

## ENVIRONMENTAL EFFECTS ON BIRTH WEIGHT IN BEETAL GOAT KIDS

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### ABSTRACT

Data on pedigree, breeding and performance records (N=1850) of Beetal goats maintained at the Angora Goat Farm Rakh Kharewala, District Layyah, Livestock Production Research Institute, Bahadurnagar District. Okara and Livestock Experiment Station, Allahdad (Jahanian) District Khenawal during the period from 1988 to 2000 were used. Least squares analysis revealed that year of birth, sire, flock, sex of kid and type of birth were significant ( $P < 0.01$ ) sources of variation for birth weight in Beetal kids. The kids born at Bahadurnagar were heavier ( $3.65 \pm 0.13$  kg) as compared to the kids born at Allahdad ( $3.55 \pm 0.08$  kg) or Rakh Kharewala ( $2.96 \pm 0.05$  kg). Birth weights for male and female kids were  $3.48 \pm 0.06$  and  $3.29 \pm 0.06$  kg, respectively. Single born kids were heavier ( $3.69 \pm 0.06$  kg) than twins ( $3.37 \pm 0.06$  kg) and triplets ( $3.08 \pm 0.08$  kg). There was an appreciable twinning rate (47.9%) in these flocks.

**Key words:** Beetal goats; birth weight; environmental effects.

### INTRODUCTION

Sheep and goats are the major source of livelihood for over a million livestock farmers (Hasnain, 1985). There are more than 50.9 million heads of goats in Pakistan (Anonymous, 2002). The sub-optimal productivity of the existing flocks of goats is mainly attributed to low genetic potential, nutritional and managerial inadequacies. However, some breeds of goats in Pakistan, like Beetal, offer a high potential for meat and milk production. It is famous for its dairy characteristics as well as mutton production. Its males are especially preferred for sacrificial purposes.

One of the traits of economic importance in goats is birth weight. The diversity in performance traits of goats may be attributed to several genetic and non-genetic factors. Although any programme of breed improvement is based on the maximum exploitation of genetic variation, yet these traits also vary due to certain environmental factors, e.g. climate and seasonal differences, sex of the kid, type of birth and age of the dam. It is therefore, imperative to estimate the magnitude of all such factors, so that the genetic variation among animals can be used to devise effective breeding plans for their improvement. The present investigation was thus planned to analyse the data on birth weight of Beetal goats kept at various livestock experiment stations in Punjab, Pakistan.

### MATERIALS AND METHODS

Data on pedigree breeding and performance records (N=1850) of Beetal goats maintained at the Angora Goat Farm Rakh Kharewala, District Layyah, Livestock Production Research Institute, Bahadurnagar District Okara and Livestock Experiment Station, Allahdad (Jahanian) District Khenawal during the period from 1988 to 2000 were used. The information on individual's identity, date of birth, birth weight, sex of kid, sire and type of birth was collected. Generally, the does were bred once a year in autumn (September-October) and kids were born during subsequent spring (February-March). Most of the does (78.2%) gave birth to kids during spring season, while rest of the does, not bred during autumn season, were mated in the subsequent spring to kid during the autumn season. Data with any recorded abnormality were excluded from the analysis. For the evaluation of environmental effects, least squares analysis was performed using LSMLMW computer program (Harvey, 1990). The mathematical model assumed was:

$$Y_{ij} = \mu + F_i + \varepsilon_{ij}$$

Where

$Y_{ij}$  = observation on the trait

$\mu$  = population mean

$F_i$  = effect of all fixed effects (year and season of birth, flock, sex, type of birth) with the restriction that  $\sum F_i = 0$

$\varepsilon_{ij}$  = random error associated with each observation.

## RESULTS AND DISCUSSION

Least squares mean for birth weight was  $3.38 \pm 0.06$  kg in the present investigation. The birth weight had been reported to be  $2.88 \pm 0.03$ ,  $2.88 \pm 0.06$  and  $2.05 \pm 0.01$  kg in Sirohi, Jamunapari and Cheghu goats, respectively (Mehta *et al.*, 1997; Roy *et al.*, 1997; Karna *et al.*, 2001).

Least squares analysis revealed that sire, year of birth, flock, sex of kid and birth type were significant ( $P < 0.01$ ) sources of variation for birth weight in Beetal goats. Similar results, except the effect of year of birth, were observed by Mehta *et al.* (1997) in Sirohi goats. Karna *et al.* (2001) also reported that sire, year of birth and sex of kid exerted a significant effect on birth weight in Cheghu kids.

The birth weight of Beetal kids born during different years showed wide variation (Table 1). Maximum birth weight ( $4.41 \pm 0.11$  Kg) was recorded for the kids born during the year 2000 whereas minimum ( $2.31 \pm 0.08$  Kg) was observed during 1993. The least squares mean for birth weight was  $2.97 \pm 0.15$  Kg during 1988 and decreased gradually to  $2.31 \pm 0.08$  Kg up to 1993. Thereafter, an increase in birth weight was noticed up to the year 1997, when it was recorded as  $4.23 \pm 0.10$  Kg. During the years 1998 and 1999, slightly low birth weight was recorded ( $4.19 \pm 0.10$  and  $4.20 \pm 0.10$  Kg, respectively).

The variation in birth weight of kids born in different years reflected variation in level of management, some environmental effects like temperature and humidity and availability of good quality feed in sufficient quantity. The level of management can vary according to the ability of the farm manager, his system of crop husbandry, methods and intensity of culling and his efficiency in the supervision of the farm labor as well as availability of financial resources. Season of birth had a non-significant effect on birth weight, as also observed by Mehta *et al.* (1997).

The kids born at Bahadurnagar were heavier ( $P < 0.01$ ) at birth than those born at Allahdad and Angora Goat Farm (Table 1). These differences may be due to the differences in location of dams, managemental practices, or genotype x environment interaction. Apparently, the managemental practices at Bahadurnagar seem to be better, as the flock size at this station was comparatively small and management was easier than at other stations.

The male kids were heavier ( $P < 0.01$ ) than female kids (Table 1). It may be due to the fact that the gestation period of does carrying male kids is usually slightly longer (1–2 days) than those carrying female

kids. Single born kids were heavier than the multiple born kids (Table 1), as they had better opportunities in the uterus of their dams as compared to multiple kids.

The maximum kidding in all the flocks (78.2%) was recorded in spring season, while only 21.8% kids were born during autumn season. This reflects the seasonality of breeding in Beetal goats under farm conditions in Pakistan. The overall twinning rate (47.9%) in Beetal goats is appreciable, 7.1% kids were born as triplets, while 45% of kids were born as singles. At Angora Goat Farm, single, twin and triplet born kids

**Table 1: Least squares means of birth weight for different groups of Beetal kids**

Factors	No. of observations	Least squares means (Kg)
<b>Year of birth</b>		
1988	31	$2.97 \pm 0.15$
1989	67	$2.77 \pm 0.14$
1990	232	$2.70 \pm 0.10$
1991	414	$2.59 \pm 0.07$
1992	204	$2.53 \pm 0.08$
1993	131	$2.31 \pm 0.08$
1994	149	$3.02 \pm 0.08$
1995	131	$4.00 \pm 0.08$
1996	137	$4.07 \pm 0.09$
1997	75	$4.23 \pm 0.10$
1998	78	$4.19 \pm 0.10$
1999	74	$4.20 \pm 0.10$
2000	76	$4.41 \pm 0.10$
<b>Season of birth</b>		
Spring	1408	$3.36 \pm 0.06^a$
Autumn	319	$3.41 \pm 0.07^a$
<b>Flock</b>		
Rakh	965	$2.96 \pm 0.05^a$
Kharewala		
Bahadurnagar	196	$3.65 \pm 0.13^b$
Allahdad	638	$3.55 \pm 0.08^c$
<b>Sex of kid</b>		
Male	961	$3.48 \pm 0.06^a$
Female	838	$3.29 \pm 0.06^b$
<b>Birth type</b>		
Single	810	$3.69 \pm 0.06^a$
Twin	861	$3.37 \pm 0.06^b$
Triplet	128	$3.08 \pm 0.08^c$

Values with different superscripts for each factor differ significantly ( $P < 0.01$ ).

were 33.0, 55.5 and 11.5%, respectively. The corresponding values at Bahadurnagar were 39.3, 56.1 and 4.6%. The twin and triplet born kids at Livestock Experiment Station, Allahdad were 34.0 and 1.3%, respectively, while the rest were born as singles. The twinning percentage was almost similar at Angora Goat Farm, Rakh Kharewala and at Livestock Production Research Institute, Bahadurnagar and was higher than that observed at Allahdad farm.

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