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COMPARISON OF BEETAL GOATS' REPRODUCTIVE EFFECTIVENESS UNDER DIFFERENT MANAGEMENT APPROACHES

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Abstract

The Beetal goat or Lahori goat is a breed from the Punjab region of Pakistan and India. It is used for milk and meat production. It is similar to the Jamnapari goat and the Malabari goat. Beetal goats have been widely used for improvement of local goats throughout the subcontinent. These goats are also adapted to stall feeding, thus are preferred for intensive goat farming. The Beetal goat and the Malabari goats are usually compared for their body characteristics. The objective of the study was to determine the effectiveness of beetal goat reproduction under different management techniques. Based on reproductive effectiveness and growth parameters, the results of two goat production management systems, namely (1) seasonal breeding and (2) year-round breeding, were compared. The study was performed out during a one-year period. The data was collected from two farms for this study, the 1st farm was the private farm known as Noor-Hussain Goat Farm in Raiwind and 2nd farm was Bahadurnagar Research Institute in Okara which is run by the government. Adult goats (n=72+) were collected for this study and their reproductive and productive traits were examined (2-bucks with each flock).

Keywords: *Adult weight, Age at Puberty, Birth weight of Kids, Conception rate, Goat, Weight at puberty*

INTRODUCTION

Goat is a significant contributor to the nation's economy and consider as one of the smallest domesticated ruminants. Globally, there are around 400 million goats (1), and Pakistan has 3rd largest goat population in the world (2). Despite the fact the mutton prices in the country are constantly escalating every year. Improvement in the purchasing power of the urban population could be an important factor in increasing demand for goat meat globally. An increasing number of people around the world eat goat meat and drink goat milk. Interestingly, Pakistan has 2.5% population of the world that consumes 5% of total mutton consumed in the world. Goat produced by the poorest farmer for the consumption of the richest people of the country. Manifold raise in the cost of goat meat makes the commodity out of reach of common citizen. The traditional livestock and feed production Systems cannot adequately meet the increasing meet demand. Goat meat production is constrained by the availability/affordability of land for goat rising (3).

Breeds of sheep and goat from temperate zones frequently exhibit a seasonal reproduction, which appears to have remained in sheep and goat breeding systems for generations. Since both Alpine goats and ewes have an annual breeding season that starts in the summer and concludes in the winter, which shows a clear seasonality in the birth dates of lambs and kids as a result. This seasonality is controlled by photoperiodic factors in goats and sheep. Short days promote and long days suppress sexual activity in

goats and sheep under experimental settings. Goats and sheep, on the other hand, apparently have an endogenous cycle that is regulated by photoperiod, allowing breeding to take place in the fall and winter and anovulation (anestrous) to take place in the spring and summer under natural conditions in temperate areas. Under their natural tropical environment, local sheep and goat breeds either do not breed seasonally or only reproduce seasonally (5). Even while some females have brief periods of an ovulation and anestrous, these breeds' females ovulate and display anestrous almost persistently throughout the year. To explain the apparent lack of seasonality, two basic theories may be put forth: either females are not photoperiod sensitive, or the intensity of photoperiodic changes is too small. Traditionally, herds browsed forested areas, which no longer exist. Goat keeping is poorly esteemed in the area, but it presents a low-input source of income for impoverished communities, as goats sustain themselves on sparse vegetation.

This study examined the reproductive effectiveness and growth characteristics of 2 breeding systems for the goat production, 1st is seasonal breeding and 2nd is year-round breeding. Additionally, the study analyzed the cost effectiveness of the two systems based on their results. The results of this study may be helpful in assessing the sustainability of systems based on reproductive effectiveness and may offer a fundamental framework for future goat farms.

MATERIALS AND METHODS

The study was conducted in two farms, the 1st farm was the private farm known as Noor-Hussain (NH) Goat Farm in Raiwind and 2nd farm was Bahadurnagar (BN) Research Institute in Okara which is run by the government of Punjab. Adult goats (n=72+) were collected for this study and their reproductive and productive traits were examined (2-bucks with each flock).

REPRODUCTIVE PARAMETER

Conception rate, birth weight, weight at puberty, age at puberty, prolificacy and kidding distribution, kidding interval, postpartum anestrous period, and abortion in does.

PRODUCTIVE PARAMETERS

Concentrate feed intake, feeding quality, Body condition scoring Weight gain of dose: Nutritional analysis of feed: Feeding cost, Labor cost: The labor cost and miscellaneous costs of both farms were collected and calculated to compare the cost of both farms.

STATISTICAL ANALYSIS

Study of this Data was analyzed using T-distribution for the testing of two independent samples. Comparison between two farms, the body weight, body condition scoring, kidding interval, age at puberty, postpartum an estrous and feedings cost was analyzed.

RESULTS

The results for the comparative study of reproductive efficiency of beetal goats under different management systems have been presented.

The mean conception rate was not significantly different (p=0.421) between BN and NH herds. Mean conception rates were 80 ± 0.05 % and 87 ± 0.04 % at BN and NH herds respectively. Birth weight of male kids was not significantly different (p=0.161) between BN and NH herds. The mean birth weight of female kids was also not different (P-0.72) between BN and NH herds (Table I).

Table I. Mean birth weight of male and female kids in BN & NH herds

Source	Mean ± SE (kg)
BN(M)	3.824 ±0.083
NH(M)	3.513 ± 0.20
BN(F)	3.503 ±0.083
NH(F)	3.456 ± 0.10

*BN= Bahadurnagar Research Institute
NH= Noor-Hussain Goat Farm

Weight at puberty was not significantly different (p= 0.043) between BN (19.65± 1.3 kg) and NH flock (22.55 ± 0.53 kg) as shown in Fig. 1. Mean age of puberty was not significantly different (p=0.39) between BN (245.3 ± 2.9 days) and NH herds (242.4 ±1.9 days) (Fig. 2).

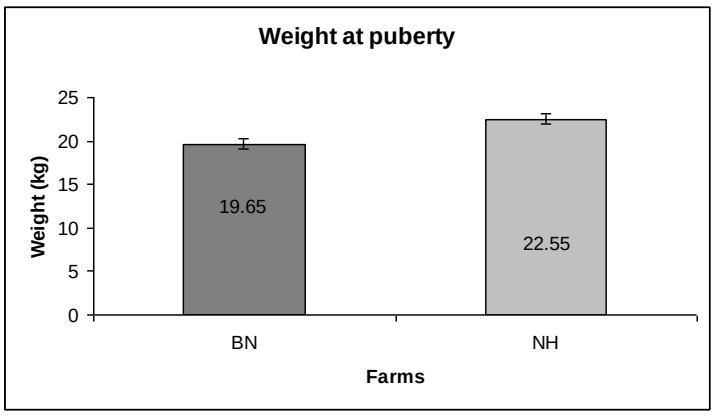

Fig. 1. A graphical presentation of weight at puberty in Beetal goat at BN & NH herds

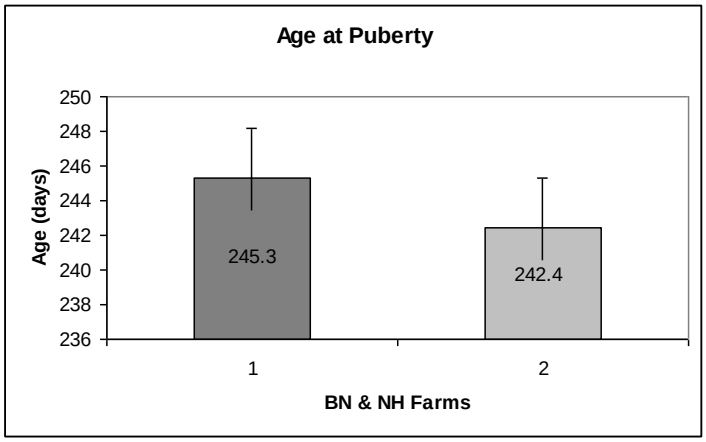

Fig. 2. A graphical presentation of age at puberty in Beetal goat at BN & NH herds

The prolificacy and kidding distribution was significantly different (P=0.014) in NH (1.893± 0.14 %) than BN goat farm (1.468 ± 0.090%) (Fig. 3).

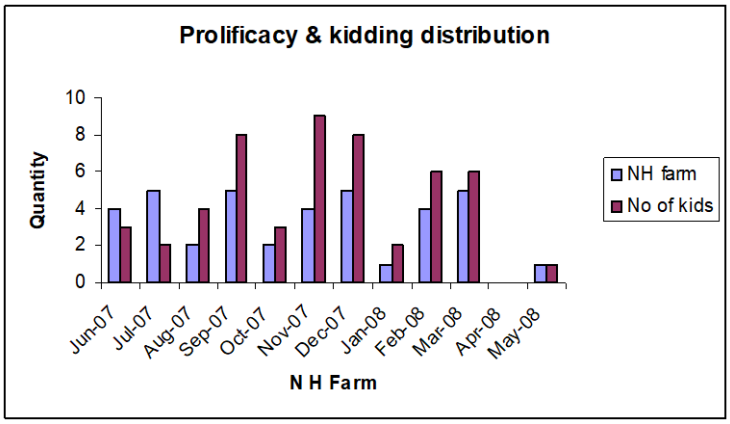

Fig. 3. A graphical presentation of prolificacy and kidding distribution

Mean kidding intervals was significantly higher (p=0.001) in BN flock (314 ± 20 days) compared to N H flock (149 ± 15 days) as shown in Table I. Data of post-partum anestrous of NH goats was used as the buck was free around the year. The animals exhibited the postpartum anestrous period of 50.00± 3.95 days (Table II). Four does were aborted out of 25 and 7 kids were died out of 52 in NH flock while in BN flock three doses were aborted out of 47 and 6 kids were died out of 70. Mean body condition scoring (1-5 point) was significantly higher (p=0.000) in NH flock (2.44± 0.14) than BN flock (1.91± 0.11). While the body weight of does was compared between the two farms, no significant difference (p=0.519) was observed as BN (42.47± 0.92 kg) and in NH flock (41.10 ± 1.9 kg). The concentrate feed intake per day between two farms was

also compared, it was found that the concentrate feed intake was significantly higher (p=0.00) in BN (491.5 ± 8.5 gm per day) and NH flock (146 ± 30 gm per day). Weight gain of does was not significantly different (p=0.601) between BN and NH herds. It was (43.19 ±0.69 kg) and (42.0 ± 2.1 kg) in BN and NH flock (Table II).

Table II. Comparative characteristics of BN & NH herds

Characteristics	Source	Mean ± SE	*p*-value
Mean conception rate	BN	0.809± 0.058	0.421
	NH	0.88 ± 0.066	
Mean age at puberty (days)	BN	245.3 ± 2.9	0.39
	NH	242.4 ±1.9 days	
Weight at puberty (kg)	BN	19.65± 1.3	0.043
	NH	22.55 ± 0.53	
Prolificacy and kidding distribution (%)	BN	1.468 ± 0.090	0.014
	NH	1.893± 0.14	
Kidding Intervals (days)	BN	314 ± 20	0.001
	NH	149 ± 15	
Body condition scoring (points)	BN	1.91 ± 0.11	0.000
	NH	2.44 ± 0.14	
Body weight of does ((kg)	BN	42.47 ± 0.92	0.519
	NH	41.10 ± 1.9	
Concentrate feed intake/day (gm)	BN	491.5 ± 8.5	0.000
	NH	146 ± 30	
Weight gain of does	BN	43.19 ± 0.69	0.601
	NH	42.0 ± 2.1	
Post-partum anestrous (days)	NH	50.00± 3.95	

FEEDING, LABOR, AND MISCELLANEOUS COST OF BN & NH FARMS

The cost of feeding was higher in BN than NH flock, because at BN farm they provided concentrate daily. Labor costs at both farms were different; however, the number of persons managing goats was same at both farms. The Labor Cost at NH goat farm was higher than BN goat farm.

The miscellaneous expenditure was higher in NH than BN herds. The miscellaneous expenditure consisted, ear tagging charges, medicines, deworming, vaccination charges medical charges, market taxes, salt etc. (Table III).

Table III. Feeding, labor and miscellaneous cost of BN & NH goat farm

Source	BN Farm	NH Farm	Difference
Feeding cost/annum	Rs. 284760	Rs. 171072	Rs. -113688
Labor cost	Rs.86400	Rs.151200	Rs.64800
Misc. exp	Rs.18650	Rs.99533	Rs.80883
Total	Rs. 389810	Rs. 421805	Rs. 31995

DISCUSSION

The major goal of this research was to identify an effective and practical goat management system that could be used to increase goat production throughout the nation.

BN and NH herds had different conception rates of (0.071 ± 0.602%). According to Shelton, 1992, the most significant factor affecting production efficiency in animals raised primarily for meat production is reproductive rate (6). There is evidence to suggest that several inseminations increase the likelihood of conception (7).

The difference of kidding interval between BN and NH flock was 165 ± 5 days. In BN flock there was seasonal breeding whereas at NH farm, the bucks are allowed throughout the year. That is why the kidding interval was longer in BN goat farm. The kidding interval at (n=250) days. Regarding 26% and 35% of the animals, respectively, had kidding intervals that were shorter than or equivalent to (n=250) and (n=300) days, respectively. Most (39%) of the group had kidding intervals of between (n=301) and (n=450) days. The mean kidding interval was 370 ± 122 days (8). According to Kim and Chung, 1979, in extensive and intensive circumstances, the mean time between kidding was 207.8 ± 1.8 and 211.6 ± 2.7 days,

respectively. In this data the kidding interval was 361 ± 20 days in BN while in NH the kidding interval was 219 ± 15 days (9). Song, 2007 found agreement in his statement that short kidding intervals are typically connected with year-round free mating systems (10).

The difference in birth weight of BN and NH male and female kids was 0.311 ± 0.117 and 0.047 ± 0.017gm individually. Both the male and female children of BN were somewhat heavier than those of NH. The birth weight and live weight heaviest was (1.3 to 1.4 kg) and the lightest kids was (1.07 to 1.18 kg). Male animals excelled the females on birth weight (11). The total birth weight of Tellicherry children in Namakkal was 2.057 ± 0.031 kg according to minimal means.

The difference in weight at puberty between both herds was 2.9 ± 0.77 kg. The age and weight at puberty was studied by Devandra and Burns, 1983, in Saanen kids and found that they achieved puberty earlier and more synchronized ($P<0.05$) than Anglo-Nubian kids (12). There were no significant differences between the Anglo-Nubian and Saanen kids when comparing the proportion of adult body weight at which the goat's reached puberty, 50.9% against 45.1%, accordingly. The same situation in BN and NH herds was observed that, there was no more difference in weight at puberty. The green fodder was available in rich quantity, but in BN farm they also provided concentrate on daily basis. Might be due to this they attained puberty earlier than NH flock.

In herds from BN and NH, Beetal goats reached puberty at a similar age of 2.9 days. The most often mentioned range for the age at puberty of most goats worldwide is 6 to 8 months (13,14); 7 to 10 months for the majority of meat-type goats; and 6 to 8 months for dairy-type goats (15). When compared to other goat breeds, Beetal goats took 7-8 months to reach puberty.

The difference in prolificacy and kidding distribution between two herds was 0.425 ± 0.053 kids in a year. The prolificacy rate is greater than that of other native or tropical breeds (up to 1.98 kids/kidding) as well as Nubian goats in Mexico (16,17). Due to seasonal breeding in BN flock, the does was Kidded 75 % from Feb to March while the rest in April and May. But in NH goat farm the kidding distribution continued all year, except in April. In this month, there was lack of green fodder, due to this there was no kidding in the month of April. The same study was observed by Silva *et al* (18).

The postpartum anestrous observed in this study in NH flock and was found that the postpartum anestrous was variable 50.00 ± 3.95. Reported by Shahnaz *et al*, 2007 all animals showed the postpartum estrous period of 15 to 59 days, and the standard length of postpartum period was found as 27.9 ± 14 days (19).

The score difference between the two bodily condition assessments was 0.53 ± 0.03. In comparison to NH goat farm, the body condition score in BN was lower. However, compared to all other animals, those with a body condition score (BCS) less than 1.5 (on a 5-point scale) were 9 times more likely to abort, according to Craig Richardson's 2005 research. However, in our investigation, the BCS in both herds was greater from a 1.5-point scale, and the animals' condition was better (20). Morand-mean Fehr's condition score performance is based on the sternum and lumbar ratings (21). Both herds used the same technique for BCS. The scores of pregnant women were higher ($P<0.01$) than those of non-pregnant women.

There was a 1.37 + 0.98 kg body weight difference between the two herds. The BN flock's body weight has slightly increased. The adult body weight of goats was reported in prior research by Hamayun, *et al.*, 2006, to be 14.50 ± 1.19, 21.0 ± 3.47, 24.00 ± 1.25, and 33.95 ± 4.97 kg, respectively (22), According to Banerjee, 2000, the adult male Indian Beetal's body weight ranges from 50 to 62 kg, whereas the adult female's weight is noted as being between 35 and 40 kg (23). In our study, the female goats in both herds were the same weight, but the male beetles in NH farm were heavier at 67.800, 83.600 kg than they were in BN farm at 82.200 kg. The outcome seen in goats that produce mohair is consistent with this (24).

FEEDING, LABOR, AND MISCELLANEOUS COST OF BN & NH

Mean feeding cost were noted at both herds and concluded that the annual feeding cost was higher in BN flock than in NH flock. The main reason of higher cost of feeding in BN farm was to provide concentrate on daily basis, but in NH goat farm, the concentrate was provided seldomly. Mean labor cost

was high in NH farm than in BN farm, because in NH goat farm the cost of labors was higher than in BN farm annually. Mean miscellaneous cost was higher in NH goat farm than in BN farm annually.

CONCLUSION

The seasonal breeding at Bahadurnagar Research farm has restricted the frequency of kidding, which leads to the conclusion that the reproductive efficiency of beetal goats in Noor-Hussain Goat Farm was greater than Bahadurnagar Research farm. Adversely, breeding throughout the year was effective, and the incidence of kidding nearly quadrupled the same year. Because they offer concentrate daily, Bahadurnagar Research goat farms had greater feeding costs than Noor-Hussain goat farms, while Noor-Hussain goat farms had higher labor and other costs. In the Noor-Hussain goat farm, green fodder management was better, and there was enough green fodder for the entire year. Even though the cost of labor and other expenses was greater in the Noor-Hussain goat farm, it produced more than the Bahadurnagar Research farm. Effective management practices and year-round breeding can boost Beetal goats' reproductive efficiency.

According to this study the productivity of goat reproduction may be considerably increased via research and development, which will also benefit the lives of the impoverished. Utilizing modified reproductive strategies to structure the entire system, allowing for high production levels. The study's conclusions might be used to assess the feasibility of systems based on reproductive effectiveness and could offer general principles for establishing goat farms in the future.

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