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Effect of Selection for Growth on Production Performance in Black Bengal Goats

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Abstract: Selection for growth at 6 months of age in Black Bengal goats was practiced to improve the growth and production performance. Selection was done for three generations. Two groups were maintained simultaneously, selected group and control group. The birth weight of selected group (0.98 kg) was significantly ($p<0.01$) higher than the control group (0.85 kg). Body weights in selected group at 3, 6, 9, 12 months were 4.85, 8.11, 10.68 and 15.49 kg and that of control group were 4.36, 6.86, 9.76 and 13.52 kg, respectively having significant differences ($p<0.05$). The reproductive performance and survivability were also studied to predict the extent of correlated response on them as a result of selection for growth. Age at first service was 281 days in selected line and that of random bred was 265 days. The weight at first service were 10.96 and 9.32 kg, respectively in selected and control lines. The number of service per conception of two groups were 1.17 and 1.19, respectively in selected and control does. Litter size of goats was 2.10 and 1.93 in selected and control lines, respectively. The kidding interval in selected does was lower (233.47 days) than that of random bred (274.60 days). The litter weight in selected and control kids were 1.62 and 1.42 kg, respectively. The pre-weaning kid survivability (%) of selected and control lines upto 60 days were 87.4 and 89.3, respectively. From the results, it was concluded that selection for growth at 6 months in Black Bengal goats substantially improved growth efficiency and production performance without affecting fertility and fitness.

Key words: Selection, growth, production performance, goats

INTRODUCTION

Of the domestic animals of value to man in the tropics the goat is perhaps the most important one because they are extremely hardy, disease resistant and easy to rear. Bangladesh has the third highest population of goats among the Asiatic countries, which accounts for about 34 million heads representing 57% of total ruminant livestock (Amin *et al*., 2000). Goat significantly contribute to the national GDP through the production of 116,000 MT of meat representing 25% total red meat, 1,328,000 MT milk and 3,900 MT skin each year (FAO, 1997). Bangladesh possesses a tropical breed of its own known as the Black Bengal goat, is being reared primarily for meat production and has the potential of being developed a Broiler goat (Singh, 1985), hence growth capacity must be considered as an important trait in meat production.

Ercanbrack and Price (1972) expressed that selection has a notable economic importance to livestock breeders for improving rate of weight gain. Selective breeding using superior bucks and does expected to improve growth potential of Black Bengal goats without much alteration in the prevailing production system. As such selection efforts become specially important in our situation to preserve the well-adapted indigenous genetic resources and to save them from extinction. It is necessary to take into account the reproductive and survivability traits when a flock or population is to be considered for the said purpose.

The objectives of the study were, to evaluate the production performance of Black Bengal goats in terms of growth and reproduction; to study the effect of selection for growth in production and reproduction performance; to predict the extent of correlated response on reproduction and fitness.

MATERIALS AND METHODS

The data used for this experiment was collected from "Goat Breeding Project" in the Department of Animal Breeding and Genetics of Bangladesh Agricultural University, Mymensingh which was carried out at a number of villages around the station.

Animal and management: A total number of 814 animals were maintained dividing into two groups, they

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are selected and control. The selection principles of this experiment were fixed upon live weights of both parents ranged between ages from 6-12 months in first generation and 6 months in second and third generations.

The animal management procedures in both the elected and control groups were similar to efface the genotype-environment interaction (Bhuiyan, 1989). All the animals were kept under typical goat husbandry system prevailing in the countryside of Bangladesh (Husain *et al*., 1998), feeding them solely by grazing without offering any concentrate to them.

Traits considered for analyses: The following records of all the experimental animals were maintained:

a. Live weights:
   Birth weight
   Monthly liveweight upto 12 months in male and
   Upto first conception in female
b. Reproduction (in female)
   Age at first service
   Weight at first service
   Service per conception
   Kidding interval
   Litter size
   Biomass(litter weight)
c. Pre-weaning kid survivability (cumulative) upto 3, 7,15, 30 and 60 days of age

Statistical analyses: Data were analyzed with MSTAT computer program. The Least Squares Analysis of Variance (LSANOVA) and Least Squares Means (LSM) were calculated for all the traits. The following model was used for the analyses of live weight and reproductive traits in particular generation as a part to assess the growth potential as well as the correlated response of reproduction.

$$Yijk=\mu + Gi + Lj + eijk$$

Where, Yijk is an individual observation, μ the mean, Gi the effect of ith group (i = selected and control), Lj the effect of jth generation (j = 1, 2, 3), eijk the residual error normally distributed with mean 0 and variance σ^2e.

Code '0' for dead and '1' for survivor was used in the method of calculating the Pre-weaning Kid Survivability, PKS (Singh *et al*., 1991a, 1991b; Husain, 1993; Husain *et al*., 1994, 1995). Therefore, PKS denoted probability of thriftiness ranged between 0 and 1; data on PKS was analyzed using the following model:

$$Yij= \mu + Gi + eij$$

Where, Yij is the individual record, μ the mean, Gi the effect of ith group (I = selected and control), eij the random error, normally and independently distributed with mean 0 and variance σ^2e.

For separation of subclass means Least Significant Difference (LSD) test or Duncan's Multiple Range Test (DMRT) was performed only in case where main effects were significant (Snedecor and Cochran, 1980).

RESULTS AND DISCUSSION

Figure 1 shows live weights of selected and control groups of Black Bengal goats respectively at birth, 3, 6, 9 and 12 months of age when generations were pooled. Selected group was heavier than control group ($p<0.05$) at all ages in generation pooled. Selection showed no significant increase in live weights (birth, 3, 6, 9 and 12 months) for three successive generations (Table 1).

Table 2 shows the average value of reproductive traits of both selected and control groups in three successive generations (Generation pool). Correlated responses of selection for reproductive traits were non significant.

Among the parameters of growth, birth weight is an important factor affecting productivity to a great extent because it is strongly correlated with postnatal survivability, growth rate, and body size. The gradual increase of birth weight in three generations of selected kids indicated the positive effect of selection on pre-natal growth. Birth weight of kids obtained from this study was slightly lower than that reported by Devendra (1985) as 1.3 kg for the same breed but higher as reported by Ali *et al*. (1973) in farm conditions. In the present study, significantly high birth weight of selected Black Bengal compare with control line agrees with the findings of Husain *et al*. (1996b). Kids of selected goats had almost the same weight at 3 month of age as reported by Husain *et al*. (1996b).

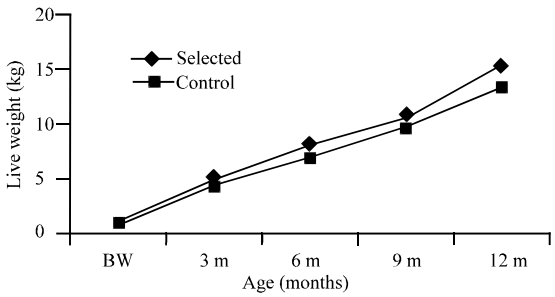

Fig. 1: Comparison of live weight between selected and control group (Generation Pooled)

Table 1: Live weight in three generations of selected and control groups (mean±SE)

	Selected			Control		
Traits	G1	G2	G3	G1	G2	G3
Birth weight	0.96±0.04	1.02±0.08	1.12±0.11	0.82±0.01	0.91±0.02	1.05±0.03
3 month weight	4.99±0.15	4.64±0.33	4.07±0.42	4.38±0.13	4.39±0.27	3.99±0.47
6 month weight	7.98±0.29	7.63±0.67	9.88±0.82	6.82±0.08	7.00±0.17	6.93±0.31
9 month weight	10.76±0.14	10.44±0.31	10.49±0.42	9.79±0.52	9.70±0.93	9.70±1.82
12 month weight	15.98±1.15	13.70±3.38	12.85±3.53	12.85±1.34	12.68±2.59	12.50±4.10

Table 2: Reproductive traits in selected and control lines (mean±SE)

Groups	Age at first service (d)	Weight at first service (kg)	Litter size	Kidding interval (d)	Service per conception	Biomass (Kg)
Selected	281.02±9.93	10.96±0.22	2.10±0.13	233.47±15.46	1.17±0.05	1.62±0.14
Control	265.43±9.71	9.32±0.21	1.93±0.15	274.60±14.48	1.19±0.04	1.42±0.07

In this study, the 6 month weight of kids was almost similar to that reported by Husain *et al.* (1996b). This weight slightly decreased in G2 than G1 but there was a sharp increase in G3, which can be attributed to selection of very little number of goats for that particular age.

Correlated response of selection at 9 month weight observed in this study had the similar value of that reported by Husain *et al.* (1996a). Slight decrease in G2 and G3 compared to G1 in selected line might be due to managemental variation during this period.

The body weight difference at 12 month of age was higher in G1 than G2 and G3, might be caused by large selection differential applied in selecting parents of G1.

Correlated response of live weight at birth, 3, 6, 9 and 12 months of age showed consistent superiority of selected line than control line in different generations which signifies that selection within Black Bengal breed for growth was persistent.

Both age and weight at which the does exhibit first estrus were higher than that observed by Amin *et al.* (2001). It may be due to both genetic and environmental reasons (e.g., growth rate, ambient temperature, season of birth and especially nutrition and management).

The average litter size appears to be smaller than those (2.09 in India and 2.31 in Bangladesh) cited by Devendra (1985) larger than (1.10) Verma *et al.* (1991) and close to Amin *et al.* (2001).

In this study, kidding interval incase of selected Black Bengal does were higher than that reported by Amin *et al.* (2001).

The number of service required per conception of does decreased with the increase in generation number for both lines. The mean number of services for each conception were similar to that reported by Koratkar *et al.* (1998) for Osmanabadi up to second generation but little lower in third generation.

Litter weight (biomass) of kids slightly lower than that of Amin *et al.* (2001) of selected group and higher than control group. The reason may be that selection for growth increased litter weight (biomass) and kids of selected group grew and survived better than control group.

It can be concluded that selection for growth did not affect productivity of Black Bengal goats on the other hand the selection efforts could preserve the indigenous genetic resources from extinction or unplanned crossbreeding.

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