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Crossbreeding Trials with Boer Goats in Sri Lanka: Effects on the Birth Weights of Kids

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Abstract

Records of 2644 kids born between 1983 and 1990 from a crossbreeding programme involving Boer, Jamnapari and Kottukachchiya breeds were analyzed to study the effects of breed types, sex and month of birth on the birth weight of goats. Average birth weights of Boer, Jamnapari, Kottukachchiya and 50% Boer crossbreds were 3.02, 2.76, 2.23 and 2.69 kg, respectively. *Inter se* mating of 50% Boer crossbreds did not cause any reduction in the birth weights. Backcrossing the 50% Boer crossbreds to the Boer increased birth weights. Male kids were significantly heavier at birth than the females. The effect of month of birth on birth weights was not significant.

1 Introduction

Recent livestock development programmes have highlighted the potential of goats as an alternative to meet the shortfall in meat supply in Sri Lanka. The number of goats in the country is about 550,000, but majority of this population belongs to the indigenous goat types. Though the indigenous types are prolific and tolerant of local environment, they are poor meat producers with a small mature body size (SIRIWARDENE AND RAJAGURU, 1989). Periodically, improved breeds of goats have been imported in the past to upgrade the indigenous types and, these include Jamnapari from India and Anglo-Nubian from the Europe. In 1982, the Sri Lankan Government, with assistance from the German Government, established a goat breeding project at Kottukachchiya to improve the meat producing ability of indigenous goats through crossbreeding with the German Boer breed. The focus of the present study was to examine the effects of this breeding programme with the Boer on the birth weights of crossbred kids. Data on Jamnapari, Kottukachchiya and their crosses were also included for comparison purposes. In addition, the effects of sex and month of birth on the birth weight of goats were investigated.

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2 Materials and methods

Source of data

The data consisted of records of 2644 kids born between January 1983 and December 1990 at the State Livestock Farm, Kottukachchiya. Most of the land area in this farm is under improved pasture, such as *Brachiaria brizantha*, *B.Mutica* and *Digitaria decumbens*. The pasture is sparsely distributed with *Manilkara hexandra* and *Centranthera indica* trees. About 20 ha of land is established under ipil-ipil (*Leucaena leucocephala*). Rest of the farm area is scrub jungle with thick undergrowth.

The farm is located in the dry zone of Sri Lanka and experiences a bimodally distributed rainfall of 1268 mm. The rains precipitate mainly during the North East (October - December) and South West (April - May) monsoonal periods. The average monthly temperatures range from 26 to 29°C. The relative humidity ranges from 75 to 85% with a mean of 81%.

Breed types

Birth weight records of eight breed types were utilized in the present study. The parentage of these breed types are summarized in Table 1. The Boer animals were imported from West Germany in 1982. Boers are stocky, dual-purpose animals. Mature females weigh around 60 - 75 kg, while full-grown males can attain a weight of 100 kg. Jamnapari, imported from India, is a dual-purpose breed. The average mature body weight of females is about 55 kg and that of males is 75 kg. The Kottukachchiya is a breed type developed at Kottukachchiya farm from a nondescript type of South Indian goats imported in 1965 (WIJERATNE, 1968). They thrive well in the dry zone and, are resistant to infectious pneumonia and cerebrospinal nematodiasis compared to other introduced breeds (BUVANENDRAN AND JALATGE, 1974). The mature body weights of Kottukachchiya females and males are 20 and 25 kg, respectively.

General management

All animals were maintained in ground-level cement floor housing. Year-round grazing on both cultivated pasture and natural grasslands was practiced. The animals grazed from 7 - 11 a.m. and 2 - 6 p.m. They were penned during the night and given supplementary feeding of *ad lib* ipil-ipil fodder. A concentrate mixture of rice bran and coconut poonac was fed during the dry season. Mineral supplements were provided to all animals and water was available at all times.

A controlled breeding schedule was practiced in which bucks were penned with appropriate doe types until breeding is confirmed. Pregnant animals were maintained in separate pens and given additional concentrates, especially during the latter part of the pregnancy. Kid weights were recorded within 12 hours of birth.

Statistical analysis

The data was subjected to analysis of variance and the effects of breed type on birth weight were tested using orthogonal polynomial contrasts. The effect of sex was examined using the Student's t-test, whereas the effect of month of birth was tested by regression analysis (SAS,1982).

Table 1: Types of goats evaluated in the study.

	Parents	
Breed type	**Sire**	**Dam**
100% Boer	B	B
87.5% Boer	B	75% B
75% Boer	B	50% B
50% Boer	B	J,K,J x K
50% Boer *inter se*	50% B	50% B
J	J	J
K	K	K
JxK	J	K

B - Boer; J - Jamnapari; K - Kottukachchiya.

3 Results and Discussion

The unadjusted mean birth weight and standard deviation of the different breed types are presented in Table 2. Weight at birth was significantly ($P < 0.01$) influenced by the kid's breed type. The major objective of the present investigation was to establish the effects of incorporating of Boer blood on the birth weight of the crossbred goats. The interpretation of data however, was made difficult by the inability to separate the effects of the three dam breed types used in the production of F_1 crossbreds (50% Boer); the breed effects are therefore confounded with the dam breed effects. An analysis of breed population in the farm showed that Jamnapari, Kottukachchiya and Jamnapari x Kottukachchiya does constituted approximately 25, 30 and 45 % of the females during the study period (1983 - 1990). Extrapolation of this information to the birth weight data enabled certain reasonable interpretations to be made.Weights at birth of the F_1 crossbreds were similar to that of Jamnapari, but higher ($P<0.01$) than those of the local types (Kottukachchiya and Jamnapari x Kottukachchiya crosses). Interestingly, the birth weights of F_1 crossbreds were intermediate to those of the Boer and the local types On the average, these crossbred kids were about 0.3 kg heavier at birth than the local types. Thus the advantage of upgrading the local types with the Boer is obvious. The results also suggest that the birth weight of Boer halfbreeds is more influenced by the kid's genotype than by maternal genotype.

It is noteworthy that the improvements in birth weight were maintained in the F_2 crossbreds as well. The birth weight of F_2 crossbreds, resulting from the *inter se* mating of F_1 animals, was similar to that of F_1 crossbreds (Table 2). As anticipated, backcrossing of F_1 crossbreds to the Boer increased ($P<0.05$) the birth weights of kids. The average birth weight recorded for the Boer in the present study is lower than the value of 3.7 kg reported for Boers in Southern Africa (DEVENDRA AND BURNS,1983}.

Table 2: Birth weights of Boer, Jamnapari and Kottukachchiya breeds, and their crosses.

Kid Breed	Number of Observations	Mean ± SD
100% Boer	27	3.02 ±- 0.64
87.5% Boer	30	3.11±- 0.63
75% Boer	149	2.82± 0.56
50% Boer	1426	2.69±- 0.59
50% Boer *inter se*	737	2.76± 0.52
Jamnapari	81	2.76± 0.51
Kottukachchiya	165	2.23 ±0.55
Jamnapari x Kottukachchiya	29	2.27±0.46

The average birth weight of the Jamanapari x Kottukachchiya crossbreds was lower ($P<0.0l$) than that of Jamnapari, but similar to that of Kottukachchiya. These results are in agreement with those reported by Buvanendran and Jalatge (1974). The data show that, in contrast to that noted for Boer halfbreds, the birth weights of Jamnapari x Kottukachchiya crossbreds are largely determined by the maternal genotype.

Male kids registered significantly ($P<0.0l$) higher birth weights than the female kids (Table 3). The data is consistent with other published work (MAVROGENIS et al.,1984; MUKUNDAN et al.,1981; SAXENA et al.,1990; SINGR et al., 1975). Males in general are heavier at birth than the females, because of the faster growth of male foetuses during prenatal development (NEEEDHAM, 1964).

Table 3: Birth weights of male and female kids.

Sex of Kid	Number of Observations	Mean ± SD
Male	1078	2.80 ± 0.57
Female	1568	2.62 ± 0.58

Significant ($P<0.01$) sex effects.

Month of birth had no effects on the birth weight of kids (Table 4). The mean birth weights ranged from 2.61 kg (June) to 2.77 kg (January), but the differences were not statistically significant ($P>0.05$). The present results are in disagreement with the findings reported in India (MOULIK AND SYRSTAD,1970; NAIK et al., 1985; SINGH, 1973; SINGH et

al.,1975; SAXENA et al., 1990), where significant seasonal effects were reported. The year-round supplementary feeding practiced at the Kottukachchiya farm is probably responsible for the absence of any seasonal effects on birth weights.

Table 4: Effect of month of birth on the birth weight of goats

Birth Month	Number of Observations	Mean ± SD
January	397	2.77± 0.60
February	269	2.69f 0.56
March	355	2.68± 0.53
April	213	2.68f 0.53
May	200	2.63± 0.64
June	144	2.61± 0.58
July	202	2.73± 0.59
August	181	2.66± 0.61
September	195	2.75± 0.59
October	169	2.71± 0.64
November	154	2.69± 0.54
December	165	2.69± 0.56

Data statistically not significant (P>0.05)

Weight at birth is of importance in goats because of its positive relationship with kid survival and, postnatal growth and development for mutton production. With the current emphasis on smallholder goat production, a good start is critical particularly in an environment such as the dry zone which is not optimum in terms of feed availability and climate. The evidence from the results presented herein suggest that crossbreeding with the Boer would be advantageous to improve the performance of the indigenous goat types. Confirmation of this conclusion however, necessitates more detailed studies on the preweaning mortality, weaning weights and postweaning growth of the crossbred kids.

4 Zusammenfassung

Kreuzungen mit Burenziegen in Sri Lanka: Auswirkungen auf das Geburtsgewicht von Ziegenlämmern

Ergebnisse von 2644 Geburten zwischen 1983 und 1990 aus einem Kreuzungsprogramm mit Buren, Jamnapari und Kottukachchiya wurden in der Studie auf Geschlecht, Geburtsmonat und Geburtsgewicht untersucht. Das durchschnittliche Geburtsgewicht von Buren, Jamnapari und Kottukachchiya und 50% Burenkreuzung war 3,02; 2,76; 2,23 und 2,69 kg. Die Einkreuzung von 50% Buren ergab keine Reduzie-

rung des Geburtsgewichts während die Rückkreuzung das Gewicht erhöhte. Männliche Tiere waren signifikant schwerer bei Geburt als weibliche, der Geburtsmonat hatte keine Auswirkungen.

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