

A STUDY ON ESTIMATION OF HERITABILITY OF BIRTH WEIGHT AND WEANING WEIGHT OF TEDDY GOATS KEPT UNDER PAKISTANI CONDITIONS

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Summary

The mean birth weight and weaning weight estimated from 777 kids from 30 bucks of Teddy goats were 1.67 ± 0.31 and 8.50 ± 2.18 kg, respectively. The estimates of heritability of birth weight and weaning weight by half sib correlation method were 0.048 ± 0.022 and 0.101 ± 0.012 kg, respectively. The high heritability estimates of birth weight indicates that selection on the basis of individual's own record will be effective. The low estimates of heritability of weaning weight indicates more emphasis should be given to improve environmental conditions for better achievement.

(Key Words : Heritability, Birth Weight, Weaning Weight, Correlation)

Introduction

Of all the domestic animals, the goat probably has the widest ecological range. Goat is a multipurpose animal producing meat, milk, skin, mohair and hair. They are primarily reared for meat, but in temperate countries milk is of greater importance. The world population of goats is about 526.4 million heads while our national flock is about 36.8 million or 6.5% of the total world population belonging to 29 different breeds (Anonymous 1990). Goats share 25% of the total annual production of meat and 2.77% milk in addition to 17.9 million of skins and 5,700 tonnes of hair.

In recent years, Teddy goat has emerged as an efficient meat supplier and is very popular due to its easy handling, small size, low cost, early maturity, high prolificacy and good quality meat. The knowledge of its potential and performance under local environmental conditions is a vital spring board for its improvement. In spite of a significant role in fulfilling the meat shortage, no systematic work has been undertaken to study the genetic potential of this breed. So this project was planned to study the heritability of birth and weaning weights. This information will be of prime importance in future planning for genetic improvement of Teddy goats.

Materials and Methods

Data from 777 pedigree and performance records of 30 sires of Teddy goats kept at Livestock Production Research Institute Bahadumgar, Okara (Pakistan) during 1975-90 were used for this study. The feeding and management of the goats during experimental period were the same. The bucks selected based on their phenotypes and pedigrees, whereas no attention was given for the selection of females. After parturition, birth weight of kids was recorded before they were allowed to suckle their dams. All prophylactic measures against contagious, endo and ecto parasitic diseases were undertaken. The weaning age varied from 60 to 152 days. The kids having less than 60 days weaning age and the sires having less than 5 kids were excluded from the study. The data on date of birth, birth weight, birth type, sex of kid, date of weaning and weaning weight were recorded.

The heritability of birth weight and weaning weight was estimated by half sib correlation method which is based on phenotypic resemblance between relatives as compared to unrelated individuals. The recorded data were analyzed for the estimation of variation between and within sire groups and various components of variance were worked out (Kempthorne, 1957).

As there were unequal number of offsprings in individual sire groups, the average number of progeny per sire (K) was worked out by the formula.

$$K = \frac{1}{S-1} \cdot \frac{[N - \sum n^2]}{N}$$

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Where

S = Number of sires

N = Total number of progenies used in the study

Σ = Means sum of

n_i = Number of observations on the i_{th} sire.

The heritability was estimated by multiplying intraclass correlation (t) by the factor 4. (Becker, 1992).

$$t = \frac{\sigma^2_s}{\sigma^2_w + \sigma^2_s} \text{ and } h^2 = 4t$$

Where

t = interclass correlation

h^2 = heritability

σ^2_s = genetic variation

σ^2_w = environmental variation

Results and Discussion

Birth Weight

The average birth weight of 777 kids from 30 sires born during the experimental period was 1.67 ± 0.31 kg comparable to those reported in Malaya goats and in Angora goats (Mukherjee et al., 1983 and Jagtap et al., 1988). The recorded data were grouped according to sires and analyzed for between and within sire sources of variation. The average number of progeny per sire (K) was calculated to be 17.299 and the estimated heritability was 0.448 ± 0.022 (table 1).

TABLE 1. ESTIMATION OF HERITABILITY OF BIRTH WEIGHT

Source of variation	d.f	M.S	E.M.S
Between sires	29	0.245	$\sigma^2_w + 17.299 \sigma^2_s$
Within sires	747	0.077	σ^2_w

$$\sigma^2_s = 0.0097, \quad t = 0.112, \quad h^2 = 4t = 0.448.$$

The high estimate of heritability than this investigation in Black Bengal kids was reported by Endang (1988) and lower estimates were also reported by Constantinou (1986) and Santos et al. (1989).

This variation may be due to several factors such as heritability varies between breeds, places, flocks and method of estimation. Inbreeding and small size of breeding group may reduce the genetic variation whereas different environmental factors at different places, breeds, flocks and even year might increase the phenotypic variation.

The high estimate of h^2 0.448 ± 0.022 suggested that additive gene action or the hereditary variation in birth weight was fairly high and individual selection and mating of the best to the best would be beneficial to improve birth weight.

Weaning Weight

The mean weaning weight of 777 progenies from 30 sires and 301 dams was 8.50 ± 2.18 kg. The comparable weaning weights of 8.14 ± 2.42 , 8.90 and 9.41 ± 0.74 kg were reported respectively by Mukherjee 1983, Kanaujia et al., 1985 and Mittal, 1987. The recorded data were analyzed by half sib-correlation method for between and within sires sources of variation. The average number of progeny per sire (K) was estimated to be 17.299. The estimated heritability was 0.101 ± 0.012 (table 2).

TABLE 2. ESTIMATION OF HERITABILITY OF WEANING WEIGHT

Source of variation	d.f	M.S	E.M.S
Between sires	29	5.135	$\sigma^2_w + 17.299 \sigma^2_s$
Progeny within sires	747	3.551	σ^2_w

$$\sigma^2_s = 0.0916, \quad t = 0.025, \quad h^2 = 4t = 0.101.$$

The compromising heritability estimates of 0.17 ± 0.30 was reported by Setiadi (1988) and 0.10 by Nicoll et al., 1989. The low estimates of heritability of this study indicate that larger proportion of the phenotypic variation is due to non additive gene action or environmental conditions under which the kids were reared. AS the portion of hereditary (σ^2_H) is low, hence the progress through selection without improving environment will be slow. To get proper improvement, greater emphasis should be given to environmental conditions of feeding, management and disease control measures.

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