_{3.5}$ group and it increased with decrease in BCS though difference was not statistically significant. In $T_{1.5}$ group, only one goat conceived so statistics has not been performed and values have been presented for reference only. Similarly, in higher BCS group services per conception i.e. service rate was lower indicating better reproduction efficiency than lower BCS groups. Rate of anoestrus (absence of heat for two consecutive estrus cycles) was lowest in higher BCS group and it increased with decrease in BCS.

Table 3: Reproduction performance of Beetal goats in different BCS groups

Groups	Total No. of Goats	No. of Goats Conceived	Conception Rate/Pregnancy Rate (%)	*Mean Conception Period (days)	Service Rate	Anoestrus Rate (%)
$T_{3.5}$	3	3	100	26.00 ± 7.55	1.00 (3/3)	0.00 (0/3)
$T_{3.0}$	8	7	87.5	27.57 ± 3.30	1.00 (7/7)	12.50 (1/8)
$T_{2.5}$	8	7	87.5	31.29 ± 5.64	1.14 (8/7)	12.50 (1/8)
$T_{2.0}$	18	13	72.22	31.69 ± 4.05	1.46 (19/13)	16.67 (3/18)
$T_{1.5}$	3	1	33.33	13**	2.00** (2/1)	33.33 (1/3)

**Mean conception period i.e. average interval between day of commencement of heat detection to successful breeding;*
***only one goat conceived in $T_{1.5}$ group on 13th day after commencement of heat detection*

De Santiago-Miramontes *et al.* (2009) and Gallego-Calvo *et al.* (2014) also found that better conditioned does have early commencement of estrus and ovulation, normal estrus cycles and longer reproductive activity than lesser conditioned does. Present study also indicates that goats with higher BCS (up to 3.5) have better functional ovaries than lower BCS goats as goats with higher BCS conceived earlier than lower BCS goats after commencement of breeding. Higher BCS goats had regular estrus cycle and had better service rate than lower BCS goats. These findings are in consonance with studies of Mellado *et al.* (2004) and Ilker *et al.* (2010) who also found a significant influence of higher BCS on the better reproduction performance and a negative effect of lower BCS in terms of shorter breeding season and poor fertility in different breeds of goats. They suggested that lower BCS and body weight goats should be given higher energy feeding before breeding season. These results prove that lower nutritional status of goats at the time

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of mating is resulting in poor reproduction performance of the does in the form of decrease in conception rate and increase in conception period, services per conception and anoestrus rate among the Beetal goats.

Effect of BCS of Beetal Goats at the Time of Mating on Kidding Performance

Effect of BCS of Beetal goats at the time of mating on traits related to kidding performance are presented in Table 4. Mean kid mass of $T_{3.5}$, $T_{3.0}$, $T_{2.5}$ and $T_{2.0}$ groups were 6.99 ±1.19, 6.09 ±0.81, 4.53 ±0.74 and 4.02 ± 0.48 kg, respectively. Kid mass produced by higher BCS goats is non-statistically higher than lower BCS goats and consistent declining trend is evident with decrease in BCS value from 3.5 to 2.5. Similarly, average litter size of $T_{3.5}$, $T_{3.0}$, $T_{2.5}$ and $T_{2.0}$ groups were 2.00 ± 0.58, 1.86 ± 0.34, 1.43 ± 0.20 and 1.31 ± 0.13, respectively. Average birth weight of $T_{3.5}$, $T_{3.0}$, $T_{2.5}$ and $T_{2.0}$ groups were 3.49 ± 0.35, 3.28 ± 0.23, 3.17 ± 0.26 and 3.08 ± 0.20 kg, respectively. Similar to kid mass, litter size and birth weight of kids were more for higher BCS goats than lower BCS groups but difference was not significant. Beetal goats with higher BCS produced non-statistically higher kid mass, litter size and kids having higher birth weight and this trend consistently reversed with decrease in BCS.

Table 4: Effect of BCS of Beetal goats on performance of kids

Group	Kid Mass (kg)	Litter Size	Birth Weight
$T_{3.5}$	6.99 ±1.19	2.00 ± 0.58	3.49 ± 0.35
$T_{3.0}$	6.09 ±0.81	1.86 ± 0.34	3.28 ± 0.23
$T_{2.5}$	4.53 ±0.74	1.43 ± 0.20	3.17 ± 0.26
$T_{2.0}$	4.02 ± 0.48	1.31 ± 0.13	3.08 ± 0.20
*$T_{1.5}$	5.36	2	2.68
Overall	4.92 ± 0.38	1.53 ± 0.12	3.20 ± 0.12

**Only one goat was available in this group, so statistics has not been performed and values have been presented for reference only*

The results of present study are in consonance with Mellado *et al*. (1996) who found kidding rate of the thin goats at mating (BCS ≤3) were lower than the higher BCS (4 or greater) goats. Sejian *et al*. (2015) got contrary result for highest litter size in Garole x Malpura Ewes of BCS 2.5 but supports present findings for kidding rate and birth weights i.e. higher the BCS better will be the kidding rate and birth weight of kids. Similarly, Davoud *et al.* (2012) and Jalilian and Moeini (2013) got the best results in terms of lambs born/ewe and kilograms lambs born per ewe with BCS=3.0 while decline in the performance with BCS 3.5 and more for the ewes. This could be due to primary embryo wastage in ewes with obesity condition and thereby decrease in reproductive performance (Rhind *et al.*, 1985). Whereas, in present study, Beetal goats of BCS more than 3.5 were not available for comparison with above mentioned studies in addition to the fact that above mentioned studies were carried out on ewes.

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Conclusion

From present results it is evident that kidding performance increases with increase in BCS (up to 3.5) of Beetal does at the time of mating. From the study, it is concluded that Beetal goats of higher BCS (3.5) at the time of breeding have better breeding and kidding performance than lower BCS groups. Therefore, attempts should be made to increase BCS of poor conditioned Beetal goats through feeding and grouping interventions before breeding.

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